



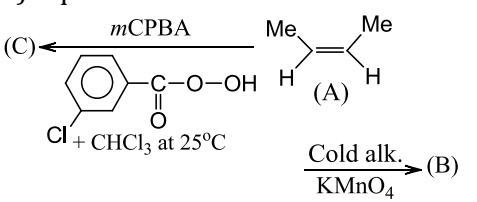


Single Correct Answer Type

- When cyclohexane is poured in water, it floats because:
 - Cyclohexane is in boat form
 - Cyclohexane is denser than water
 - Cyclohexane is in chair form
 - Cyclohexane is in crown form
- Which of the statements is correct?
 - Melting point of alkane increases with increase of C atoms and with increase in branching
 - Boiling point of alkane increases with increase of C atoms but with decrease in branching
 - Cycloalkanes have lower boiling point than normal alkane with same number of C atoms
 - Alkanes have lower boiling point than same number of C atoms in alkanes
 - (I), (II)
 - (I), (II), (III)
 - (III), (IV)
 - (IV)
- During debromination of meso-dibromobutane, the major compound formed is:
 - n*-Butane
 - 1-Butene
 - cis*-2-Butene
 - trans*-2-Butene
- The decreasing order of the acidic character of the following is:

(I)  (II)  (III)  (IV) 

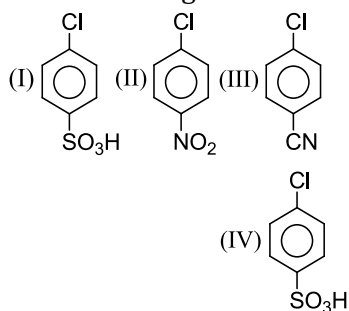
 - (I) > (II) > (III) > (IV)
 - (I) > (III) > (II) > (IV)
 - (IV) > (III) > (II) > (I)
 - (IV) > (II) > (III) > (I)
- Arrange the following in the decreasing order of their melting points:
 - Decane
 - Nonane
 - Octane
 - Heptane
 - (I) > (II) > (III) > (IV)
 - (IV) > (III) > (II) > (I)
 - (I) > (III) > (II) > (IV)
 - (IV) > (II) > (III) > (I)
- Baeyer's reagent is:
 - Alkaline permanganate solution
 - Acidified permanganate solution
 - Neutral permanganate solution
 - Aqueous bromine solution
- (C) 

Which product is racemic in the above reaction?

 - Product B
 - Product C
 - Both
 - None
- When propyne is treated with aqueous H_2SO_4 in the presence of $HgSO_4$, the major product is:
 - Propanal
 - Propyl hydrogen sulphate
 - Acetone
 - Propanol
- Which is the **wrong** statement about oxymercuration-demercuration?
 - In the first step, oxymercuration occurs, i.e., water and $Hg(OAc)_2$ add to the double bond
 - In the second step, demercuration occurs, i.e., $NaBH_4$ reduces ($-HgOAc$) group to hydrogen
 - The net reaction is addition of water according to
 - Rearrangement takes place

Markovnikov's rule

10. The decreasing order of reactivity towards ArSN reaction of the following with NaOMe is:



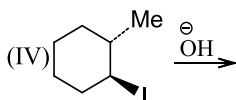
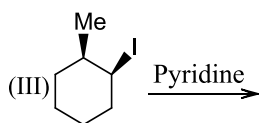
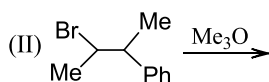
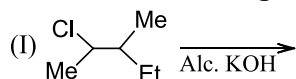
- a) (I) > (II) > (III) > (IV) b) (IV) > (III) > (II) > (I)
 c) (II) > (I) > (III) > (IV) d) (IV) > (III) > (I) > (II)

11. Necessary conditions for Diels–Alder reactions are:

- (I) Non-linearity of dienes
 (II) *S-cis* conformation of dienes
 (III) Dienes with EDG's and dienophile with EWG's groups
 (IV) Diene with EWG's and dienophile with EDG's groups

- a) (I), (II), (III) b) (I), (II), (IV) c) (II), (III) d) (II), (IV)

12. Which of the following reactions is Hofmann elimination?



- a) (I) b) (I), (III) c) (II), (III) d) (II), (IV)

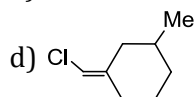
13. In the presence of peroxide, hydrogen chloride and hydrogen iodide do not give anti-Markovnikov's addition to alkenes because:

- a) Both are highly ionic
 b) One is oxidizing and the other is reducing
 c) One of the step is endothermic in both the cases
 d) All the steps are exothermic in both the cases

14. Which of the following shows geometrical isomers?

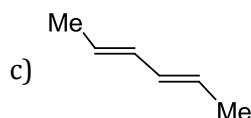
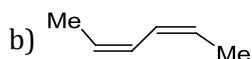
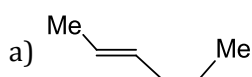
- a) $\text{BrCH} = \text{C} = \text{C} = \text{CHBr}$ b) $\text{BrCH} = \text{C} = \text{C} = \text{CBr}_2$

- c) $\text{CH}_2 = \text{C} = \text{C} = \text{CHBr}_2$



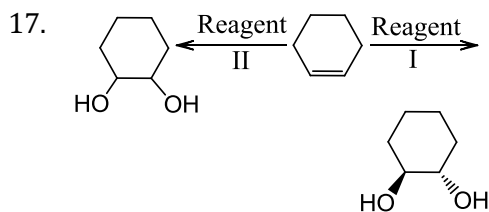
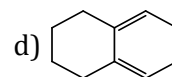
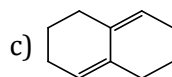
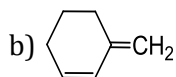
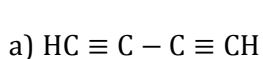
15. $\text{Me} \overset{1}{\equiv} \overset{2}{\text{C}} \overset{3}{\text{C}} \overset{4}{\equiv} \overset{5}{\text{C}} \overset{6}{\text{Me}}$ $\xrightarrow[\text{+ EtoH}]{\text{Cs + Liq. NH}_3}$ (B)
 Hexa-2,4-diyne (A)

Compound (B) is:

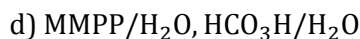


- d) All

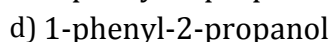
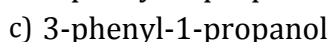
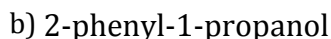
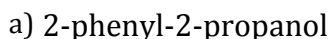
16. Which of the following compounds would undergo Diels-Alder reaction with dienophile (e.g., Maleic anhydride)?



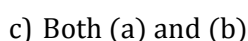
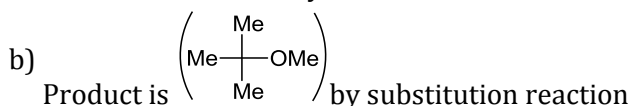
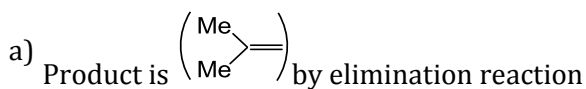
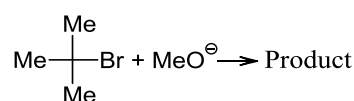
Reagent I and II, respectively are :



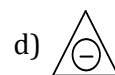
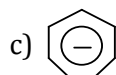
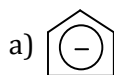
18. 2-phenyl propene on acidic hydration gives,



19. Which statement is correct about the following reaction?



20. Which of the following is the most stable species?



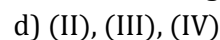
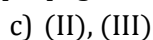
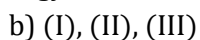
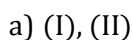
21. Which of the statements is/are true about the reactivity of halogenation of alkanes? The reactivity order is $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$

I. Lower the activation energy for the chain initiation step, more reactive is the halogen

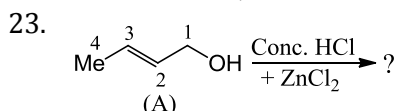
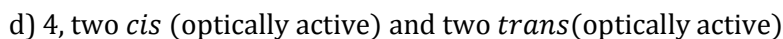
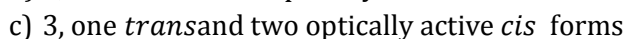
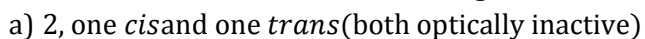
II. Lower the activation energy for the first chain propagation step, more reactive is the halogen

III. More negative is the overall heat of the reaction (ΔH_r°) of halogenation of alkane, more reactive is the halogen

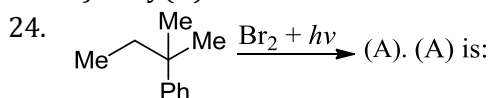
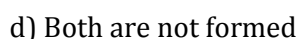
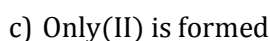
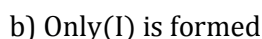
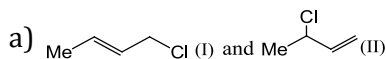
IV. Lower the activation energy for the second chain-propagation step, more reactive is the halogen



22. The total number of isomers including stereoisomers for 1,2-dimethyl cyclobutane is:

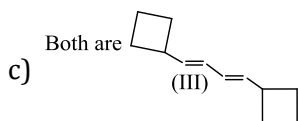
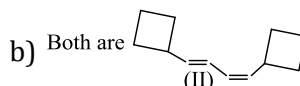
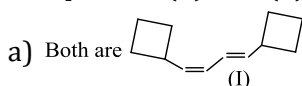


Which statement is correct



25. (A) $\xrightarrow{O_3/\text{reduction}}$ (B) + (C)
 (A), (B), and (C) are:
 a) $\text{CH}_2=\text{O}$ $\text{O}=\text{CH}-\overset{\oplus}{\text{C}}\text{H}_2\text{Br}$
 b) $\text{CH}_2=\text{O}$ $\text{O}=\text{CH}-\text{CH}_2\text{Br}$
 c) $\text{CH}_2=\text{O}$ $\text{O}=\text{CH}-\text{CH}_2\text{Br}$
 d) $\text{CH}_2=\text{O}$ $\text{O}=\text{CH}-\overset{\oplus}{\text{C}}\text{H}_2\text{Br}$
26. Which of the following is the strongest nucleophile?
 a) EtO^- b) $\overset{\ominus}{\text{O}}\text{H}$ c) $\overset{\ominus}{\text{C}}\text{N}$ d) I^-
27. Which of the following is non-aromatic in nature?
 a) Azulene
 b) [10]-Annulene
 c) Furan
 d) Pyrrole
28. The reagent(s) for the following conversion, cis/are
 a) Alcoholic KOH b) Alcoholic KOH followed by NaNH_2
 c) Aqueous KOH followed by NaNH_2 d) $\text{Zn}/\text{CH}_3\text{OH}$
29. In which of the reactions the inversion of configuration takes place
 (I) $\text{SOCl}_2 \rightarrow$
 (II) (A) + $\text{COCl}_2 \rightarrow$
 (III) (A) + $\text{SOCl}_2 \xrightarrow{\text{Pyridine}}$
 (IV) (A) + $\text{COCl}_2 \xrightarrow{\text{Pyridine}}$
 a) (I), (III)
 b) (I), (II)
 c) (III), (IV)
 d) (I), (IV)
30. $\xrightarrow[2. \text{NaBH}_4 + \overset{\ominus}{\text{O}}\text{H}]{1. \text{Hg}(\text{OAc})_2}$
 a) b) c) d) All
31. $\xrightarrow[\text{(iii) } \text{H}_3\text{O}^{\oplus}]{\text{(i) } 2 \text{ BuLi}, \text{(ii) } 1 \text{ mol of } \text{C}_2\text{H}_5\text{Br}}$ (B)
 The product (B):
 a) b) c) d) Me
32. $\xrightarrow[\text{+ EtOH}]{\text{Cs + liq. NH}_3}$ (B)
 $\xrightarrow{\text{LiAlH}_4}$ (C)

Compounds (B) and (C) are:



d) B is (I) and C is (II)

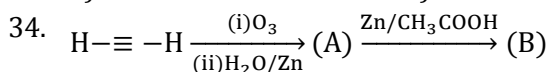
33. Methyl bromide is converted into ethane by heating it in ether medium with:

a) Zn

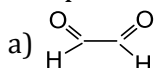
b) Cu

c) Na

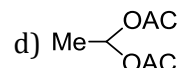
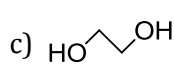
d) Al



Compound (B):



b) Me - COOH



35. The number of structural and configurational isomers of a bromo compound, $\text{C}_5\text{H}_9\text{Br}$, formed by the addition of HBr to 2-pentyne respectively, is:

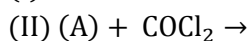
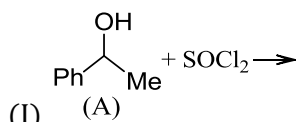
a) 1 and 2

b) 2 and 4

c) 4 and 2

d) 2 and 1

36. In which of the following reactions, retention of configuration takes place?



a) (I), (III)

b) (I), (II)

c) (III), (IV)

d) (I), (IV)

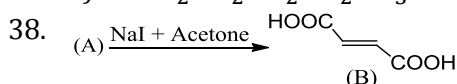
37. The synthesis of 3-octyne is achieved by adding a bromoalkane into a mixture of sodium amide and an alkyne. The bromoalkane and alkyne respectively are

a) $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$

b) $\text{BrCH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{CH}$

c) $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{C}\equiv\text{CH}$

d) $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$



(A) is 2,3-dibromobutan-1,4-dioic acid. Which stereo-chemical reactant is (A)?

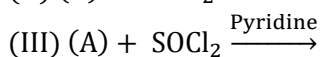
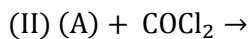
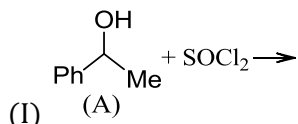
a) Erythro-

b) Meso-

c) Threo-

d) Both (a) and (b)

39. In which of the reactions proceeds by SN^1 mechanism

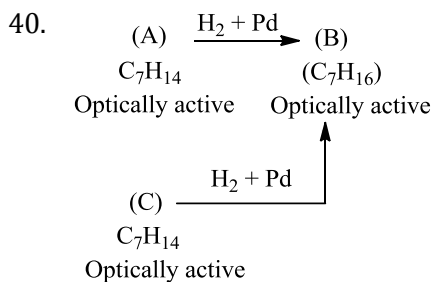


a) (I), (III)

b) (I), (II)

c) (III), (IV)

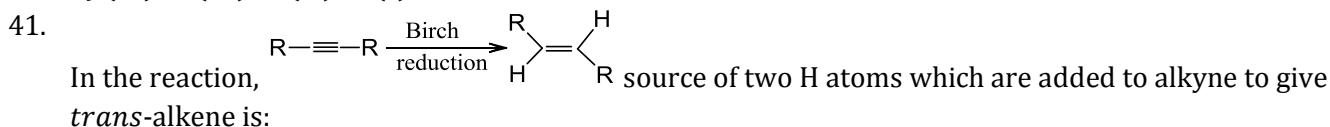
d) (I), (IV)



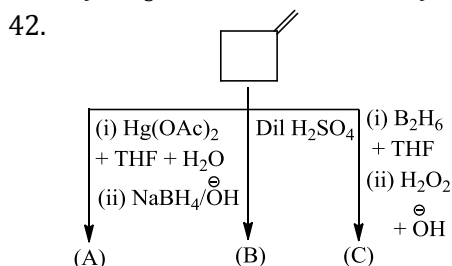
(A) and (C) are different compounds and rotate the plane-polarised light in the same direction, and both are dextrorotatory. Both (A) and (C) do not show diastereomers,

The decreasing order acidic character is:

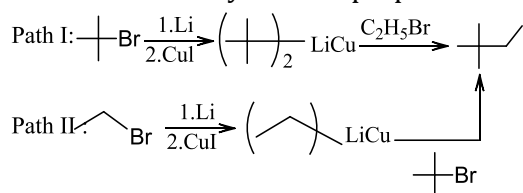
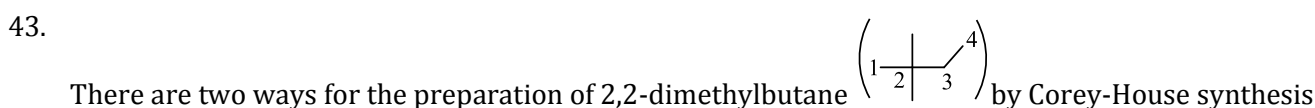
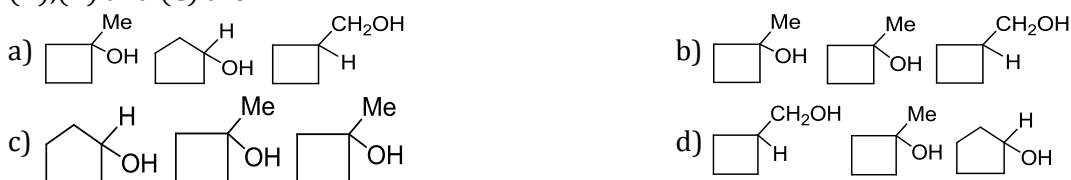
- a) (I) > (II) > (III) > (IV)
 b) (I) > (II) > (IV) > (III)
 c) (IV) > (III) > (II) > (I)
 d) (III) > (IV) > (II) > (I)



- a) NH₃ b) EtOH c) Et – NH₂ d) Both (a) and (c)



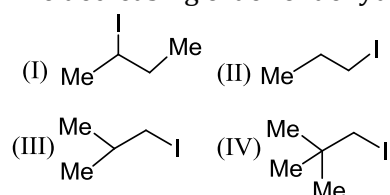
(A),(B) and (C) are:



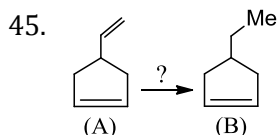
Which of the following statements is correct?

- a) Both Path I and II are feasible b) Path I is feasible
 c) Path II is feasible d) Both path I and II are not feasible

44. The decreasing order of dehydrohalogenation of the following compound is:



- a) (I) > (II) > (III) > (IV) b) (IV) > (III) > (I) > (II)
 c) (II) > (I) > (III) > (IV) d) (IV) > (III) > (II) > (I)



Which reagent is used for the conversion of (A) to (B)?

- a) $H_2 + [RhCl(Ph_3P)_3]$ b) $NH_2NH_2 + O_2$ c) MMPP in ethanol / H_3O^+ d) $Si_2BH + CH_3COOH$

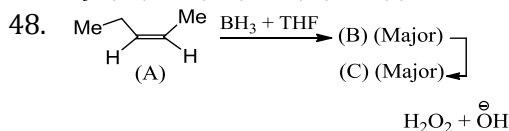
46. Which of the following will decolourise alkaline $KMnO_4$ solution?

- a) C_3H_8 b) CH_4 c) CCl_4 d) C_2H_2

47. Arrange the following compounds in the decreasing order of acidic character

- I. Butane II. But-1-ene
III. But-1-yne IV. Butan-1-ol

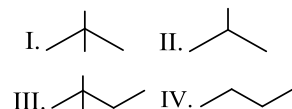
- a) (I) > (II) > (III) > (IV) b) (IV) > (II) > (III) > (I)
c) (IV) > (III) > (II) > (I) d) (I) > (III) > (II) > (IV)



(B) and (C) are:

- a)
- b)
- c)
- d)

49. Which of the following products would produce a racemic mixture on monochlorination?



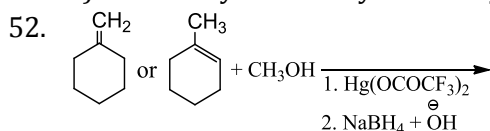
- a) I, II b) II, III c) II, IV d) III, IV

50. A partially racemised (+)-2-bromo-octane (2° RX) on reaction with aq. NaOH in acetone gives an alcohol with 80% inversion and 20% racemisation. find out the rate expression of the reaction

- a) $Rate = K_1[2^\circ RX][\overset{\ominus}{O}H]$
b) $Rate = K_2[2^\circ RX]$
c) $Rate = K_1[2^\circ RX][\overset{\ominus}{O}H] + K_2[2^\circ RX]$
d) $Rate = K_1[2^\circ RX][\overset{\ominus}{O}H] + K_2[1^\circ RX]$

51. Reactivity of hydrogen atoms attached to different carbon atoms in alkane has the order:

- a) Tertiary > Primary > Secondary b) Tertiary > Secondary > Primary
c) Secondary > Tertiary > Primary d) Both (a) and (c)

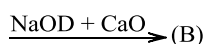
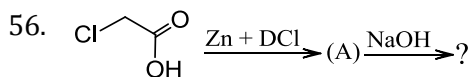
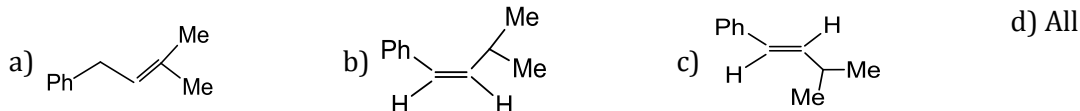
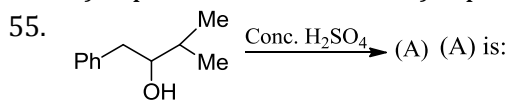


- a) b) c) d) All

53. Give the reactivity in the decreasing order of the following nucleophiles towards nucleophilic addition reaction with compound A ($F_3C-C \equiv C-CF_3$)

- (I) CH_3O^\ominus (II) $C_3H_5^\ominus$
(III) CH_3COO^\ominus (IV) $CH_3SO_3^\ominus$
a) (II) > (I) > (III) > (IV) b) (IV) > (III) > (I) > (II) c) (I) > (II) > (IV) > (III) d) (III) > (IV) > (II) > (I)

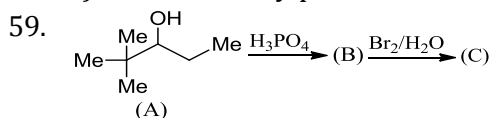
54. The racemic-2,3-dibromopentane on reaction with KI in acetone gives:
 a) *E*-pent-2-ene b) *Z*-pent-2-ene c) Both (a) and (b) d) None



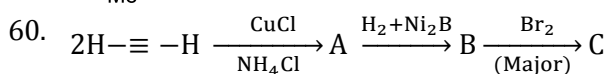
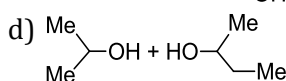
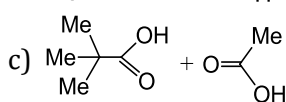
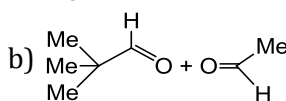
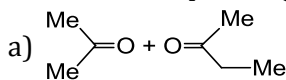
The compounds (A) and (B) in the equation given above are:

(A) (B)

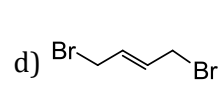
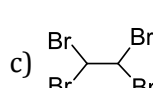
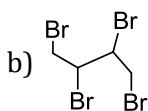
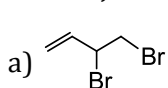
- a) $\text{CH}_3 - \text{COOHCH}_2\text{CH}_3$
 b) $\text{DCH}_2 - \text{COODCH}_3$
 c) $\text{DCH}_2 - \text{COOHCH}_2\text{D}_2$
 d) $\text{CH}_3 - \text{COODCH}_2\text{D}$
57. The compound that has one isopropyl group is:
 a) 2-Methyl pentane b) 2,2,3,3-Tetramethyl pentane
 c) 2,2-Dimethyl pentane d) 2,2,3-Tetramethyl pentane
58. The structure of alkane or cycloalkane with molecular formula C_8H_{18} that has only 1°H atom is:
 a) 2,2,3,3-Tetramethylbutane b) 2,2,3-Trimethylpentane
 c) 2,2,4-Trimethylpentane d) 2,3,3-Trimethylpentane



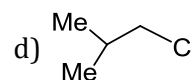
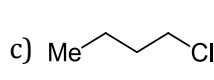
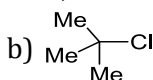
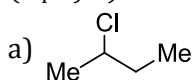
When the compound (B) on ozonolysis is followed by oxidation with H_2O_2 , the products are:



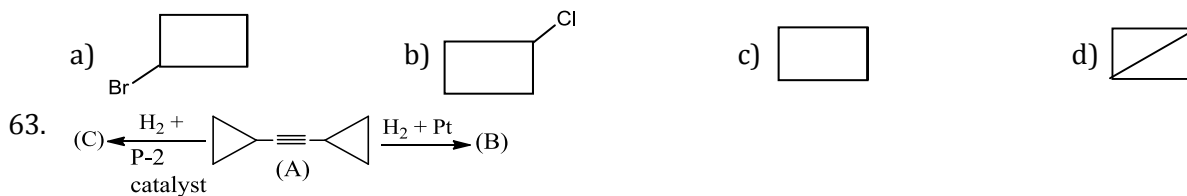
The major amount of (C) is:



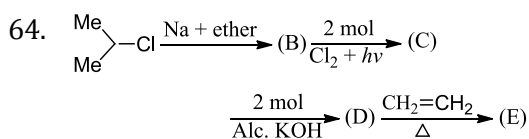
61. Equal amount of an RCl ($\text{C}_4\text{H}_9\text{Cl}$) is reacted at the same temperature with equal volume of 0.2M and 0.4M solution of KOH, respectively, in two separate experiments. The time taken for the reaction of 50% of ($\text{C}_4\text{H}_9\text{Cl}$) was found to be same, the alkyl halide is:



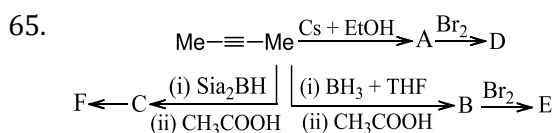
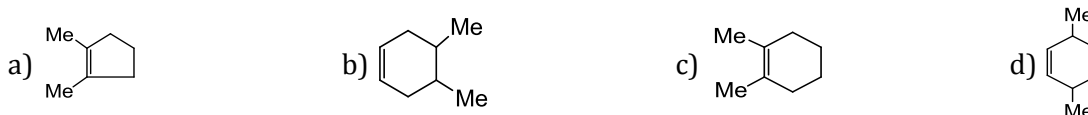
62. What would be the product formed when 1-bromo-3-chlorocyclobutane reacts with two equivalents of metallic sodium in ether?



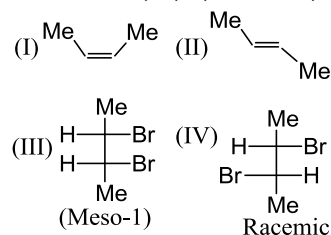
Compounds (B) and (C) are:



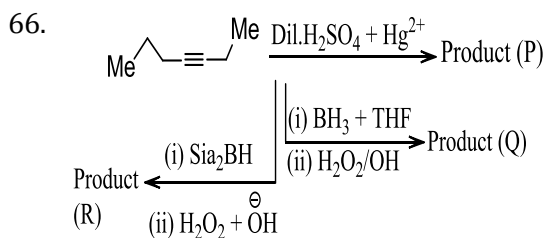
The final product (E) is:



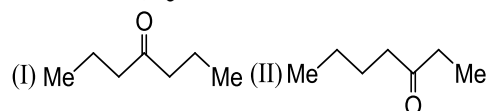
Products A, B, C, D and F, respectively are:



- | A | B | C | D | E | F |
|---------|------|------|-------|-------|-------|
| a) (I) | (II) | (I) | (IV) | (III) | (IV) |
| b) (I) | (I) | (II) | (IV) | (IV) | (III) |
| c) (II) | (I) | (I) | (IV) | (III) | (III) |
| d) (II) | (I) | (I) | (III) | (IV) | (IV) |

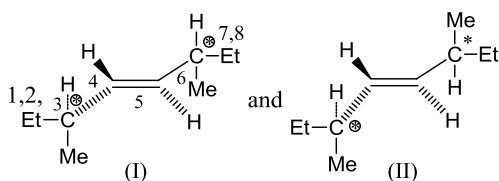
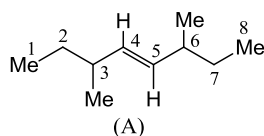


Products P, Q and R are:



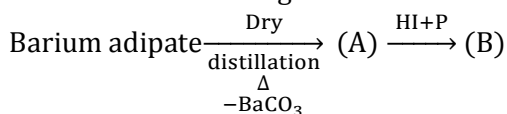
- a) P \Rightarrow I, Q and R \Rightarrow II
- b) P and Q both I and II, R \Rightarrow II
- c) P is both I and II, Q and R \Rightarrow II
- d) P, Q, and R \Rightarrow All II

67. *trans*-3,6-Dimethyl oct-4-ene (A) exists in two diastereomers (I) and (II)

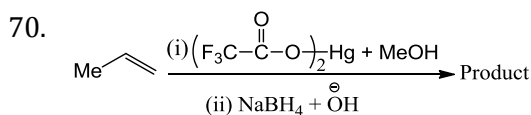


The total number of stereoisomers for (A) is:

- a) 6 b) 8 c) 4 d) 5
68. Acidic hydrogen is present in:
 a) Ethyne b) Ethene c) Benzene d) Ethane
69. Consider the following reaction:



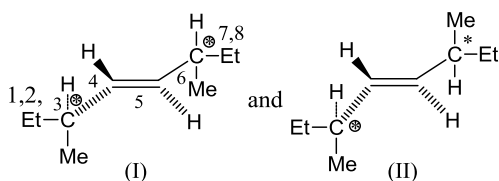
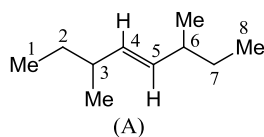
Compound (B) is:



Which statement is true?

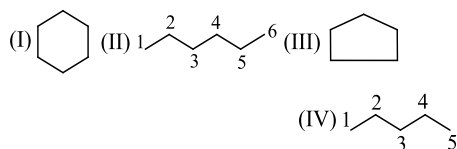
- i. The product is
- ii. The product is
- iii. The reaction is called alkoxymercuration-demercuration (a type of solvomercuration-demercuration)
- iv. It proceeds *via* Markovnikov addition, anti-addition of $(\text{F}_3\text{C-C(=O)-O)}_2\text{Hg}$ and ROH (a nucleophilic solvent), and no rearrangement

- a) (i) b) (ii) c) (i),(iii),and (iv) d) (ii),(iii), and (iv)
71. *trans*-3,6-Dimethyl oct-4-ene (A) exists in two diastereomers (I)and (II)

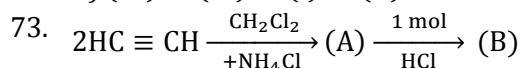


If the stereochemistry about the double bond in(A) is *cis*-,the total number of stereoisomers for (A) is:

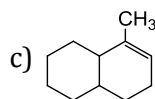
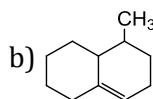
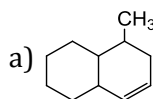
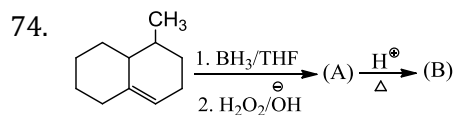
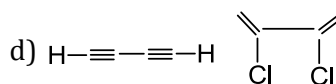
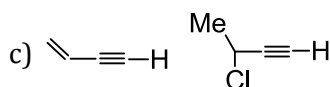
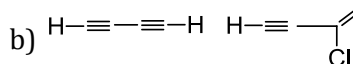
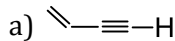
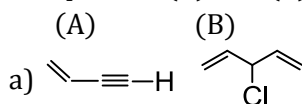
- a) 2, pair of enantiomers
- b) 3, one pair of enantiomers and one meso form (optically inactive due to the presence of centre of symmetry)
- c) 3, one pair of enantiomers and one meso form(optically inactive due to the presence of plane of symmetry)
- d) 2,both optically inactive due to the presence of both centre and plane of symmetry
72. The decreasing order of melting points of the following compounds is:



- a) (I) > (II) > (III) > (IV)
 b) (IV) > (III) > (II) > (I)
 c) (II) > (I) > (IV) > (III)
 d) (III) > (IV) > (I) > (II)



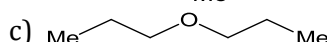
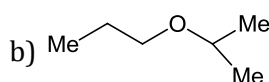
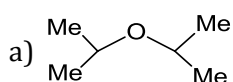
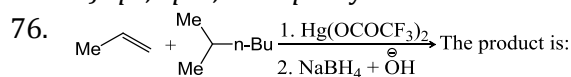
Compounds (A) and (B) are:



d) All

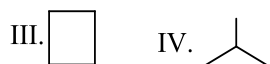
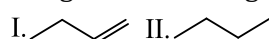
75. The compound 1,2-butadiene has:

- a) Only sp -hybridised carbon atoms
 b) Only sp^2 -hybridised carbon atoms
 c) Both sp - and sp^2 -hybridised carbon atoms
 d) sp -, sp^2 -, and sp^3 -hybridised carbon atoms



d) All

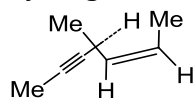
77. Arrange the following in the decreasing order of their boiling points



- a) (I) > (II) > (IV) > (III)
 c) (III) > (IV) > (II) > (I)

- b) (I) > (II) > (III) > (IV)
 d) (IV) > (III) > (II) > (I)

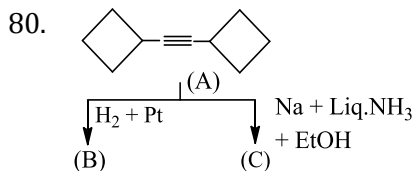
78. Hydrogenation of the adjoining compound in the presence of poisoned palladium catalyst gives:



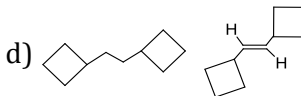
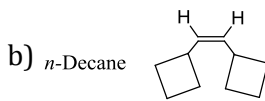
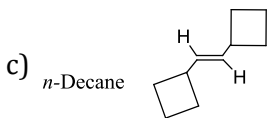
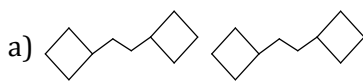
- a) An optically active compound
 b) An optically inactive compound
 c) A racemic mixture
 d) A diastereomeric mixture

79. 2-Methyl butane on reacting with Br_2 in sunlight mainly gives:

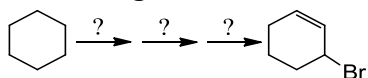
- a) 1-Bromo-2-methyl butane
 b) 2-Bromo-2-methyl butane
 c) 2-Bromo-3-methyl butane
 d) 1-Bromo-3-methyl butane



Compound (B) and (C) are:



81. Which of the following has the highest knocking property?
 a) Olefins b) Straight-chain paraffins
 c) Branched-chain paraffins d) Aromatic hydrocarbons
82. Which reagents could be used to carry out the following reaction?



a) NBS/ CCl_4

c) i. \xrightarrow{ONa} \xrightarrow{OH} ii. NBS + CCl_4 + $h\nu$

b) i. $Br_2/h\nu$ ii. \xrightarrow{ONa} \xrightarrow{OH}
 iii. NBS + CCl_4 + $h\nu$

d) i. NBS + CCl_4 + $h\nu$ vii. $Br_2/h\nu$

83. Out of the following compounds,
 I. Pent-1-ene,
 II. Pent-2-ene,
 III. 2-Methyl but-1-ene,
 IV. 2-Methyl but-2-ene,

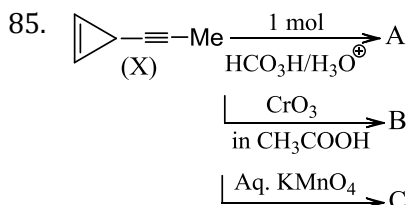
Which pair has the lowest and the highest heats of combustion, respectively?

- a) (IV) and (I), respectively b) (I) and (IV), respectively
 c) (II) and (III), respectively d) (III) and (II), respectively

84. The decreasing order of nucleophilicities of the following is:

(I) Br^\ominus (II) MeO^\ominus (III) Me_2N^\ominus (IV) Me_3C^\ominus

- a) (I) > (II) > (III) > (IV)
 b) (IV) > (III) > (II) > (I)
 c) (IV) > (III) > (I) > (II)
 d) (II) > (I) > (III) > (IV)



compound (X) on complete catalytic hydrogenation with H_2 /Pt gives an alkane. The number of moles of H_2 required per mole of compound (X) is:

- a) 2 b) 3 c) 4 d) 5

86. Which of the following compounds does not dissolve in conc. H_2SO_4 even on warming?

a) Ethylene b) Benzene c) Hexane d) Aniline

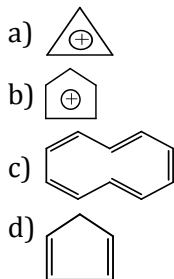
87. The (C – H) bond distance is longest in:

a) $C_2H_2Br_2$ b) C_2H_4 c) C_2H_6 d) C_2H_2

88. The compound having only primary hydrogen atom is:

a) Butane b) Isobutane
 c) Cyclohexane d) 2,2-Dimethyl butane

89. Which of the following is anti-aromatic in nature?

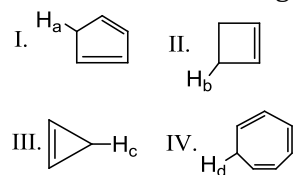


90. $\text{Me}-\text{C}\equiv\text{C}-\text{H} \xrightarrow[-2\text{H}^{\oplus}]{2\text{BuLi}}$ Intermediate species

The intermediate species formed in the above reaction is:



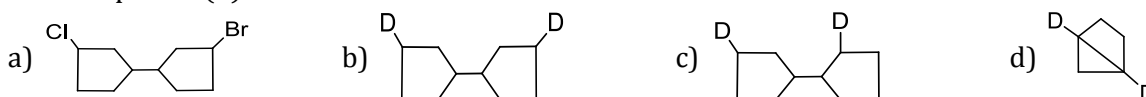
91. Which of the following will have lower pK_a value?



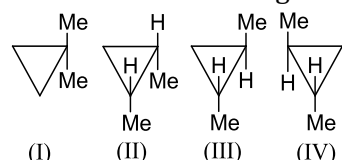
a) H_a b) H_b c) H_c d) H_d

92.

The compound (X) is:

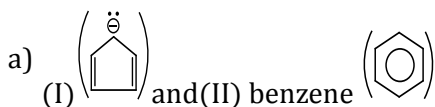


93. Which of the following compounds would have the same vapour pressure



a) (I) and (II) b) (II) and (III) c) (III) and (IV) d) (II) and (IV)

94. Which statement is correct about cyclopentadienyl anion?



b) Both (I) and (II) are aromatic but (II) is more stable than (I)
 c) Both (I) and (II) are aromatic and have the same stability
 d) (II) is more aromatic and more stable than (I) and it is non-aromatic

95. The structure of the compound with molecular formula C_6H_{12} that has only $2^\circ H$ atoms is:

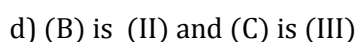
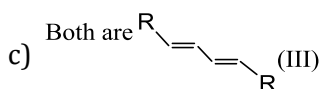
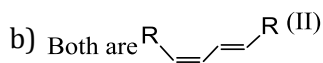
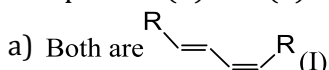
a) 1-methyl cyclopentane b) Cyclohexane
 c) 2,3-Dimethyl but-2-ene d) 2-Methyl pent-2-ene

96. The formation of cyanohydrin from ketone is an example of:

a) Electrophilic addition b) Nucleophilic addition
 c) Nucleophilic substitution d) Electrophilic substitution

97. $\text{R}-\text{C}\equiv\text{C}-\text{R} \xrightarrow[\text{(A)}]{\text{Lindlar's catalyst} + \text{H}_2} \text{(B)}$
 $\xrightarrow[\text{catalyst}]{\text{H}_2 + \text{P-2}} \text{(C)}$

Compounds (B) and (C) are:



98. Which of the following is the smallest ring that can accommodate a triple bond?

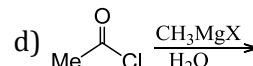
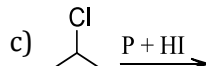
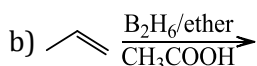
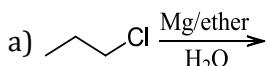
a) Cyclohexyne

b) Cycloheptyne

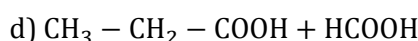
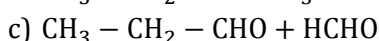
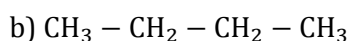
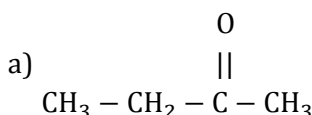
c) Cyclooctyne

d) Cyclononyne

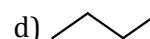
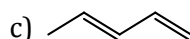
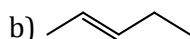
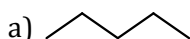
99. Which of the following reactions will not give propane?



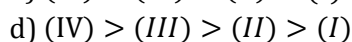
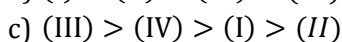
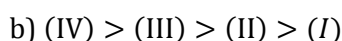
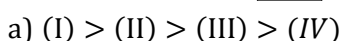
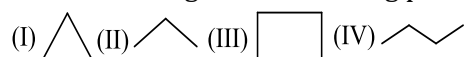
100. The product (s) obtained *via* oxymercuration ($\text{HgSO}_4 + \text{H}_2\text{SO}_4$) of 1-butyne would be:



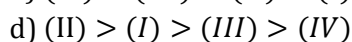
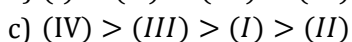
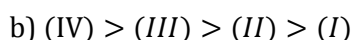
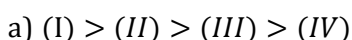
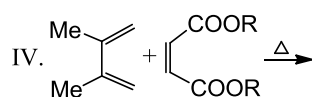
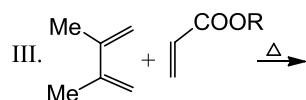
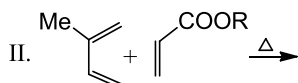
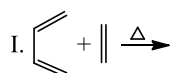
101. Which of the following has the lowest boiling point?



102. The decreasing order of boiling points of the following compounds is:



103. Give the decreasing order of reactivity of Diels-Alder reactions for the following:



104. The compound with the highest boiling point is:

a) *n*-Pentane

b) *n*-Hexane

c) 2-Methyl butane

d) 2,2-Dimethyl propane

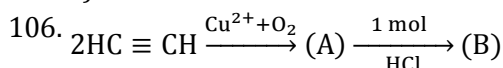
105. The most stable conformer of *cis*-cyclohexane-1,4-diol is:

a) Diaxial boat form

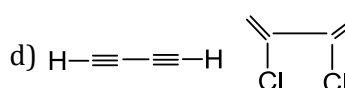
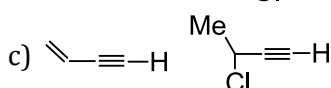
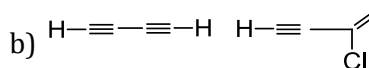
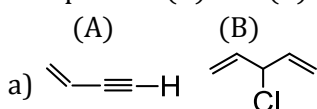
b) Diequatorial boat form

c) Diaxial chair form

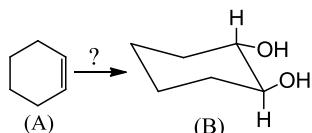
d) Diequatorial chair form



Compounds (A) and (B) are:

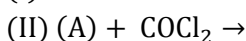
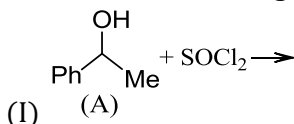


107. Which of the following reagents can be used for the reaction given below?

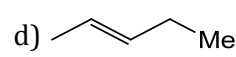
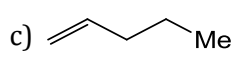
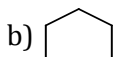
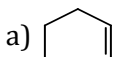


- a) Cold, dilute aqueous KMnO_4 b) $\text{OsO}_4 + \text{NaHSO}_3$ c) $\text{O}_3/\text{H}_2 + \text{Pt}$ d) $\text{MMPP} + \text{C}_2\text{H}_5\text{OH}$ and then $\text{H}_3\text{O}^+/\text{H}_2\text{O}$

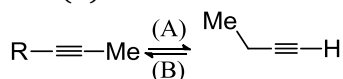
108. Which of the following reactions proceeds by S_N^2 mechanism



- a) (I), (III) b) (I), (II) c) (III), (IV) d) (I), (IV)
109. Compound (A) (C_5H_{10}) does not dissolve in cold conc H_2SO_4 . what is (A)?



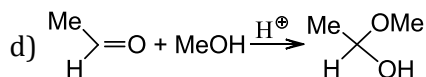
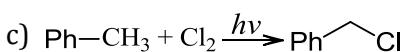
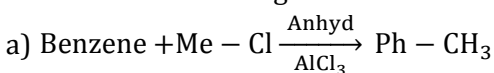
110. Interconversion of terminal to internal alkyne and *vice versa* takes place by the following reagents (A) and (B)



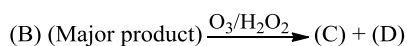
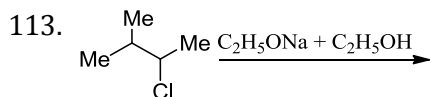
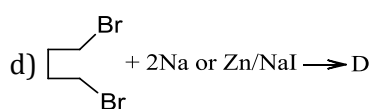
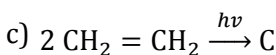
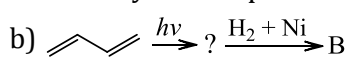
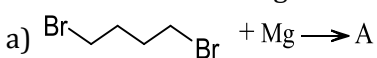
Reagents (A) and (B) are:

- a) NaNH_2 and alc. KOH b) Alc. KOH and NaNH_2
 c) Alc. KOH and P-2 catalyst d) NaNH_2 and Lindlar's catalyst

111. Which of the following is free radical substitution reaction?

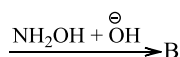
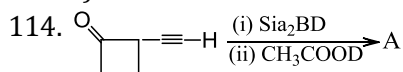


112. Which of the following reactions will not give four-membered cyclic compound?



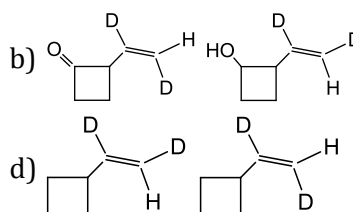
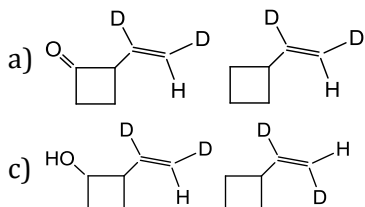
The products (C) and (D) are:

- a) Acetone + Ethanal b) Acetone + Ethanoic acid
 c) Isobutanal + Methanal d) Isobutanoic acid + Methanoic acid



Compounds (A) and (B) are:

- (A) (B)



115. Arrange the following in the decreasing order of NA (nucleophilic addition) reaction

(I) MeCOMe (II) PhCOMe (III) PhCOPh (IV) PhCH₂COMe

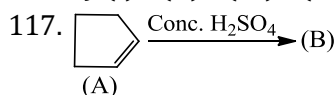
- a) (I) > (II) > (III) > (IV)
 b) (IV) > (III) > (II) > (I)
 c) (IV) > (I) > (II) > (III)
 d) (III) > (II) > (I) > (IV)

116. Give the reactivity in the decreasing order of the following alkynes towards nucleophilic addition reaction with MeO[⊖]/MeOH



(III) Me-C≡C-H (IV) H-C≡C-H

- a) (I) > (II) > (III) > (IV) b) (I) > (IV) > (III) > (II) c) (IV) > (III) > (II) > (I) d) (II) > (III) > (IV) > (I)

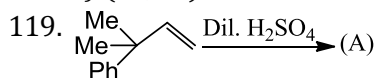


Product (B) is:

- a)  b)  c) Both (a) and (b) d) None

118. The most stable form of *trans*-1,2-dimethyl cyclohexane is:

- a) (1e, 2e) b) (1a, 2a) c) (1e, 2a) d) (1a, 2e)

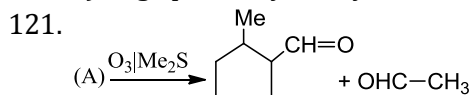


Compound (A) is:

- a)  b)  c)  d) 

120. Which is **wrong** statement?

- a) In oxymercuration and demercuration reaction, alcohol is formed by Markovnikov addition
 b) In hydroboration oxidation reaction, alcohol is formed by anti-Markovnikov addition
 c) Regiospecificity of HBO reaction is syn
 d) Regiospecificity of oxymercuration and demercuration reaction is anti and rearrangement occurs

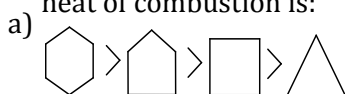


The number of geometrical isomers of (A) can be:

- a) 2 b) 3 c) 4 d) 5

122. Which of the following statement is wrong?

The decreasing order of the numerical value of heat of combustion is: b) Cycloalkanes are planar

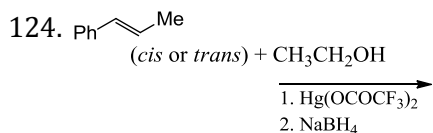


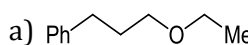
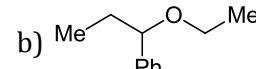
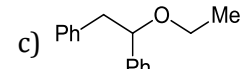
Cyclopropane has higher heat of combustion per d) With the exception of cyclopropane, cycloalkanes

- c) methylene (-CH₂-) group than that of are non-planar cyclobutane

123. Which one of the following does not dissolve in conc. H₂SO₄?

- a) H-C≡C-H b) Me-C≡C-Me c)  d) H₂C = CH₂


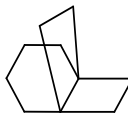
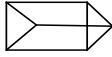



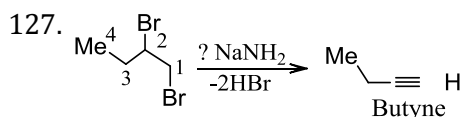
- a)  b)  c)  d) All

125. The structure of the compound with molecular formula C_8H_{14} that has 12 secondary and 2 tertiary H atoms is:

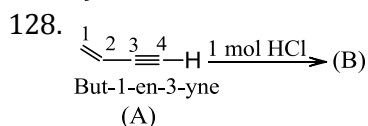
- a) Bicyclo [2.2.2] octane
b) 1,2-Dimethyl cyclohexane
c) Bicyclo[3.2.1] octane
d) Tricyclo [2.2.2.0] octane

126. Which of the following is a tetracyclic compound?

- a) 
b) 
c) 
d) 



a) One
b) Two
c) Three
d) Four

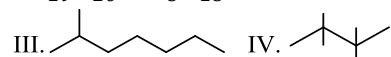


The product (B) is:

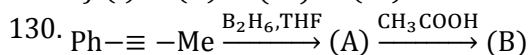
- a)  b)  c)  d) 

129. Arrange the following in the decreasing order of their boiling points:

I. $\text{C}_{19}\text{H}_{20}$ II. C_8H_{18}



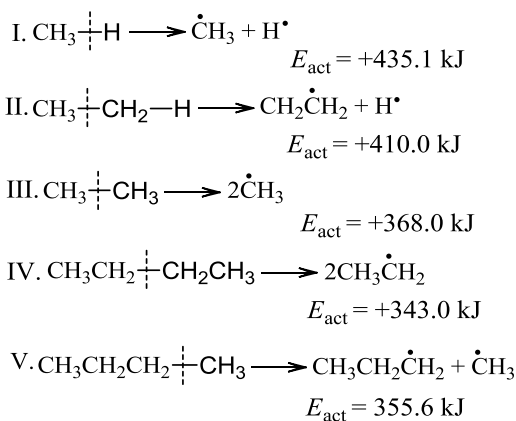
- a) (I) > (II) > (III) > (IV)
b) (IV) > (III) > (II) > (I)
c) (I) > (II) > (IV) > (III)
d) (III) > (IV) > (II) > (I)



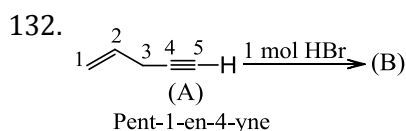
(A) and (B) are:

- a)  b) 
c)  d) 

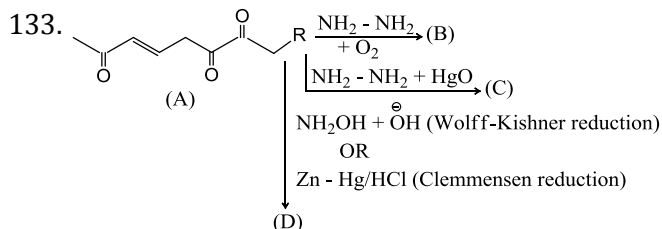
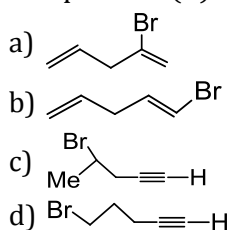
131. With the help of the following equations and data choose the **wrong** statement



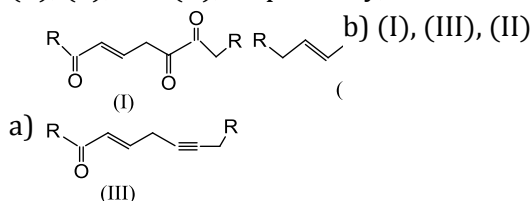
- Thermal cracking of (C – H) bond of methane occurs at 1500 K and that of (C – H) bond of ethane breaks at 800 – 900 K
- During homolysis of ethane at high temperature, the (C – C) bond breaks more readily than (C – H) bonds
- Formation of $\text{CH}_3\dot{\text{C}}\text{H}_2$ radical by reaction (II) will take place at lower temperature than the formation of $\dot{\text{C}}_2\text{H}_5$ radical by reaction (IV)
- c) During the cracking of *n*-butane, reaction (IV) occurs more readily than reaction (V)



The product (B) is:

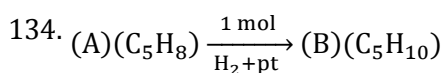


(B), (C), and (D), respectively, are

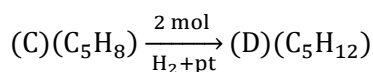


c) (III), (II), (I)

d) (III), (I), (II)



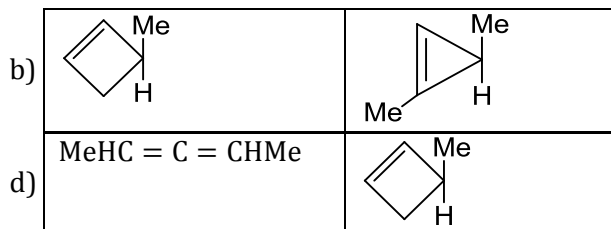
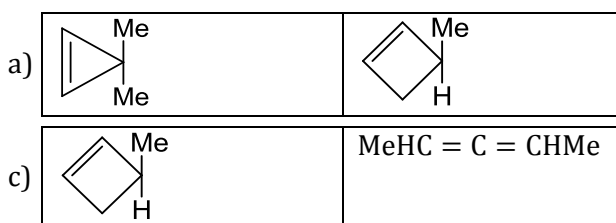
Resolvable non-resolvable



resolvable Non-resolvable

Which statement is correct about (A) and (C)?

(A) (C)

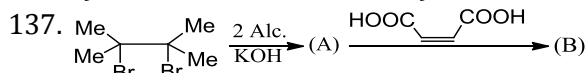


135. The minimum number of C atom an alkyne must have to show diastereomerism:

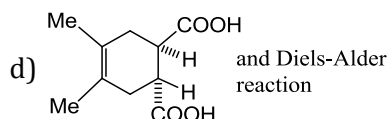
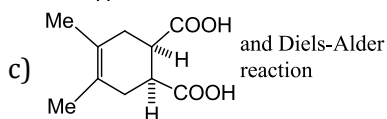
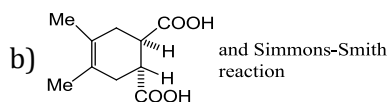
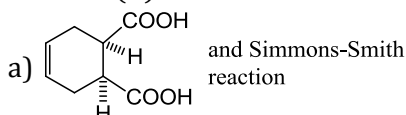
- a) 4 b) 5 c) 6 d) 7

136. Rearrangement reactions are shown by:

- a) Carbanion b) Free radical c) Carbene d) Carbocation



Product (B) and name of the reaction in the formation of (B) are:



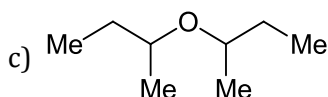
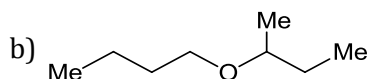
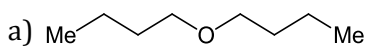
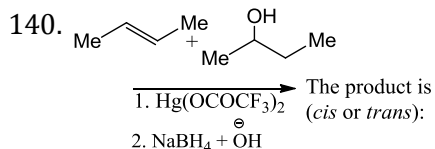
138. In S_N2 , solvolysis of RX in which the solvent is a nucleophile, what is the order and molecularity of the reaction?

- a) First order; unimolecular b) First order; bimolecular
c) Second order; bimolecular d) Pseudo first-order; bimolecular

139. Arrange the following compounds in the increasing order of homolytic(C – C) bond dissociation energy

- I. Propane II. Ethane
III. 2,2-Dimethyl propane IV. 2-Methyl propane

- a) (III) < (IV) < (II) < (I)
b) (II) < (I) < (IV) < (III)
c) (III) < (IV) < (I) < (II)
d) (I) < (III) < (II) < (IV)

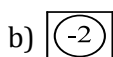
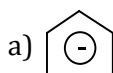


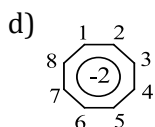
d) All

141. The decreasing order of the basic character of the following is:

- (I) F^- (II) NO_3^- (III) H_2O (IV) CH_3OH
a) (II) > (I) > (IV) > (III) b) (III) > (IV) > (I) > (II)
c) (I) > (II) > (III) > (IV) d) (IV) > (III) > (II) > (I)

142. Which of the following species is least stable?





143. The decreasing order of the anti-knocking value of octane number of the following is:

(I) CH_4 (II) C_2H_6 (III) C_3H_8 (IV) C_4H_{10}

a) (I) > (II) > (III) > (IV)

b) (IV) > (III) > (II) > (I)

c) (I) > (III) > (II) > (IV)

d) (IV) > (II) > (III) > (I)

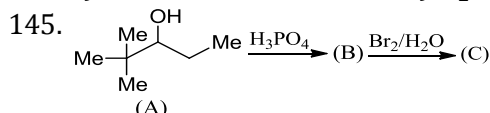
144. Marsh gas mainly contains:

a) CO

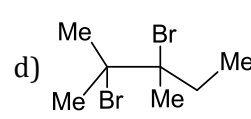
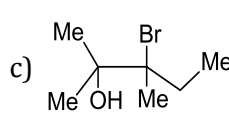
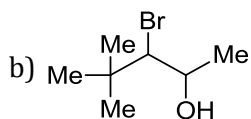
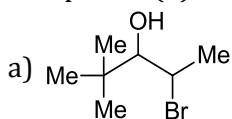
b) H_2S

c) C_2H_2

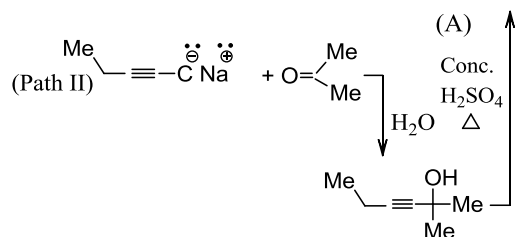
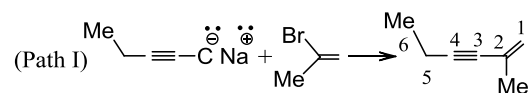
d) CH_4



Compound (C) is:



146. There are two paths to prepare a compound (A) (2-methyl-hex-1-en-3-yne). Which of the following statements is correct?

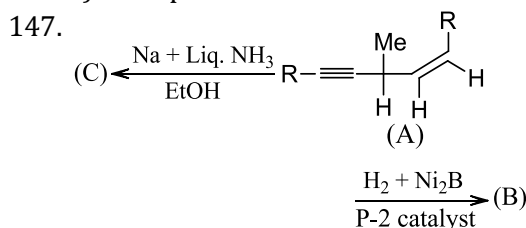


a) Path I is feasible

b) Path II is feasible

c) Both paths are feasible

d) Both paths are not feasible



Which statement is correct about the above reaction?

a) Both products (B) and (C) are optically active

b) Both products (B) and (C) are optically inactive

c) Product (B) is optically inactive but product (C) is optically active

d) Product (B) is formed by anti-addition but product (C) is formed by syn-addition of H_2

148. In the compound $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{C} \equiv \text{CH}$, the $(\text{C}_2 - \text{C}_3)$ bond is of the type:

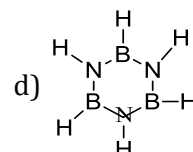
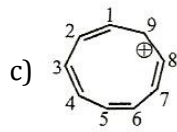
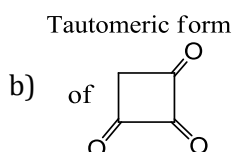
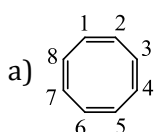
a) $sp - sp^2$

b) $sp^3 - sp^3$

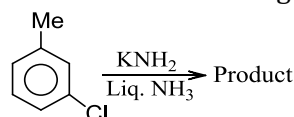
c) $sp - sp^3$

d) $sp^2 - sp^3$

149. Which of the following is a non-aromatic compound?



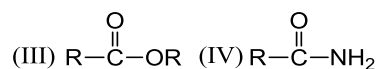
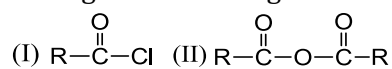
150. Consider the following reaction:



The product is:

- a) *o*-Toluidine b) *m*-Toluidine c) *p*-Toluidine d) All

151. Arrange the following in the decreasing order of nucleophilic acyl substitution reaction?

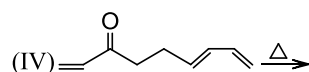
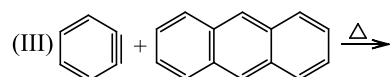
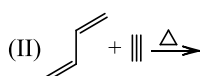
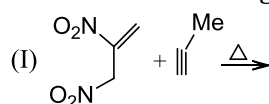


- a) (I) > (II) > (III) > (IV) b) (IV) > (III) > (II) > (I)
 c) (I) > (III) > (II) > (IV) d) (IV) > (II) > (III) > (I)

152. A partially racemised (+)-2-bromo-octane (2° RX) on reaction with aq. NaOH in acetone gives an alcohol with 80% inversion and 20% racemisation. find out the percentage of front-side attack?

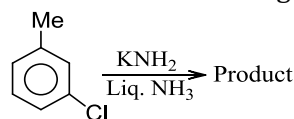
- a) 10% b) 20% c) 40% d) 80%

153. Which of the following compounds would undergo Diels-Alder reaction?



- a) All b) (II), (III), (IV) c) (III), (IV) d) (II)

154. Consider the following reaction:



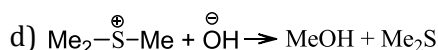
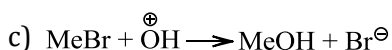
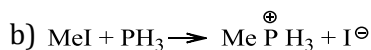
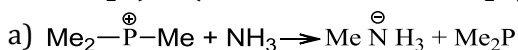
Find out which of the following statements is wrong?

- a) The reaction is ArSN (Addition -elimination reaction)
 b) The reaction is ArSN (elimination -Addition reaction) *viabenzynes* mechanism
 c) One product is obtained by direct substitution
 d) Two products are obtained by cine-substitution

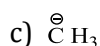
155. A partially racemised (+)-2-bromo-octane (2° RX) on reaction with aq. NaOH in acetone gives an alcohol with 80% inversion and 20% racemisation. What is the percentage of back-side attack?

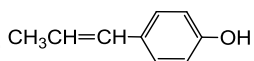
- a) 40% b) 10% c) 90% d) 80%

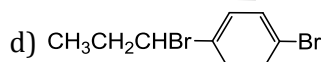
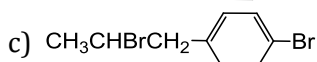
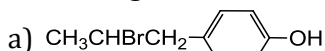
156. In which of the following reactions, SN² rate increases on changing the solvent from (95% acetone + 5% H₂O) to (80% acetone + 20% H₂O)?



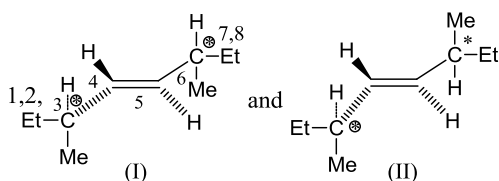
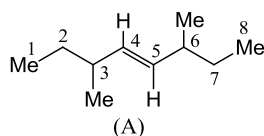
157. Which of the following has highest nucleophilicity?



158. The reaction of  with HBr gives:



159. *trans*-3,6-Dimethyl oct-4-ene (A) exists in two diastereomers (I) and (II)

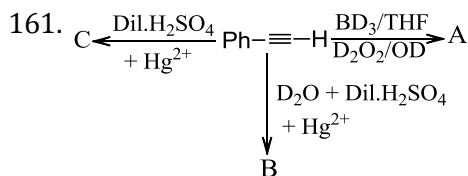


Which statement is true about (I) and (II)?

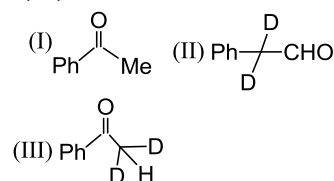
- (I) is optically active and (II) is not
- (II) is optically active and (I) is not
- Both are optically active
- Both are optically inactive due to the presence of centre of symmetry

160. The decreasing order of nucleophilicities in DMSO (dimethylsulphoxide) is:

- $F^- > Cl^- > Br^- > I^-$
- $I^- > Br^- > Cl^- > F^-$
- $F^- > Cl^- > I^- > Br^-$
- $I^- > Br^- > F^- > Cl^-$



A, B, and C are:



- (I), (II), and (III)
- (II), (I), and (III)
- (II), (III), and (I)
- (I), (III), and (II)

162. The most stable conformation of *cis*-1,4-di-*t*-butyl cyclohexane is:

- Boat
- Chair
- Twist boat
- Half chair

163. When aqueous solution of sodium ethanoate is electrolysed, the volume of gases obtained at cathode at a pressure of 1.0 bar and 298 K temperature when 2.0 Faraday of electricity is passed is:

- 67.2 litres
- 68.1 litres
- 73.2 litres
- 74.1 litres

164. The decreasing order of reactivity towards SE (substitution by electrophile) of the following is:

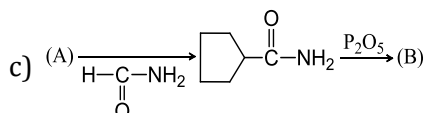
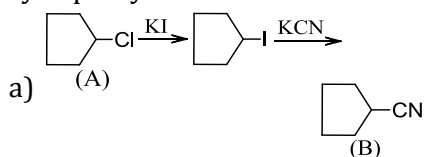
(I) Nitrobenzene (II) Chlorobenzene
(III) Toluene (IV) Benzene

- (I) > (II) > (III) > (IV)
- (IV) > (III) > (II) > (I)
- (III) > (IV) > (II) > (I)
- (I) > (II) > (IV) > (III)

165. Which of the following is propargyl group?

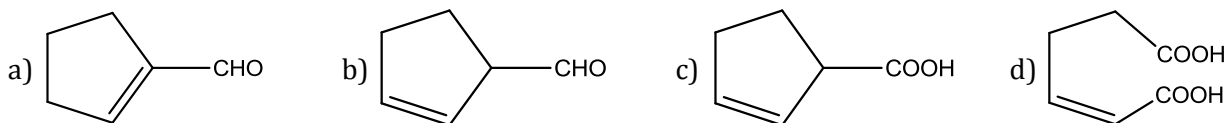
- $-CH_2 - C \equiv CH$
- $-C \equiv C - Me$
- $-C \equiv CH$
- $-C \equiv C - CH_2 - CH_3$

166. Which of the following is the best method for the preparation of compound cyclopentyl cyanide from cyclopentyl chloride?



d) All

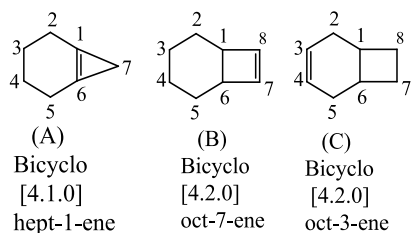
167. Cyclohexene on ozonolysis followed by reaction with zinc dust and water gives compound *E*. Compound *E* on further treatment with aqueous KOH yields compound *F*. Compound *F* is



168. An S_N2 reaction of an asymmetric carbon of a compound always gives:

- a) An enantiomer of the substrate
b) A product with opposite optical rotation
c) A mixture of diastereomers
d) A single stereoisomer

169. The three compound, (A), (B), and (C) on hydrogenation with $H_2 + Pd$ give (D), (E), and (F), respectively



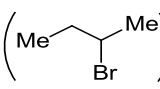
Compounds (D), (E) and (F) are:

Cyclobutane, cyclopentane, and cyclohexane are more stable than cyclopropane and do not undergo catalytic hydrogenation at normal condition of temperature

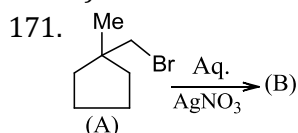
($H_2 + Pt$) converts ($C \equiv C$) to ($C - C$)

Birch reduction gives anti-addition of H_2 and converts ($C \equiv C$) to ($C=C$). So the answer is (d)

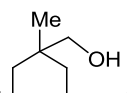
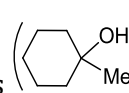


170.  (*sec*-Butyl bromide) undergoes alkaline hydrolysis by:

- a) S_N1 b) S_N2 c) Both (a) and (b) d) None



Which statement is correct about the above reaction?

- a) Product (B) is  (I) by S_N1 mechanism
b) Product (B) is  (II) by S_N2 mechanism
c) Product (B) is (I) by S_N2 mechanism
d) Product (B) is (II) by S_N1 mechanism

172. A partially racemised (+)-2-bromo-octane (2° RX) on reaction with aq. NaOH in acetone gives an alcohol with 80% inversion and 20% racemisation. find out under what condition the reaction would follow S_N1 mechanism

- a) Low concentration of OH^-
b) High concentration of OH^-
c) Low concentration of 2° RX
d) High concentration of 2° RX

173. The decreasing order of reactivity towards electrophilic addition (e.g., addition of HX, X_2 , etc.) of the following is:

- I. $CH \equiv CH$
II. $CH_2 = CH_2$
III. $H_2C = CH - Cl$
IV. $HC = CH$



a) (II) > (I) > (III) > (IV)

c) (IV) > (III) > (I) > (II)

b) (I) > (II) > (III) > (IV)

d) (IV) > (III) > (II) > (I)

174. The decreasing order of nucleophilicities of the following is:

(I) H₂O (II) EtOH (III) MeCOO[⊖] (IV) OH[⊖] (V) EtO[⊖]

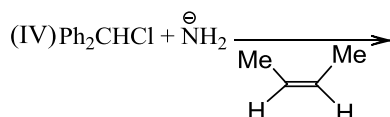
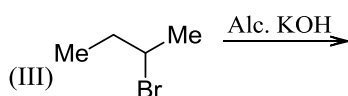
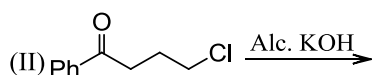
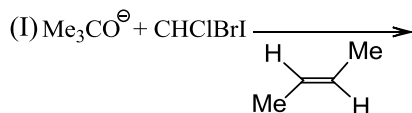
a) (V) > (IV) > (III) > (II) > (I)

c) (IV) > (V) > (III) > (II) > (I)

b) (I) > (II) > (III) > (IV) > (V)

d) (I) > (II) > (III) > (V) > (IV)

175. In which of the following α-elimination occurs?



a) (I), (II)

b) (I), (IV)

c) (II), (III)

d) (II), (IV)

176. A partially racemised (+)-2-bromo-octane (2° RX) on reaction with aq. NaOH in acetone gives an alcohol with 80% inversion and 20% racemisation. find out under what condition the reaction would follow SN² mechanism

a) Low concentration of OH[⊖]

b) High concentration of OH[⊖]

c) Low concentration of 2° RX

d) High concentration of 2° RX

177. Meso- and racemic-2,3-dibromobutane on reaction with NaI in acetone give:

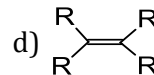
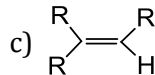
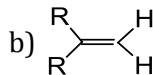
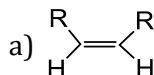
a) E-But-2-ene and Z-But-2-ene, respectively

b) Z-But-2-ene and E-But-2-ene, respectively

c) Both give E-But-2-ene

d) Both give Z-But-2-ene

178. Which of the following alkenes will react faster with H₂ under catalytic hydrogenation condition?



179. Out of the five isomeric hexanes, the isomer that can give two monochlorinated compound is:

a) 2,3-Dimethyl butane

b) 2,2-Dimethyl butane

c) 2-Dimethyl pentane

d) n-Hexane

180. The order of the leaving group ability is:

i. -OAc, ii. -OMe, iii. -OSO₂Me, iv. -OSO₂CF₃

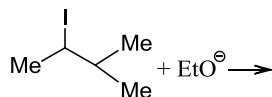
a) (i) > (ii) > (iii) > (iv)

c) (iii) > (ii) > (i) > (iv)

b) (iv) > (iii) > (i) > (ii)

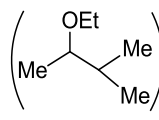
d) (ii) > (iii) > (iv) > (i)

181. Which statement is correct about the following reaction?



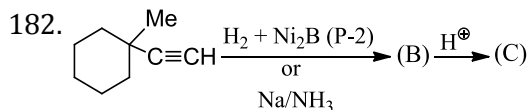
a) Major product is $\left(\text{Me-CH}_2\text{-CH(I)-CH}_2\text{-OEt} \right)$ (I) and minor

b) Major product is (II) and minor product is (I) by SN² mechanism

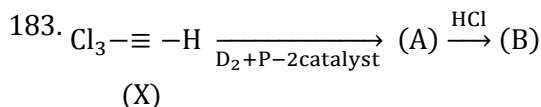
product is  (II) by SN¹ mechanism

c) Major product is (II) and minor product is (I) by SN¹ mechanism

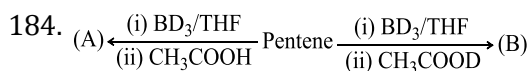
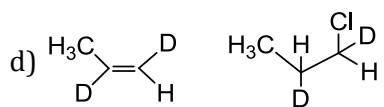
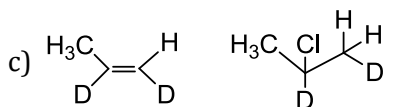
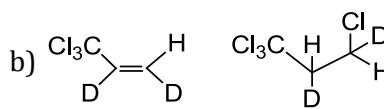
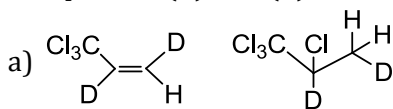
d) Major product is (II) and minor product is (I) by SN² mechanism



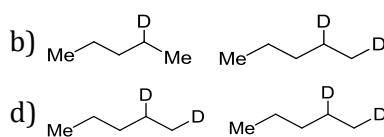
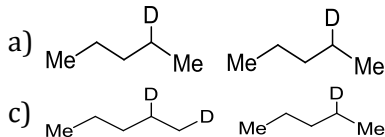
Compound (C) is:



Compounds (A) and (B) are:



(A) and (B) are:



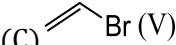
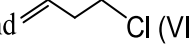
185. There is no ring strain in cyclohexane, but cyclobutane has an angle strain of 9° 44'. If ΔH_c° of cyclohexane per (CH₂) group is 660 kJ mol⁻¹ and ΔH_c° of cyclobutane is 2744 kJ mol⁻¹, what is the ring strain in kJ mol⁻¹ of cyclobutane?

a) -104 b) 104 c) -2084 d) 2084

186. Which compound in each of the following pairs will react faster in SN² reaction with OH^-

(A) MeBr (I) and MeI (II)

(B) Me₃C - Cl (III) and MeCl (IV)

(C)  (V) and  (VI)

(A) (B) (C)

a) (I) (III) (V)

b) (I) (IV) (V)

c) (II) (III) (VI)

d) (II) (IV) (VI)

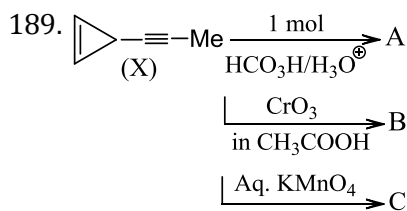
187. The most stable conformer of *cis*-cyclohexane-1,4-diol is:

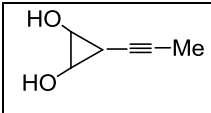
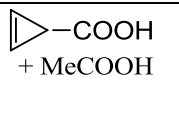
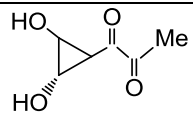
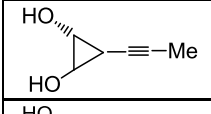
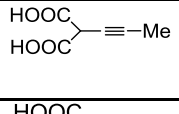
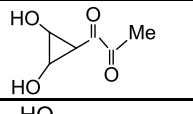
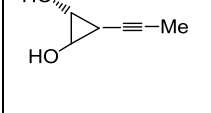
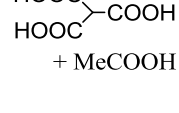
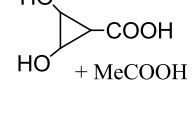
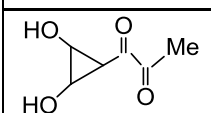
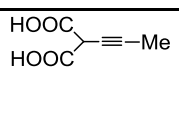
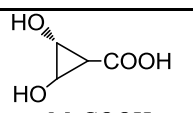
- a) Diaxial boat form
b) Diequatorial boat form
c) Diaxial chair form
d) Diequatorial chair form

188. The total number of isomers including stereoisomers for 1,3-dimethyl cyclohexane is:

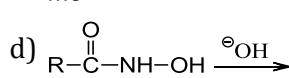
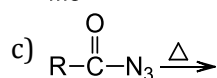
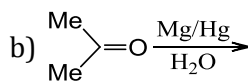
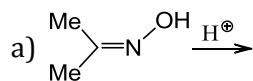
- a) 2, *cis* and *trans* both optically inactive b) 3, one *cis* and two optically active *trans* forms
c) 3, one *trans* and two optically active *cis* forms d) 4, two *cis* (optically active) and two

trans(optically active)

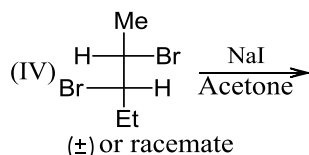
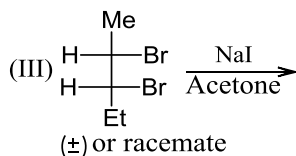
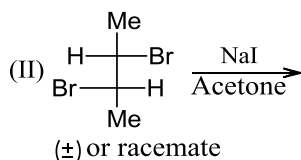
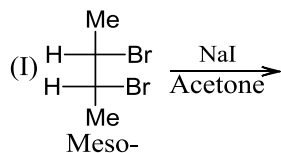


	(A)	(B)	(C)
a)			
b)			
c)			
d)			

190. Which of the following is not a rearrangement reaction?



191. Which of the following reactions would give *trans*-alkene?



a) (I)

b) (II)

c) (I), (III)

d) (II), (IV)

192. In the free-radical chlorination of methane, the chain-initiation step involves the formation of:

a) HCl

b) $\dot{\text{C}}\text{H}_3$

c) $\dot{\text{C}}\text{H}_2\text{Cl}$

d) Cl^\bullet

193. Octane number can be changed by:

a) Alkylation

b) Cyclisation

c) Isomerisation

d) All of these

194. Which of the following is the correct order of stability of the following compound?



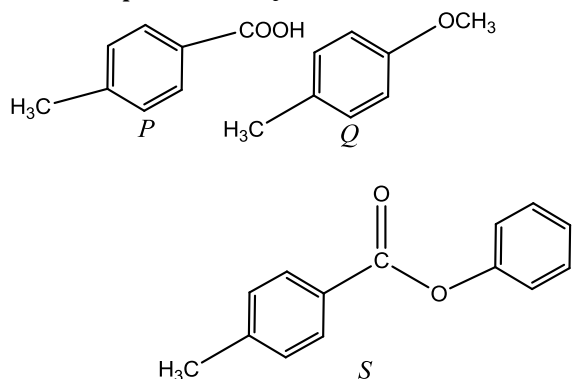
a) (I)>(II)>(III)

b) (III)>(II)>(I)

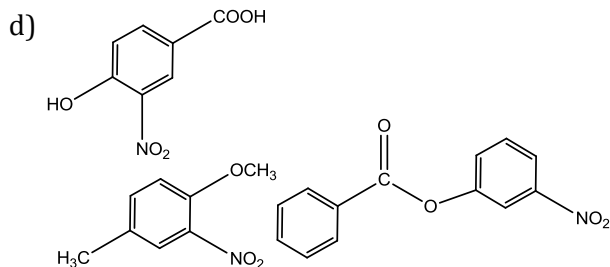
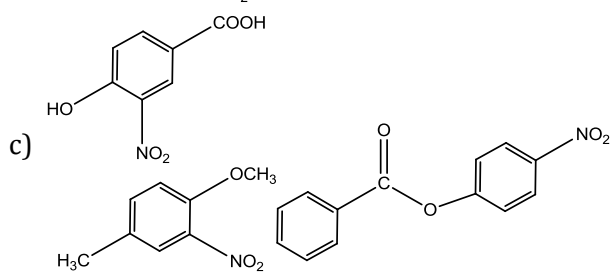
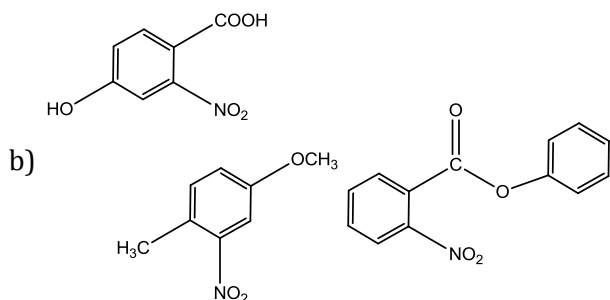
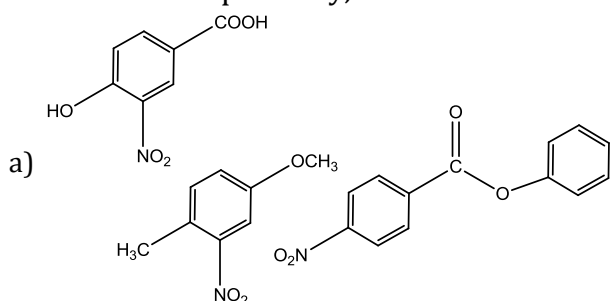
c) (II)>(I)>(III)

d) (I)>(III)>(II)

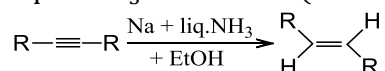
195. The compounds *P*, *Q* and *S*



where separately subjected to nitration using $\text{HNO}_3/\text{H}_2\text{SO}_4$ mixture. The major product formed in each case respectively, is



196. In the conversion of alkyne to *trans*-alkene by Birch reduction using alkali metals (such a Na or K) in liquid NH_3 and alcohol (MeOH or EtOH)



The mechanism takes place in the formation of intermediate species in the following sequence:

a) Radical anion \rightarrow vinylic radical \rightarrow *trans*-vinylic anion \rightarrow *trans*-alkene

- b) Radical anion \rightarrow *trans*-vinylic anion \rightarrow vinylic radical \rightarrow *trans*-alkene
 c) Vinylic radical \rightarrow radical anion \rightarrow *trans*-vinylic anion \rightarrow *trans*-alkene
 d) Vinylic radical \rightarrow *trans*-vinylic anion \rightarrow radical anion \rightarrow *trans*-alkene

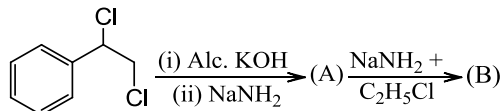
197. Which of the following yields both alkane and alkene?

- a) Williamson's synthesis
 b) Kolbe's reaction
 c) Wurtz reaction
 d) Sandmeyer's reaction

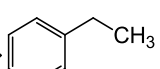
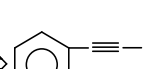
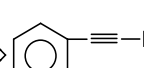
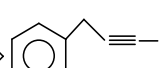
198. Hydrocarbon that is liquid at room temperature is:

- a) Ethane
 b) Propane
 c) Butane
 d) Pentane

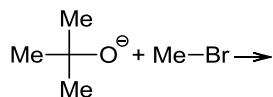
199.

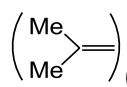
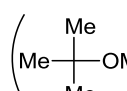


(A) and (B) are:

- a) (A) \Rightarrow  (B) \Rightarrow 
 b) (A) \Rightarrow  (B) \Rightarrow 
 c) (A) \Rightarrow  (B) \Rightarrow 
 d) None of these

200. Which statement is correct about the given reaction?

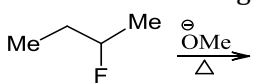
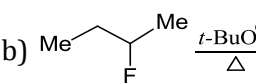
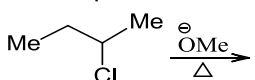


- a) Product is  (I) by elimination reaction
 b) Product is  (II) by S_N2 reaction
 c) Product is (II) by S_N1 reaction
 d) Both (a) and (b)

201. The structure of the compound with molecular formula C_6H_{12} that has only 1° and 2° H atoms is:

- a) 1-Methyl cyclo-pentane
 b) 1,1-Dimethyl cyclobutane
 c) Cyclohexane
 d) 2-Methyl pent-2-ene

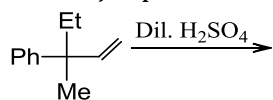
202. Which of the following reactions will not give Hofmann alkene?

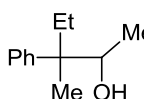
- a) 
 b) 
 c) 
 d) All

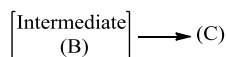
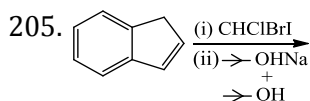
203. The highest boiling point is expected for:

- a) Isooctane
 b) *n*-Octane
 c) 2,2,3,3-Tetramethyl butane
 d) *n*-Butane

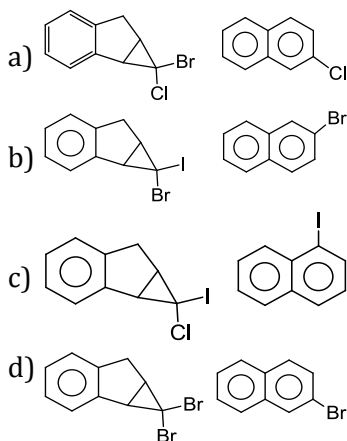
204. The major product in the reaction is:



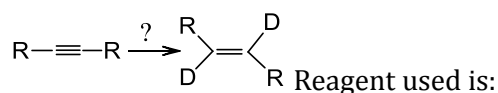
- a) 
 b) 
 c) 
 d) Both (b) and (c)



Intermediate (B) and product (C) are:



206. In the reaction:

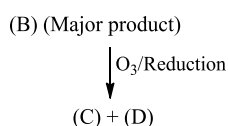
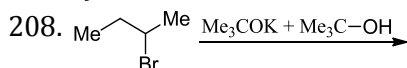
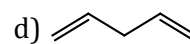
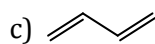


- a) Na + NH₃ + EtOD
c) Na + ND₃ + EtOD

- b) Na + ND₃ + EtOH
d) Both (b) and (c)

207. In which of the following, the $\Delta H_{\text{h}}^{\circ}$ is maximum?

- a) CH₂ = CH₂ b) CH₂ = C = CH₂

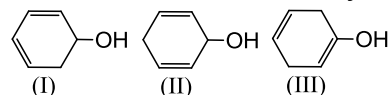


The products (c) and (D) are:

- a) Methanol + Propanal
c) 2 molethanoic acid

- b) Propanoic acid + CO₂
d) 2 moleethanal

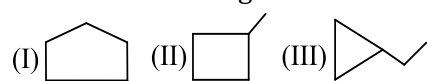
209. Which one is the most easily dehydrated?



- a) (I)
c) (III)

- b) (II)
d) All are equally dehydrated

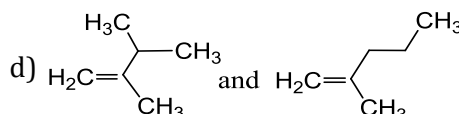
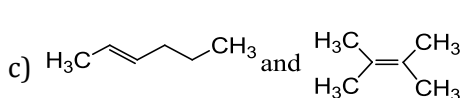
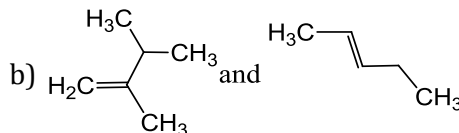
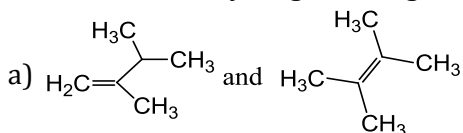
210. Give the decreasing order of the stability of the following or increasing order of heat of combustion



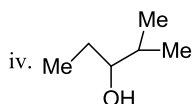
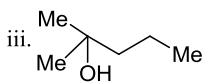
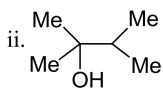
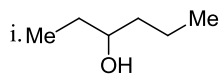
- a) (I) > (II) > (III) b) (III) > (II) > (I) c) (II) > (III) > (I) d) (I) > (III) > (II)

211. An alkyl of formula C₆H₁₃Br on treatment with potassium *t*-butoxide gives two isomeric alkenes (C₆H₁₂).

Both alkenes on hydrogenation give 2,3-dimethyl butane. Isomeric alkenes are:



212. Arrange the following alcohols in the decreasing order of dehydration with conc. H₂SO₄



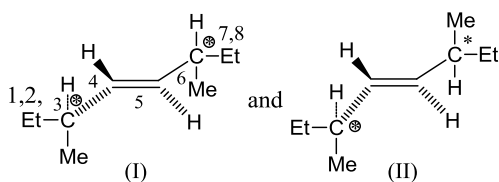
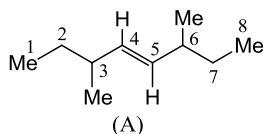
a) (ii) > (iii) > (iv) > (i)

b) (i) > (iv) > (iii) > (ii)

c) (iii) > (ii) > (iv) > (i)

d) (i) > (iv) > (ii) > (iii)

213. *trans*-3,6-Dimethyl oct-4-ene (A) exists in two diastereomers (I) and (II)



If the stereochemistry about the double bond in (A) is *trans*, two diastereomers (I) and (II) exist as shown above

Which statement is correct?

a) (I) is optically inactive due to the presence of plane of symmetry

b) (I) is optically inactive due to the presence of centre of symmetry

c) (II) is optically inactive due to the presence of plane of symmetry

d) (II) is optically inactive due to the presence of centre of symmetry

214. Which statement (s) is/are correct?

1. In oxymercuration and demercuration reaction, the electrophile is AcOHg^{\oplus}

2. In this reaction, Hg^+ is reduced to Hg^0

3. In this reaction, Hg^{2+} is reduced to Hg^+

4. In this reaction, Hg^{2+} is reduced to Hg^0

a) (i) and (iv)

b) (i) and (ii)

c) (i) and (iii)

d) (iv)

215. Which hydrocarbon is mainly present in gobar gas?

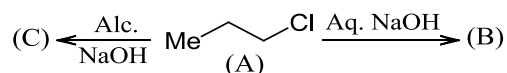
a) Methane

b) Ethane

c) Propane

d) Butane

216. Which of the following statements is correct about the following reactions?



a) (B) is obtained by elimination reaction

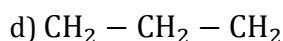
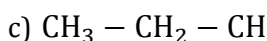
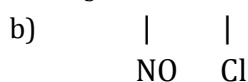
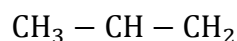
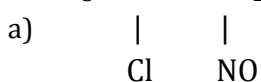
b) (C) is obtained by substitution reaction

c) The molecular formula of (B) is C_3H_6 and that of (C) is $\text{C}_3\text{H}_8\text{O}$

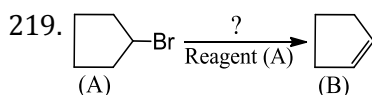
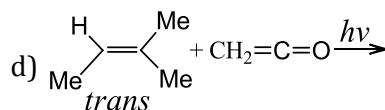
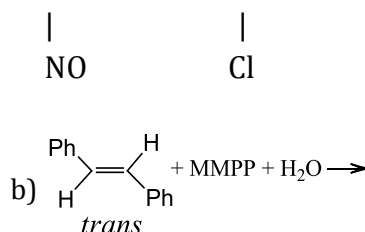
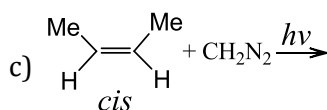
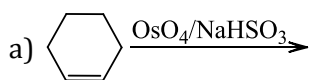
d) (B) is an isomer of ethyl methyl ether, while (C) is the dehydrated compound of (B)

217. $\text{CH}_3 - \text{CH} = \text{CH}_2 + \text{NOCl} \rightarrow \text{P}$

Identify the adduct



218. Consider the following reactions:

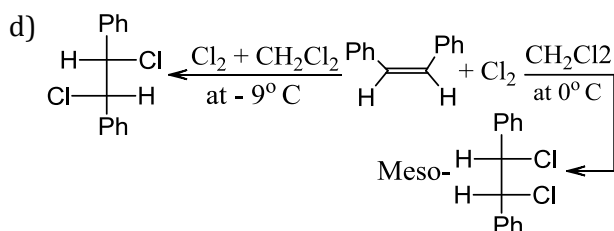
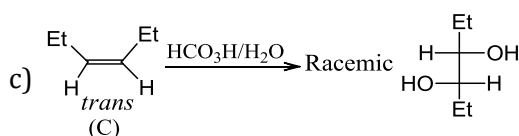
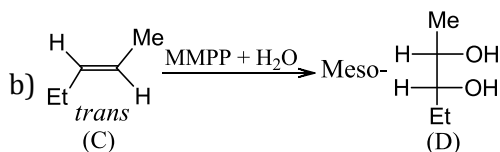
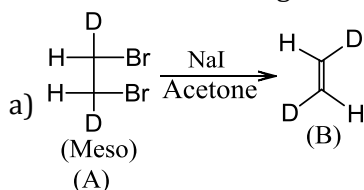


Which reagent cannot be used for the above conversion?

- a) K^+OH^- b) Et_3N c) POCl_3 d) NH_3

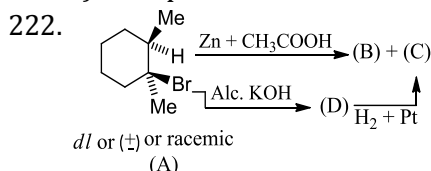
Multiple Correct Answers Type

220. Which of the following statement/reactions are correct?



221. Which of the following is an example of nucleophilic addition to acetaldehyde?

- a) Acetal formation b) Cyanohydrin formation
c) Bisulphite adduct d) Wolff–Kishner reaction



Which statement is/are correct?

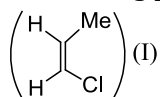
- a) Compound (B) is meso- and (C) is racemic-1,2-dimethyl cyclohexane b) Compound (B) is racemic – and (C) is meso -1,2-dimethyl cyclohexane
c) Compound (D) is 1,2- dimethyl cyclohexane d) Octane-2,7- dione is obtained on reductive ozonolysis of compound (D)

223. The halogen atom in RX can easily be replaced by nucleophiles such as:

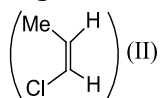
- a) NO_2^\ominus b) RO^\ominus c) CN^\ominus d) None

224. Which of the following statements (s) is/are wrong?

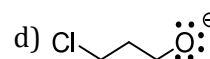
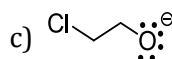
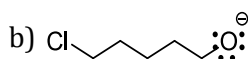
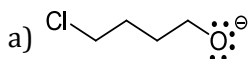
- a) The melting point of *trans*-but-2-ene is greater than that of the *cis*-isomer due to symmetrical packing in the crystal lattice of the *trans*-form
 The boiling point of *cis*-but-2-ene is greater than that of the *trans*-isomers due to steric strain in the *cis*-isomer because of van der Waals repulsion force of large group on the same side of the double bond and the *cis*-isomer becomes less stable because of the increasing repulsive force
- b) The boiling point of the *cis*-isomer is greater than that of the *trans*-isomer due to the relatively high polarity of the *cis*-isomer compound to its *trans*-isomer
- c) The boiling point of the *cis*-isomer is greater than that of the *trans*-isomer due to the relatively high polarity of the *cis*-isomer compound to its *trans*-isomer
- d) The boiling point of



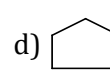
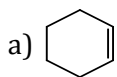
Is greater than that of



225. In which of the following species containing both nucleophile and leaving group, intramolecular S_N reaction occurs?



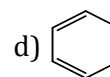
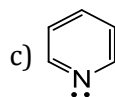
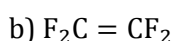
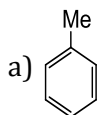
226. Which of the following compounds are called unsaturated compounds –that is, it/they add H_2 catalytically at ordinary condition of temperature?



227. Which of the following statements are correct?

- a) The reaction of *t*-butyl chloride with OH^\ominus follows first-order kinetics
- b) An $\text{S}_\text{N}1$ reaction proceeds with the inversion of configuration
- c) An $\text{S}_\text{N}2$ reaction follows second-order kinetics
- d) An $\text{S}_\text{N}2$ reaction proceeds with stereochemical inversion

228. Which of the following does not react with aqueous KMnO_4 ?

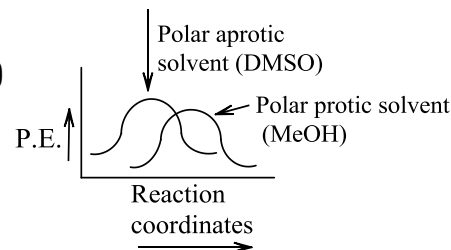


229. Which of the following statements are correct?

Polar protic solvents (e.g., MeOH, EtOH) form H-bonding to the nucleophile and stabilize it, thus rate of $\text{S}_\text{N}2$ reaction is decreased

- a) bonding to the nucleophile and stabilize it, thus rate of $\text{S}_\text{N}2$ reaction is decreased

Polar aprotic solvents (e.g., DMSO, DMF) raise the energy of the nucleophile and thus the rate of $\text{S}_\text{N}2$ is increased



Reactivity of nucleophile in the presence of crown ether (solvent) is increased for $\text{S}_\text{N}1$ and $\text{S}_\text{N}2$ reactions

- c) ether (solvent) is increased for $\text{S}_\text{N}1$ and $\text{S}_\text{N}2$ reactions

Reactivity nucleophile in the presence of crown ether (solvent) is decreased for $\text{S}_\text{N}1$ and $\text{S}_\text{N}2$ reactions

- d) ether (solvent) is decreased for $\text{S}_\text{N}1$ and $\text{S}_\text{N}2$ reactions

230. Which gas is an antidote of Lewisite (a poisonous gas used in World War II):

- a) Sarin gas b) MIC c) BAL d) Mustard gas

231. Which of the statements are WRONG about the nucleophilic addition reaction of alkenes and alkynes?

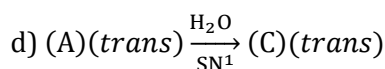
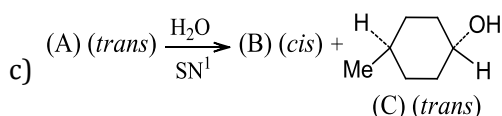
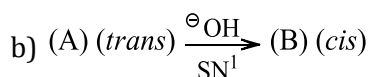
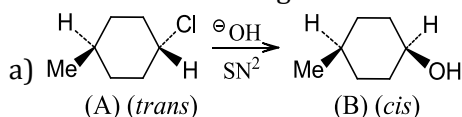
a) Addition of nucleophile (RO^\ominus) to an alkene gives an alkyl carbanion $\left(\text{>C}^\ominus\text{-C(OR)}\right)$ whose negative charge is on the sp^3 -hybridised C atom

b) Addition of nucleophile (RO^\ominus) to an alkyne gives a vinyl carbanion $\left(-\text{C}^\ominus=\text{C(OR)}\right)$ whose negative charge is on the sp^2 -hybridized C atom. Due to more s character, it is readily formed and more stable than alkyl carbanion formed with alkenes. So alkynes are more reactive than alkenes towards NA reaction

c) Strong electron-withdrawing inductive effect ($-I$) further stabilizes both vinyl and alkyl carbanion

d) Strong electron-donation inductive effect ($+I$) further stabilises both vinyl and alkyl carbanion

232. Which of the following reactions are correct?



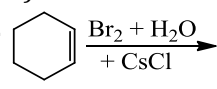
233. When aqueous solution of sodium ethanoate is electrolysed, the product(s) at anode is/are:

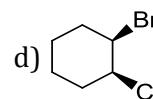
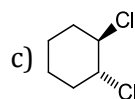
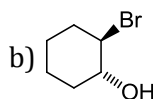
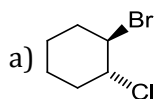
a) Ethane

b) Methyl ethanoate

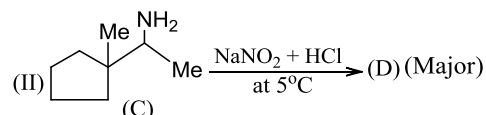
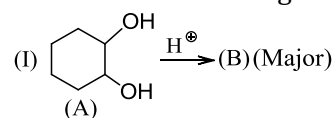
c) CO_2

d) H_2

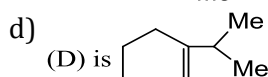
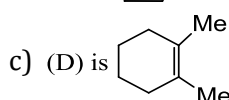
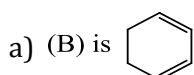
234.  which products are not formed?



235. Consider the following reactions:



Which of the following statements are correct?



236. Which of the following statements is/are wrong about pericyclic reaction?

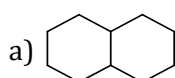
a) It is intramolecular cyclisation of acyclic compound

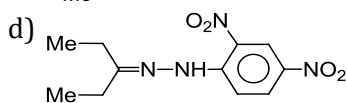
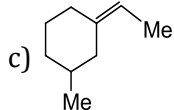
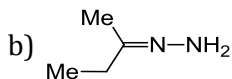
b) It is intermolecular cyclisation of acyclic compound

c) It proceeds *via* concerted mechanism in which breaking and formation of bonds take place simultaneously

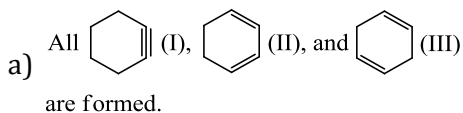
d) It proceeds *via* free-radical mechanism

237. Which of the following show diastereomers?





238. Which of the following statements are correct?



b) Only (II) is formed

c) (I) is a highly strained ring

d) Structure (II) is more stable than (III)

239. Which of the following statements are correct?

a) Hydrogenation is an exothermic reaction

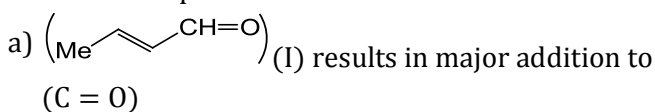
b) Heat of hydrogenation is better than heat of combustion for measuring the stabilities of alkene

c) Among the isomeric alkenes, the most stable alkene has the lowest heat (more negative value) of hydrogenation and the highest heat of combustion and heat of formation (less negative value)

d) Among the isomeric alkenes, the most stable alkene has the lowest value of heat of hydrogenation, heat of combustion, and heat of formation (more negative value)

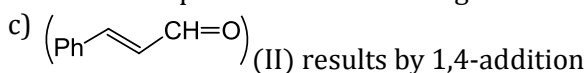
240. Which of the following statements are correct?

The nucleophile addition of HCN to

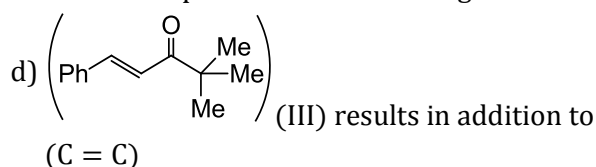


b) The nucleophilic addition of HCN to (I) results in major addition $(C = C)$

The nucleophilic addition of PhMgCl to



The nucleophilic addition of PhMgCl to



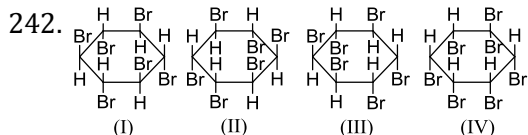
241. Which of the following statements is/are correct?

a) Decalin exists in two geometrical isomers, *cis* and *trans*

b) *cis* form is flexible and has (a, e) conformer

c) *trans* form is rigid and has (e, e) conformer and is more stable than *cis* form

d) *cis* form is rigid and *trans* form is flexible, also *trans* form has lower energy



Which of the following statements is/ are correct?

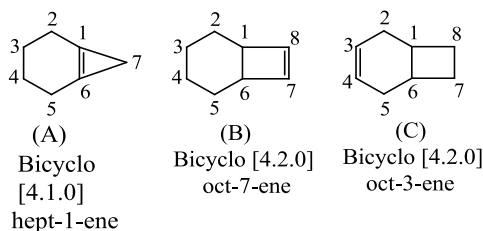
a) (I) and (IV) are meso-compounds

b) (II) and (III) are enantiomers

c) (I) is very slow (or does not react) with alc. KOH in an E2 reaction to give alkene

d) (IV) is very slow (or does not react) with alc. KOH in an E2 reaction to give alkene

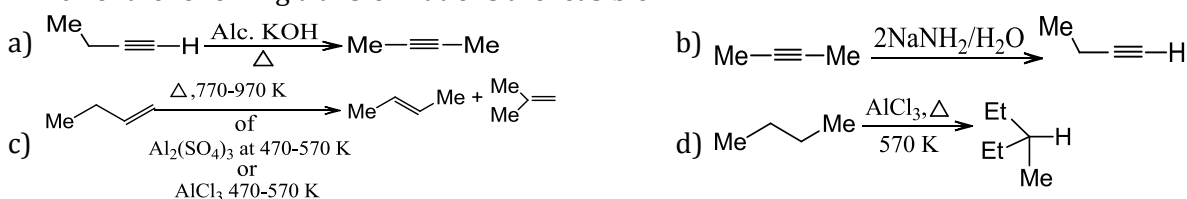
243. Three compounds (A), (B) and (C) are given



Which statements are correct about (A), (B), and (C)?

- The rate of catalytic hydrogenation is faster in (A) than in (B) and (C)
- The rate of catalytic hydrogenation is faster in (B) than in (C)
- (A) Has a cyclopropane ring whose strain on going to less-strained cyclopropane ring is reduced on hydrogenation. Similarly, cyclobutene ring in (B) on hydrogenation is reduced to less-strained cyclobutane ring. But cyclopropene ring is more strained than cyclobutene ring, so faster hydrogenation is in (A) than in (B)
- There is a little change in the ring strain when the cyclohexene ring is reduced

244. Which of the following transformations are feasible?



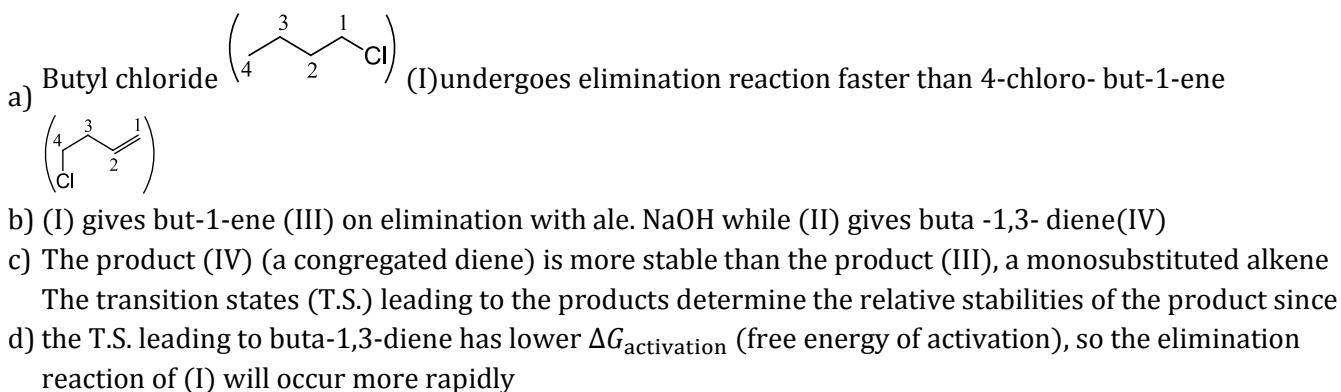
245. In which of the following, do all the C atoms not have the same hybridization?



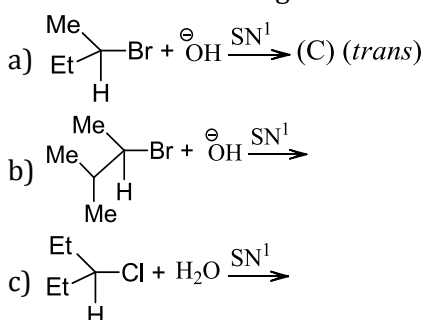
246. An automobile engine fuel has cetane number of 80. Which of the following statements is/are true?

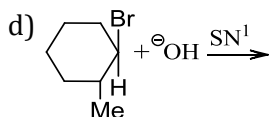
- Fuel contains 80% of α -methyl naphthalene and 20% of $\text{C}_{16}\text{H}_{34}$
- Fuel contains 80% of cetane and 20% of α -methyl naphthalene
- Knocking property of the given fuel compared to the knocking property of a fuel with cetane number of 90 is high
- Cetane number determines the quality of diesel fuel in terms of ignition properties

247. Which of the following statements is/are wrong?



248. Which of the following reactions would give racemised and retention products?





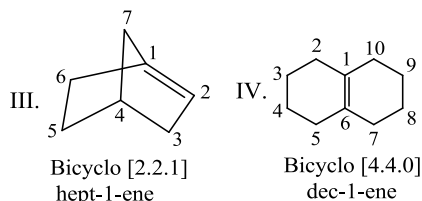
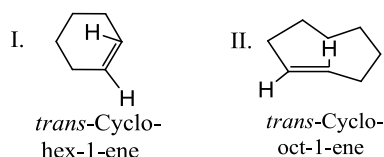
249. Which of the following statements are correct?

- a) EtO^\ominus is a stronger nucleophile than OH^\ominus b) MeO^\ominus is a stronger nucleophile than OH^\ominus
 c) RCOO^\ominus is a stronger nucleophile than ROH d) MeO^\ominus is a weaker nucleophile than OH^\ominus

250. Which of the following statement(s) about cyclohexane is/are wrong?

- a) Stability of different conformations of cyclohexane is: Chair > Boat > Twist boat > Half chair
 b) Only the chair form is free from angle strain
 c) Half chair has five C atoms in one plane and one C atom out of the plane. Hence, it has both eclipsing and bond angle strains and is the least stable conformer of cyclohexane
 d) Twisting the boat to the skew boat conformation moves the 'flagpole' H atoms away from each other and reduces the eclipsing strain. Hence, the twist boat is more stable than the boat conformation

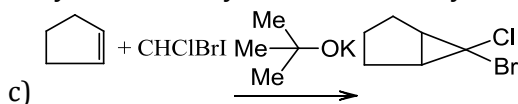
251. Which statements are correct about the following compounds?



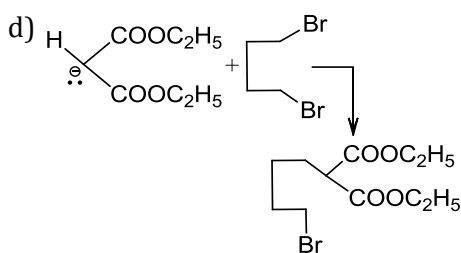
- a) (I) is not isolable because *trans*-cyclohexane is too strained
 b) (II) is isolable because because *trans*-unit can be bridged by six C atoms. Eight-membered and larger rings can have a *trans*-substituted (C = C) in the ring
 c) (III) is not isolable, exocyclic double bonds (double bond at the bridgehead) are unstable because of high strain (due to ring and double joining the two rings)
 d) (IV) is isolable, although there is a double bond at a bridgehead (joining two rings) but one of the bridgeheads has no C atom and bridgehead C atoms can flatten without ring strain

252. Which of the statements is/are correct?

- a) Diels–Alder reaction is an electrocyclic reaction
 b) Both thermal stability and probability (entropy) factors are responsible for affecting the formation of cycloalkanes by intramolecular cyclisation



The intermediate in the above reaction is $\overset{\ominus}{\text{C}}\text{ClBrI}$



The above step proceeds by $\text{S}_\text{N}2$ mechanism (substitution by nucleophile)

253. Which of the statements are correct for alkyne with molecular formula C_6H_{10} ?

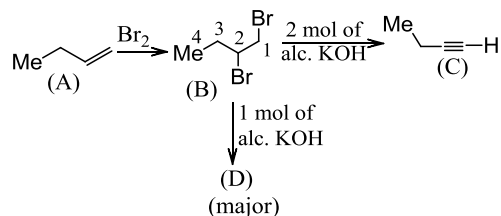
- a) It shows 7 structural isomers

- b) It shows 4 terminal and 3 internal alkynes
 c) It shows 3 terminal and 4 internal alkynes
 d) Only one isomer is chiral

254. Which of the statements are correct?

- a) $\text{Be}_2\text{C} + \text{H}_2\text{O} \rightarrow$ Marsh gas
 b) $\text{Al}_4\text{C}_3 + \text{H}_2\text{O} \rightarrow$ Gas is a content of CNG
 c) $\text{CaC}_2 + \text{H}_2\text{O} \rightarrow$ Gas is used for welding purpose with O_2 gas
 d) $\text{Ca}_3\text{P}_2 + \text{H}_2\text{O} \rightarrow$ Gas is used in Holme signals with CaC_2

255. In the following sequence of reactions,



Which of the statements are correct about the compound (D)?

(D) is:

- a)
- b)
- c)

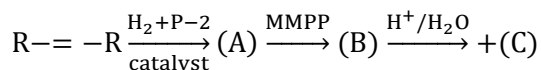
In E2 elimination, the most acidic H atom is removed. The inductive effect ($-I$) of Br atom increases the acidity of H atoms to which Br atoms are bonded

Decreasing acidity of H atom in (B) is as follows: H at C-1 > H at C-2 > H at C-3

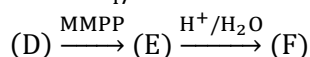
256. All reagents, $[\text{Cu}(\text{NH}_3)_2]^\oplus$, $[\text{Ag}(\text{NH}_3)_2]^\oplus$, CH_3MgBr , and NaNH_2 react with:

- a) Cyclooctyne b) Pent-1-yne c) Pent-2-yne d) Ethyne

257. Which of the statements are correct?



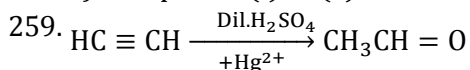
a) $\downarrow \text{LiAlH}_4/\text{EtOH}$



- b) (C) is an equimolar mixture of two enantiomeric compounds
 c) (F) is a single compound and is optically inactive
 d) (C) is a single compound and is optically inactive

258. Which statements is/are correct?

- a) 3-Methyl pentene (I) is the alkene hydrocarbon with the fewest number of C atoms that exhibit optical isomerism
 b) 4-Methylhex-2-ene (II) is the alkene hydrocarbon with the fewest number of C atoms that exhibit optical both geometrical and optical isomerism
 c) Compound (I) in (a) shows four stereoisomers
 d) Compound (II) in (b) shows four stereoisomers



Which statement(s) is/are correct about the given reaction?

- a) C atom accepting the H is reduced, and the C atom forming a bond with OH is oxidized
 b) Given reaction is a redox reaction
 c) The average oxidation number of the two C atoms in each compound is same (-1)
 d) The average oxidation number of the two C atoms in each compound is same (-2) The net effect is no change in average oxidation state

260. Which of the following statements are correct?

- a) ΔH_c^\ominus of *cis*-pent-2-ene > *trans*-pent-2-ene
 b) ΔH_c^\ominus of hex-1-ene > *trans*-hex-2-ene

c) ΔH_c° of 2,5-dimethyl hexane > octane

d) ΔH_c° of 2-methyl-pent-2-ene > *trans*-hex-2-ene $\Delta H_c^\circ =$ Heat of combustion

261. Which of the following statements are correct statements?

- a) Carbocation is less \bar{e} deficient than alkyl radical
- b) Isomerisation of a less stable carbocation to more stable carbocation by 1,2-Me shift is called Wagner–Meerwein rearrangement
- c) Isomerisation to a more stable carbocation is accompanied by decrease in potential energy
- d) Greater stability of benzyl, alkyl, and 3° carbocation is due to hyperconjugation

262. Which statements are correct:

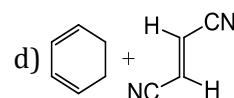
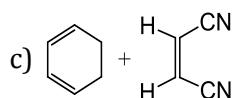
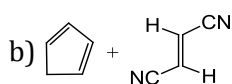
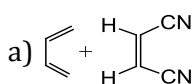
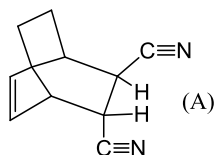
- a) Heterogeneous catalyst used in polymerization of alkene is Ziegler Natta catalyst (for the synthesis of HDPE)
- b) Homogeneous catalyst used in the hydrogenation of alkenes is Wilkinson's catalyst

Formula for Ziegler Natta catalyst is

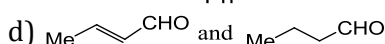
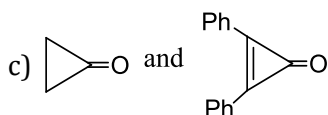
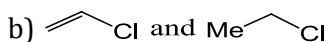
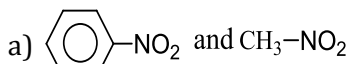
- c) $[\text{RhCl}(\text{PPh}_3)_3]$ and for Wilkinson's catalyst is $\text{TiCl}_4 + \text{Et}_3\text{Al}$

- d) Wilkinson's catalyst also reduces acid (RCOOH) to alcohol (RCH_2OH)

263. Which of the following dienes and dienophiles could be used to synthesise the following compound (A)?



264. In which of the following does the first compound have a higher dipole moment than the second?



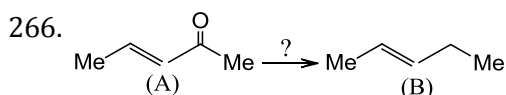
265. Which statement(s) is/are WRONG?

- a) Acetylene is insoluble in conc. H_2SO_4 due to the formation of vinyl carbocation ($\text{CH}=\text{CH}^\oplus$) (HSO_4^\ominus)
Ethylene is soluble in conc. H_2SO_4 due to the formation of alkyne carbocation

- b) ($\text{H}_3\text{C}-\text{CH}_2^\oplus$) (HSO_4^\ominus)

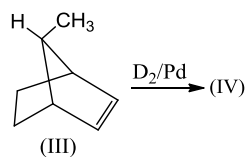
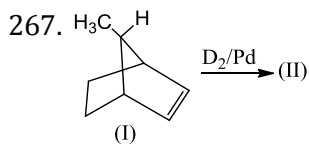
- c) But-2-yne dissolves in conc. H_2SO_4 due to the formation of vinyl carbocation ($\text{Me}-\text{C}^\oplus=\text{CH}-\text{Me}$) (HSO_4^\ominus), but it is stabilized by electron-donating methyl group and is more stable than the vinyl carbocation formed from acetylene

- d) More the s character in the positively charged C, the more stable is the carbocation and more likely is its formation

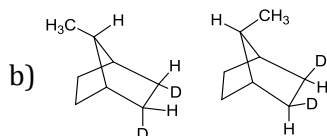
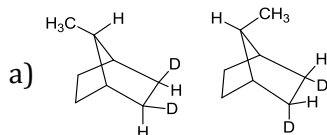


Reagents used in conversion from (A) to (B) are:

- a) $\text{Sn}(\text{Hg})/\text{conc. HCl}$ b) $\text{HI} + \text{P}$ c) $\text{Zn}(\text{Hg})/\text{conc. HCl}$ d) $\text{PhNHNH}_2, \text{glycol}/\text{OH}^\ominus$



Which of the following statements is/are correct?



c) The rate of catalytic hydrogenation of (I) is faster than that of (III)

d) In (I), the exo-approach of two D atoms is from the less-hindered side, whereas in (III), the syn [(CH₃ group)] hinders the exo-approach, so the two D atoms are in endo-position

268. In which of the following reactions, rearrangement is possible?

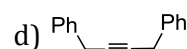
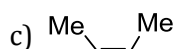
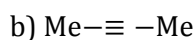
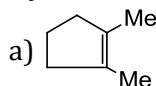
a) E1

b) SN¹

c) SN^{2'}

d) E1cB

269. Hydroboration oxidation and acid hydration will yield the same product in case of:



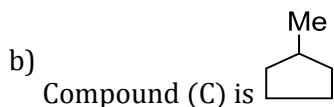
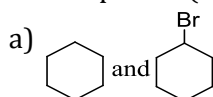
270. C₆H₁₂ (A) $\xrightarrow[\text{Monobromination}]{Br_2/h\nu}$ One isomer (B)

C₆H₁₂ (C) $\xrightarrow[\text{Monobromination}]{Br_2/h\nu}$ Number of isomers

Both (A) and (C) do not decolourise Baeyer's reagent or Br₂ solution

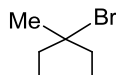
Which of the statement is/are correct?

Compound (A) and (B) are, respectively,



c) The total number of isomers obtained by monobromination of (C) is six including geometrical isomer

d) The major product of monobromination of (C) is



271. In the destructive distillation of coal, at 443 – 503 K temperature, a middle oil or carboic oil fraction is obtained. This fraction contains:

a) Phenol

b) Xylenes

c) Napthalene

d) Benzene

272. Which among the following statements is correct about nitration of aromatic compounds?

a) Rate of nitration of toluene is greater than that of benzene

b) Rate of nitration of benzene is greater than hexadeutero benzene

c) Nitration is an electrophilic substitution reaction

d) Rate of nitration of benzene is almost the same as that of hexadeutero benzene

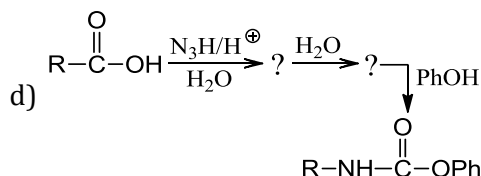
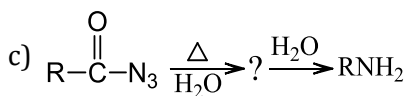
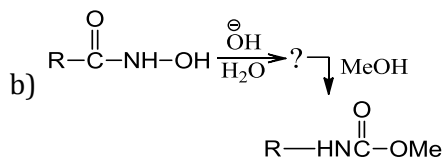
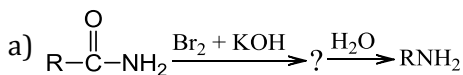
273. Which of the following statement(s) is/are correct:

a) Hydrogenation of but-2-yne in the presence of Lindlar's catalyst yields *cis*-but-2-ene

- b) Hydrogenation of pent-2-yne in the presence of P-2 catalyst yields *trans*-pent-2-ene
 c) Hydrogenation of pent-2-yne in the presence of K (potassium) and liquid NH₃ yields *trans*-pent-2-ene
 d) Hydrogenation of but-2-yne in the presence of LiAlH₄ yields *cis*-but-2-ene

274.

In which of the following reactions, the intermediate species acyl nitrene ($\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\ddot{\text{N}}:$) and intermediate compound alkyl isocyanate ($\text{R}-\text{N}=\text{C}=\text{O}$) are involved?



275. Nitration of propane with concentrated HNO₃ gives

- a) CH₃NO₂ b) CH₃CH₂CH₂NO₂ c) $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_3 \\ | \\ \text{NO}_2 \end{array}$ d) CH₃CH₂NO₂

276. Acetylene is thermodynamically unstable and readily explodes, therefore it is stored in commercial cylinders used for oxy-acetylene torch for welding. These cylinders contain:

- a) Pumice stone saturated with acetone
 b) Charcoal powder saturated with acetone
 c) Dissolved in water to give 0.5M solution
 d) Dissolved in turpentine oil

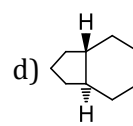
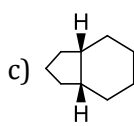
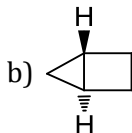
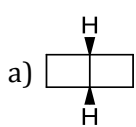
277. Which of the following has the smallest heat of hydrogenation per mole?

- a) 1-Butene b) *trans*-2-Butene c) *cis*-2-Butene d) 1,3-Butadiene

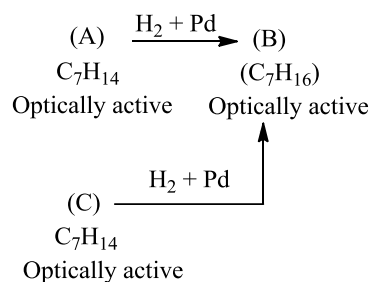
278. Which of the following statements is/are correct?

- a) The reductive and oxidative ozonolyses of *m*- and *p*-xylenes give the same product
 b) The reductive ozonolysis of *o*-xylene (1,2-dimethyl benzenr) gives glyoxal+methylglyoxal+ dimethyl glyoxal in 3:2:1 ratio
 c) The ozonolysis of *o*-xylene establishes the Kekule's structure of benzene and also proves the existence of resonance in benzene
 d) The oxidation of benzene with acidic KMnO₄ gives 3 mol oxalic acid

279. Which of the following compounds is/are isolable?

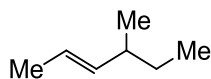


280.

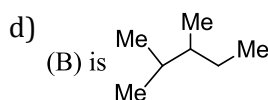
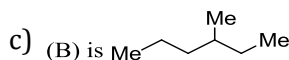
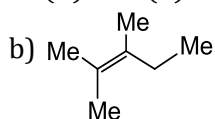


(A) and (C) are different compounds and rotate the plane-polarised light in the same direction, and both are dextrorotatory. If (A) and (C) both show optical and geometrical isomers, which of the following statements is/are correct?

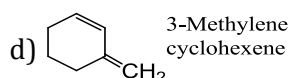
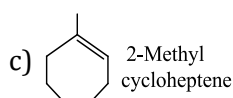
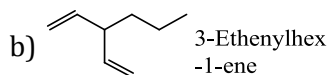
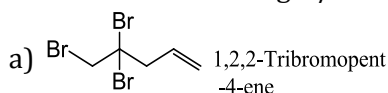
- a) (A) and (C) are the same compound which is



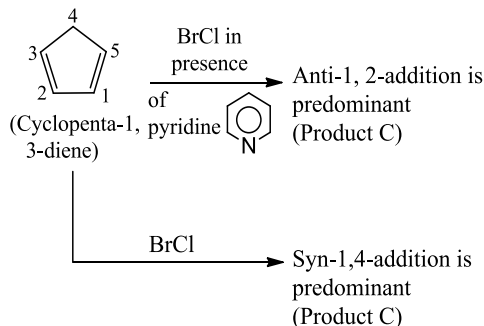
(A) and (C) are the same compound which is



281. Which of the following is/are incorrectly named?

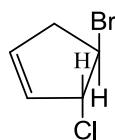


282.

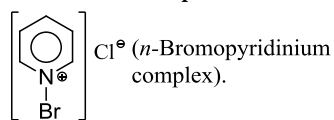


Which of the following statement is/are wrong?

Product (B) is pyridine

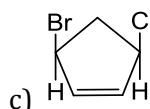


a) and BrCl reacts with to form a complex



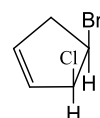
(*n*-Bromopyridinium complex)

Product (C) is

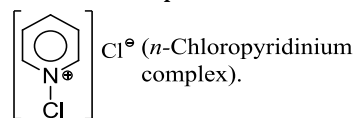


and first, the electrophilic addition of Br[⊕] takes place, and then the nucleophile Cl[⊖] adds to the double bond

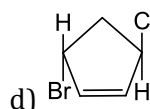
Product (B) is



b) and the complex is

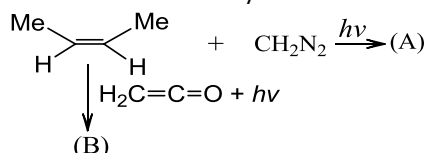


Product (C) is



and first, the electrophilic addition of Cl[⊕] takes place and then the nucleophile Br[⊖] adds to the double bond

283. Which statement is/are true about the following reactions?



a) Both the compound (A) and (B) are *cis*-1,2-dimethylcyclo propane

b) Both the compound (A) and (B) are *trans*-1,2-dimethylcyclo propane

- c) The compound (A) is *cis*, whereas (B) is both *cis* and *trans*-1,2-dimethylcyclopropane
 d) Formation of compound (A) is both stereospecific and stereoselective, but the formation of compound (B) is neither stereospecific nor stereoselective

284. Which of the following simplest alkanes with fewest number of C atom contains 1°, 2°, 3°, and 4° C atoms?

- a) 2,2,3-Trimethyl pentane
 b) 2,2,4-Trimethyl pentane
 c) 2,3,3-Trimethyl pentane
 d) 2,2,3-Trimethyl butane

285. $\text{CH}_2=\overset{3}{\text{C}}=\overset{2}{\text{C}}=\overset{1}{\text{CH}_2} \xrightarrow{\text{NaNH}_2 + \text{Liq. NH}_3} \text{(B)}$

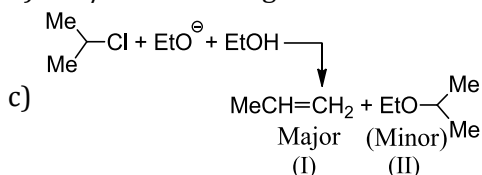
Propa-1,2-diene
 (A)

Which of the following statements is/are correct

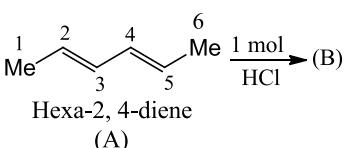
- a) Product (B) is $\text{CH}_2 = \text{CH} - \text{CH}_3$
 b) Product (B) is propyne
 c) Product (B) is more stable than (A)
 d) Compound (A) has a more negative heat of hydrogenation than the compound (B)

286. Which of the following statements/reactions are correct?

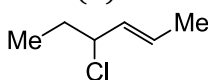
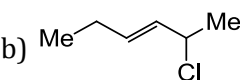
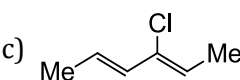
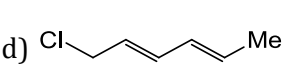
- a) $\text{SN}^2/\text{E}2$ ratio is higher with RS^\ominus than for those with RO^\ominus
 b) $\text{SN}^2/\text{E}2$ ratio is highest for 1° RX and least for 3° RX



d) $\text{Me}_3\text{C} - \text{Br} + \text{KCN} \rightarrow \text{Me}_3\text{C} - \text{CN}$

287. 
 Hexa-2, 4-diene
 (A)

Product (B) is:

- a)  b)  c)  d) 

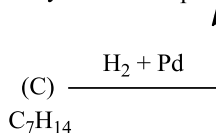
288. Which of the following compounds contain active methylene group?

- a)  b) 
 c)  d) 

289. Compound (A) reacts with $[\text{Cu}(\text{NH}_3)_2]^+$ and Tollens reagent, but after reaction with alc. KOH it does not give the above test. Compound (A) is:

- a) $\text{Me}-\equiv-\text{Me}$ b) $\text{Me}-\equiv-\text{H}$ c)  d) $\text{Ph}-\equiv-\text{H}$

290. $\text{(A)} \xrightarrow{\text{H}_2 + \text{Pd}} \text{(B)}$
 C_7H_{14} $\text{(C}_7\text{H}_{16}\text{)}$
 Optically active Optically active

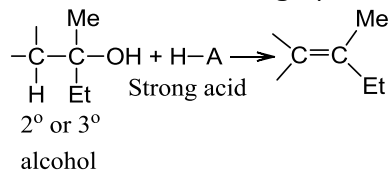


(A) and (C) are different compounds and rotate the plane-polarised light in the same direction, and both

are dextrorotatory. Both (A) and (C) do not show diastereomers, which of the following statements are correct?

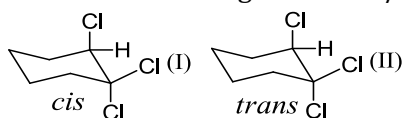
- a) (A) is (+) $\left(\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{CH}_2-\text{CH}^*-\text{CH}=\text{CH}_2 \end{array} \right)$ and (C) is (+) $\left(\begin{array}{c} \text{Me} \\ | \\ \text{CH}=\text{CH}-\text{CH}^*-\text{Me} \end{array} \right)$
- b) (A) is (+) $\left(\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{CH}^*-\text{CH}=\text{CH}_2 \end{array} \right)$ and (C) is (+) $\left(\begin{array}{c} \text{Me} \\ | \\ \text{CH}=\text{CH}-\text{CH}^*-\text{Me} \\ | \\ \text{Me} \end{array} \right)$
- c) (B) is (+) or (-) $\text{Me}-\text{CH}_2-\text{CH}^*-\text{Me}$ or (+) or (-) $\left(\begin{array}{c} \text{Me} \\ | \\ \text{CH}^*-\text{Me} \\ | \\ \text{Me} \end{array} \right)$
- d) B is (±) $\text{Me}-\text{CH}_2-\text{CH}^*-\text{Me}$ or (±) $\left(\begin{array}{c} \text{Me} \\ | \\ \text{CH}^*-\text{Me} \\ | \\ \text{Me} \end{array} \right)$

291. Which of the following is/are the rate determining step(s) of the given reaction?



- a) $\begin{array}{c} \text{Me} \\ | \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} + \text{HA} \rightleftharpoons \begin{array}{c} \text{Me} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}-\text{O}^+-\text{H} \\ | \quad | \\ \text{H} \quad \text{Et} \end{array} + \text{A}^-$
- b) $\begin{array}{c} \text{Me} \\ | \\ \text{H}-\text{C}-\text{C}-\text{O}^+-\text{H} \rightleftharpoons \begin{array}{c} \text{Me} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}^+-\text{H} \\ | \quad | \\ \text{H} \quad \text{Et} \end{array} + \text{O}-\text{H} \end{array}$
- c) $\begin{array}{c} \text{H} \quad \text{Me} \\ | \quad | \\ \text{H}-\text{C}-\text{C}^+-\text{H} \\ | \quad | \\ \text{H} \quad \text{Et} \end{array} + \text{A}^- \rightleftharpoons \begin{array}{c} \text{Me} \\ | \\ \text{C}=\text{C} \\ | \\ \text{Et} \end{array} + \text{H}-\text{A}$
- d) All

292. Which of the following statement/reactions are correct?



- a) E2 elimination of HCl with $\text{Me}_3\text{COK} + \text{Me}_3\text{C}-\text{OH}$ b) $\text{Me}-\text{CH}=\text{CH}_2 + \text{NBS} \rightarrow \begin{array}{c} \text{Br} \\ | \\ \text{Me}-\text{CH}=\text{CH}_2 \\ + \text{Me}-\text{CH}_2-\text{CH}_2-\text{Br} \end{array}$
- c) to give $\left(\begin{array}{c} \text{H} \\ | \\ \text{C} \\ | \\ \text{Cl} \end{array} \right)$ of (I) is faster than (II)



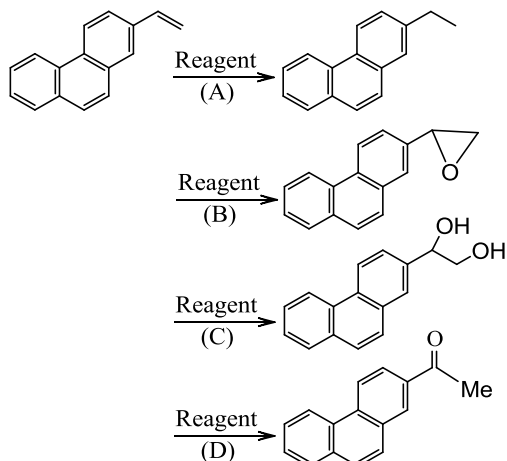
293. Which of the following reactions are both stereospecific and regioselective?

- a) *cis*-But-2-ene + $\text{D}_2 \xrightarrow{\text{Pt}}$
- b) *cis*-But-2-ene + $\text{OsO}_4 + \text{NaHSO}_3 \rightarrow$
- c) *cis*-But-2-ene + $\text{Br}_2 \rightarrow$
- d) *trans*-But-2-ene + $\text{PhCO}_3\text{H}/\text{H}_2\text{O} \rightarrow$

294. Which statements is/are correct about cyclohexene and cyclodecene?

- a) *Z* or *cis*-cyclohexene is more stable than *E* or *trans*-isomer
- b) *Z* or *cis*-cyclodecene is more stable than *E* or *trans*-isomer
- c) *Z* or *cis*-cyclohexene is less stable than *E* or *trans*-isomer
- d) *Z* or *cis*-cyclodecene is less stable than *E* or *trans*-isomer

295.



Which statements are correct for reagents A, B, C, and D?

(A)	(B)	(C)	(D)
-----	-----	-----	-----

a)

H_2/Pt	MMPP	Cold alk. $KMnO_4$	$O_2 + PdCl_2$ + $CuCl_2$ + H_2O
----------	------	-----------------------	------------------------------------------

b)

$H_2/Pd + BaSO_4 +$ quinoline	HCO_3H	Hot alk. $KMnO_4$	Dil. $H_2SO_4 + Hg^{2+}$
----------------------------------	----------	-------------------------	-----------------------------

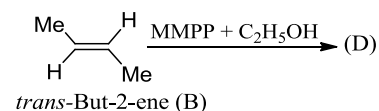
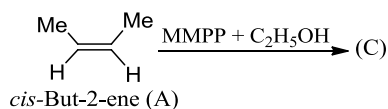
c)

$Sia_2BH + CH_3COOH$	$PhCO_3H$	$OsO_4 / NaHSO_3$	$O_2 + PdCl_2$ + $CuCl_2$ + H_2O
----------------------	-----------	-------------------	------------------------------------------

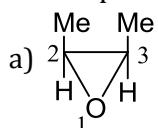
d)

$BH_3 + THF + CH_3COOH$	MCPBA	OsO_4 / H_2O_2	Wacker process
-------------------------	-------	------------------	-------------------

296.

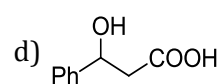
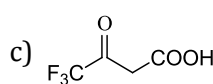
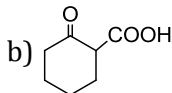
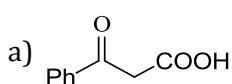


Which of the following statements is/are correct?

Compound (C) is meso-*cis*-2,3-dimethyl oxiraneb) Compound (D) is racemic-*cis*-2,3-dimethyl oxiranec) Compound (C) is meso-*trans*-2,3-dimethyl oxirane

d) Compound (D) is racemic-*trans*-2,3-dimethyl oxirane

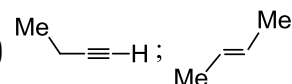
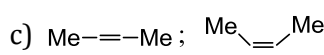
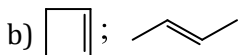
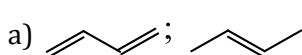
297. Which of the following compounds undergoes easy decarboxylation on heating?



298. $C_4H_6 \xrightarrow[1 \text{ mol}]{H_2+Pt} C_4H_8 \xrightarrow{O_3/H_2O} \text{Acetic acid}$

1. (B)

(A) and (B), respectively, are:



299. Which of the following statements is/are correct in the synthesis of cycloalkanes by intramolecular cyclisation?

a) Large rings with more than six C atoms are stable but difficult to prepare

b) Decreasing order of thermal stability of cyclic rings is: $6 > 7, 5 > 8, 9 \gg 4 > 3$

c) Decreasing order of probability of ring closure is:

3 > 4 > 5 > 6 > 7 > 8 > 9

d) Ease of synthesis of cyclo compounds is:

5 > 3, 6 > 4, 7, 8, 9

300. Which statements is/are correct about isomeric compound (excluding cyclic) of (A) (C_5H_{10})?

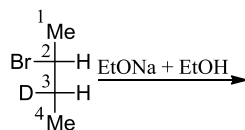
a) It shows five structural isomers

b) It shows six structural isomers

c) It shows six structural isomers and stereoisomers

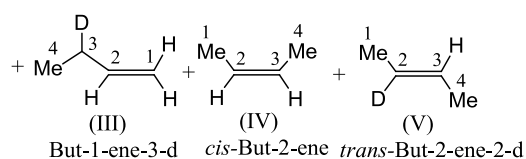
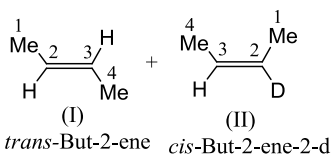
d) It shows seven structural isomers and stereoisomers

301.



(A)

Erythro-2-bromo-3-deuteriobutane or Erythro-2-bromobutane-3-d



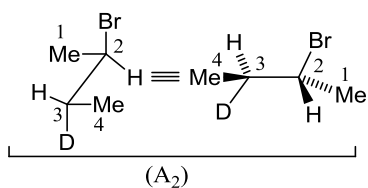
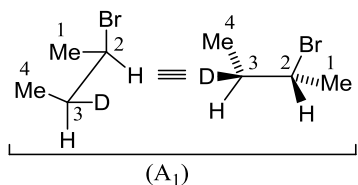
Which statement is correct?

a) (I), (II) with small amount of (III) are formed

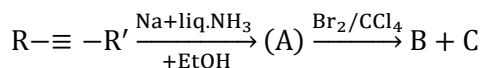
b) (IV) and (V) with small amount of (III) are formed

c) The two groups undergoing elimination (H and Br or D and Br) must lie in an anti-periplanar arrangement

d) Compound (A) has two conformations in which H or D is anti-periplanar to bromine. These are (A_2)



302. Which of the statements are correct?



Where (B) and (C) are:

- Enantiomers if $R \neq R'$
- Diastereomers if $R \neq R'$
- Both are meso and hence the same compound if $R \neq R'$
- An equimolar mixture of (B) and (C) is a racemic mixture if $R \neq R'$

303. CH_4 can be prepared by the reaction of H_2O with:

- Mg_2C_3
- CaC_2
- Be_2C
- Al_4C_3

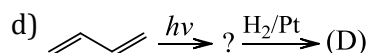
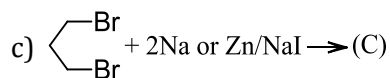
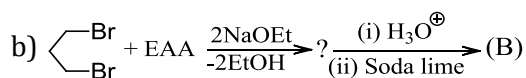
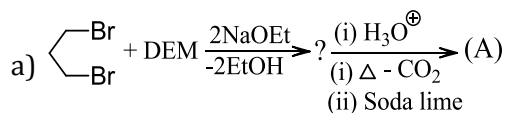
304. Compound (A) does not react with Tollens or Grignard reagent, but after treatment with NaNH_2 , it gives the above test. The compound (A) is/are:

- $\text{Me}-\equiv-\text{Me}$
-
-
- $\text{Ph}-\equiv-\text{Me}$

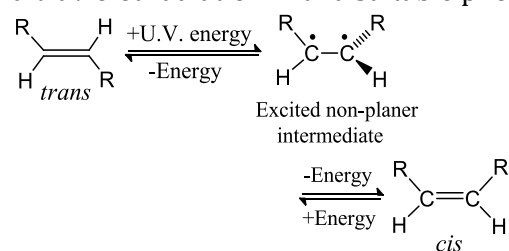
305. Which are the correct statements?

- trans*- or *E*-cyclooctene is not a flat molecule and has two puckered conformations which are isolable enantiomers
- trans*- or *E*-cyclooctene is achiral and is a flat molecule devoid of chirality
- trans*- or *E*-cyclodecene is a chiral molecule
- trans*- or *E*-cyclodecene is an achiral and a flat molecule devoid of chirality

306. Which of the following reactions will not give a four-membered cyclic compound?



307. Which statement(s) is/are wrong about the interconversion of *trans*- and *cis*-isomeric alkenes by ultraviolet radiation with a suitable photosensitiser?



- U.V. radiation provides energy to excite $\pi\bar{e}$ into an anti-bonding π molecular orbital (π^* ABMO) momentarily breaking the π - bond
- Rotation about the (C – C) single bond of either excited *cis*- or *trans*- molecule gives a common non-

planar intermediate. When the \bar{e} returns to the ground state, the π -bond reforms and the same mixture of the two geometric isomers results from either starting isomer

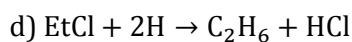
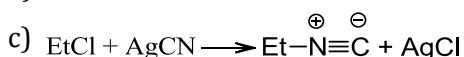
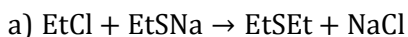
Because the rate of return from the common intermediate to the *cis*-ground state is faster, the *cis*-

c) predominates even though it has the higher energy. The product ratio is kinetically controlled and not thermodynamically controlled

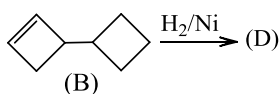
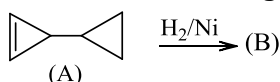
Because the rate of return from the common intermediate to the *trans*-ground state is faster, the *trans*-

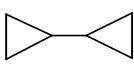
d) predominates and has lesser energy. The product ratio is thermodynamically controlled and not kinetically controlled

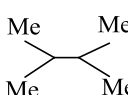
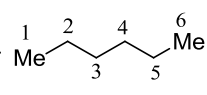
308. Which of the following reactions represent SN reaction?

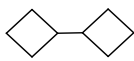


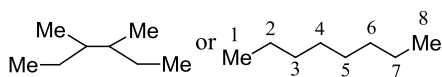
309. Which of the following statements is/are correct about the following reactions?



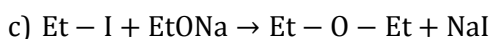
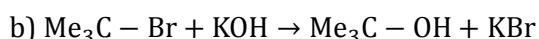
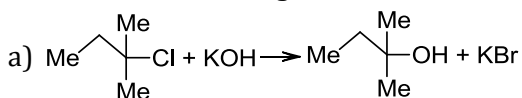
a) The product (B) is 
The product (B) is

b)  or 

c) The product (D) is 
d) The product (D) is



310. Which of the following are SN² reactions?



311. Vinyl bromide undergoes:

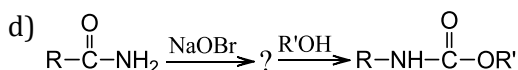
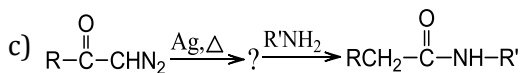
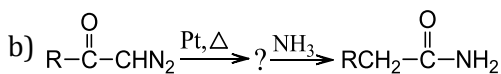
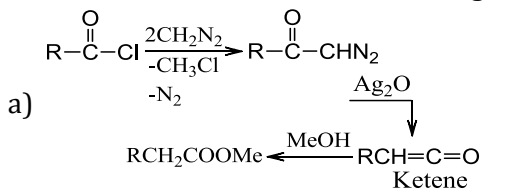
a) Addition reaction

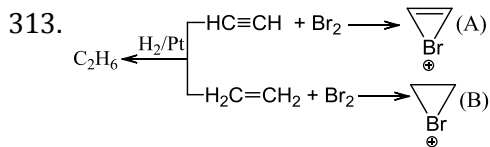
b) Substitution reaction

c) Elimination reaction

d) Rearrangement reaction

312. In which of the reaction, there is a migration of alkyl group to carbene ($\overset{\bullet}{\text{C}}\text{H}_2$) i.e., rearrangement occurs?





Which of the statements are correct about the reactivities of alkene, alkynes, and arenes?

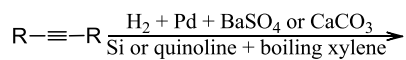
Ring (A) is more strained due to full double bond and is less stable than ring (B). Moreover, C atoms in a) ring (A) have more s character than those in ring (B), further making it less stable than ring (B). Hence, alkenes are more reactive towards EA reaction

EN of sp -hybridized C atom of alkynes is greater than sp^2 -hybridised C atom of alkenes, which holds the π electrons of alkynes more tightly. Moreover, there is a greater delocalization of π electrons (due to cylindrical nature) in alkynes than in alkenes. In alkenes, π e^- s are less easily available for EA reactions than those in alkynes. So alkynes are less reactive than alkenes towards EA reactions

In alkynes, because of the cylindrical nature of their π -bonds, approach by hydrogen along the axis of c) cylinder is more effective. Thus the transition state in alkynes is less strained. So alkynes react faster than alkenes with H_2

Arenes are more reactive towards EA reaction than alkenes and alkynes due to delocalization of their πe^- s

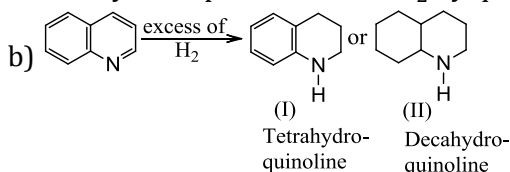
314. For the conversion of alkyne to *cis*-alkene, H_2 + Lindlar's catalyst is used:



Which of the statements are wrong:

a) The function of $BaSO_4$ or $CaCO_3$ is to reduce the surface area of finely divided catalyst Pd so that adsorption of H_2 on Pd is reduced

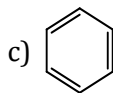
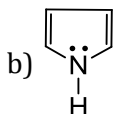
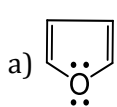
The function of S or quinoline is to remove excess of H_2 . It is done through the formation of $H_2S(g)$ with S or by absorption of excess H_2 by quinoline to form (I) or (II)



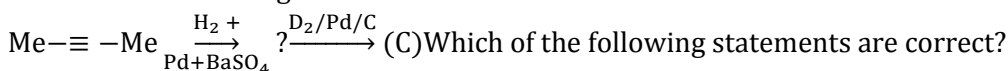
c) Boiling xylene acts as a solvent to dissolve the reactant (alkyne)

d) Boiling xylene acts as inhibitor, decreasing the adsorption of H_2 on finely divided catalyst Pd or Pt

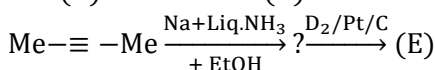
315. Which of the following decolourise(s) Br_2 solution?



316. Consider the following reactions:



(A) (B)



(A) (D)

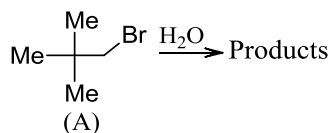
a) (B) is *cis*-but-2-ene and (D) is *trans*-but-2-ene

b) (B) is *trans*-but-2-ene and (D) is *cis*-but-2-ene

c) (C) is meso form and (E) is racemic form

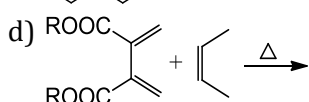
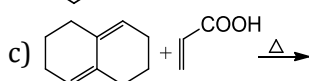
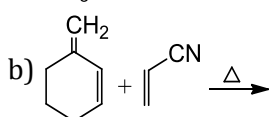
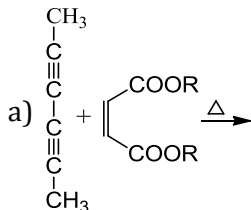
d) (C) is racemic form and (E) is meso form

317. The products in the given reaction are:

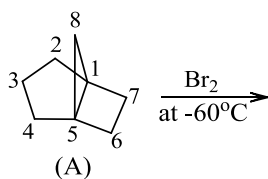


- (A)
- a) b) c) d) All

318. Which of the following Diels-Alder reactions do not take place?

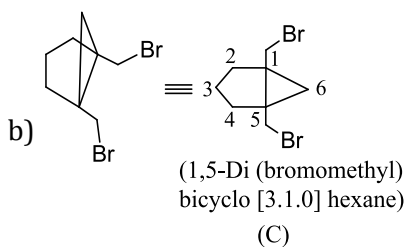
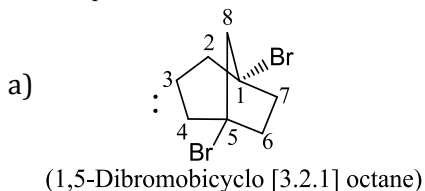


319. Which of the following statements is/are correct?



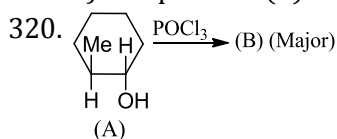
(A) Tricyclo [3.2.1 0] octane

The product is



c) The product (B) is favourable because the strain of both three- and four-membered ring in relieved

d) The product (C) is favourable because the strain of four-membered ring in relieved



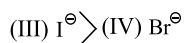
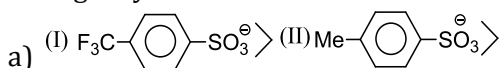
Which of the following statements is/are correct?

- a) (B) is (I)
- b) (B) is (II)

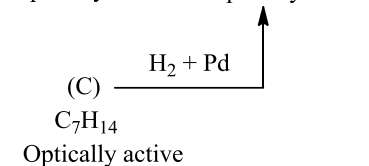
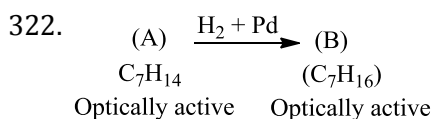
- c) (I) is Saytzeff's elimination product, while (II) is Hofmann's elimination product
 d) (II) is predominant because the two eliminating groups (H and OH) are in syn-position

321. Which of the following statements are correct?

Fugacity order:

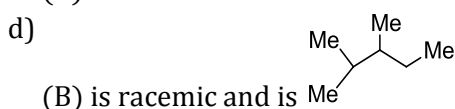
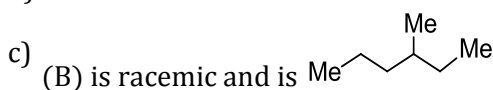


- b) RS^\ominus is less basic but a stronger nucleophile than RO^\ominus
 c) NH_3 is both a stronger base and a stronger nucleophile than H_2O
 d) RO^\ominus and OH^\ominus are both stronger bases and stronger nucleophiles than ROH and H_2O

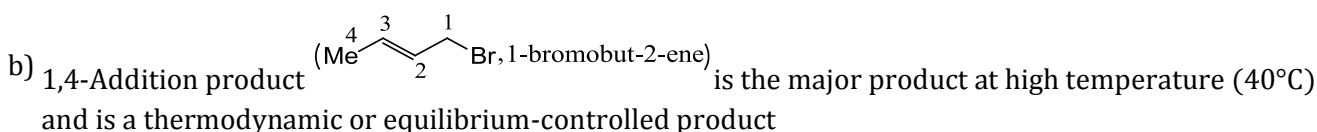
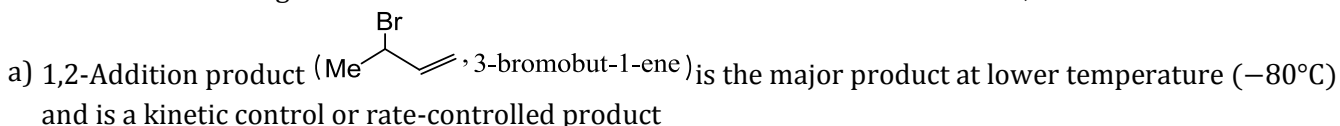


If (A) and (C) show geometrical isomers but not optical isomers, and (A) is *cis*- and (C) is *trans*-isomer, which of the following statements is/are correct?

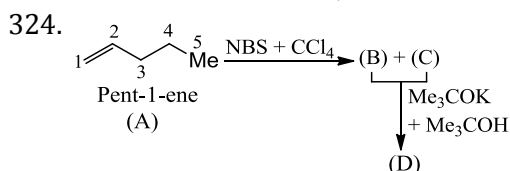
- a) The number of structure isomers for (A) and (C) are three each
 b) The number of structural isomer for (A) and (C) are four each



323. Which of the following statements are correct about the addition of HBr to buta-1, 3-diene?

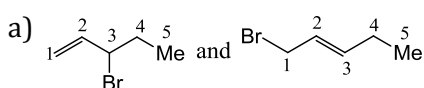


- c) In a non-polar solvent (e.g., hexane), 1,2-addition product is predominantly favoured
 d) In a polar solvent (e.g., acetic acid) 1,4-addition product is predominantly favoured

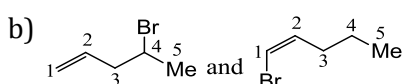


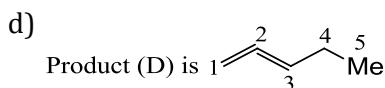
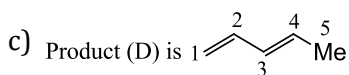
Which of the following statements is/are correct?

Products (B) and (C), respectively, are

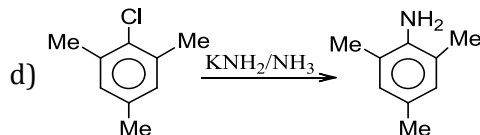
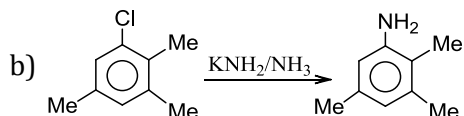
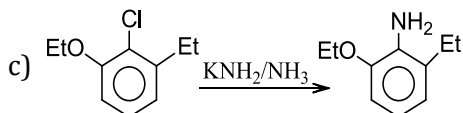
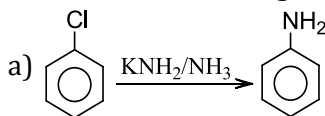


Products (B) and (C), respectively, are





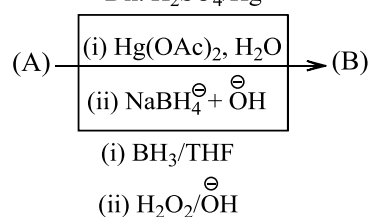
325. Which of the following reactions are feasible?



326. Benzene can undergo

- a) Elimination reaction b) Addition reaction c) Oxidation reaction d) Substitution reaction

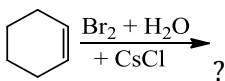
327. Dil. $\text{H}_2\text{SO}_4/\text{Hg}^{2+}$

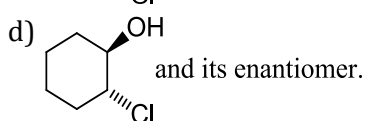
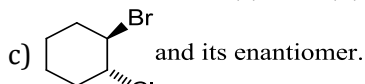
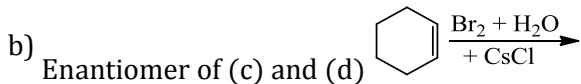
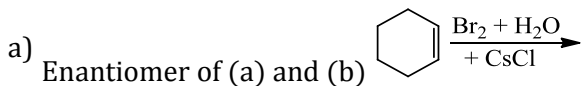


Compound (B) is same when (A) is

- a) $\text{Me}-\text{C}\equiv\text{C}-\text{Me}$ b)  c) $\text{H}-\text{C}\equiv\text{C}-\text{H}$ d) 

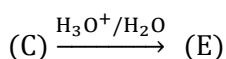
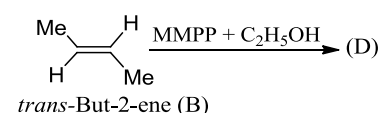
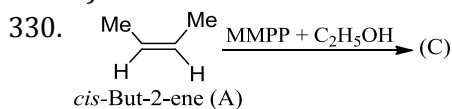
328.

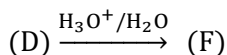
What other products is/are formed in  ?



329. Which of the following statements is/are correct?

- a) Protic solvents solvate the nucleophile, lower enthalpy of nucleophiles, increase ΔG , and decrease the reaction rate of SN^2 reaction
b) SN^1 reactions are favoured in protic solvents
c) Crown ether increases the reactivity of nucleophile by solvating its cation
d) SN^2 reactions are more favoured in protic solvents



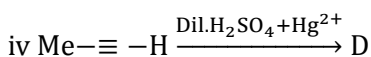
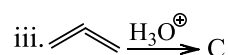
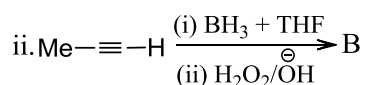
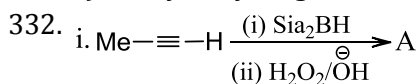


Which of the following statements is/are correct?

- a) Compound (E) is racemic-butan -2,3-diol
- b) Compound (E) is meso-butan -2,3-diol
- c) Compound (F) is racemic-butan -2,3-diol
- d) Compound (F) is meso-butan -2,3-diol

331. Which of the statements are correct?

- a) Alkenes are more reactive than alkynes towards electrophilic addition reaction
- b) Alkynes are more reactive than alkenes towards nucleophilic addition reaction
- c) Catalytic hydrogenation of alkynes is more reactive than alkenes
- d) Catalytic hydrogenation of alkenes is more reactive than alkynes



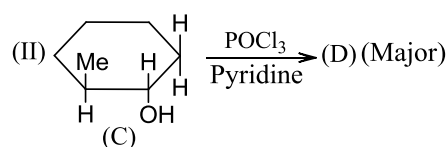
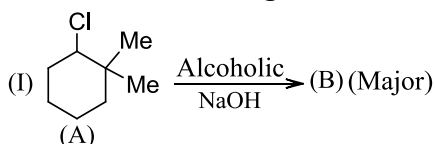
Which of the statements are correct?

- a) In all, acetone is the major product
- b) In all, propanal is the major product
- c) C and D are acetone, whereas A and B are propanal as the major product
- d) C and D are propanal, whereas A and B are acetone as the major product

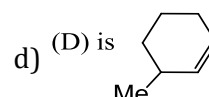
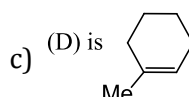
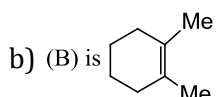
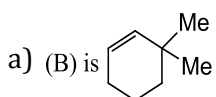
333. The reagent/s required for the conversion $R_1CH = CHR_2 \rightarrow R_1COOH + HOOCR_2$ is/are

- a) O_3 followed by treatment with H_2O
- b) Bayer's reagents
- c) Hot $KMnO_4/KOH$ followed by acidification
- d) Lemieux reagent

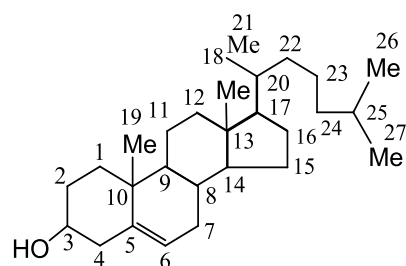
334. Consider the following reactions:



Which of the following statements are correct?



335. Structure of naturally occurring steroidal cholesterol is given:



Which of the following statements is/are correct?

- a) There are nine chiral centres in the cholesterol
- b) It is a pentacyclo compound
- c) There are two 4° C atoms in the compound
- d) There are six 3° C atoms in the compound

336. Which statement is/are correct about the conformer of *cis* and *trans* 1,1,3,5-tetramethyl cyclohexane?

- a) *cis* isomer is more stable than *trans* isomer
- b) *trans* isomer is more stable than *cis* isomer
- c) There are two 1,3-Me/H diaxial interactions in *cis* isomer
- d) There are two 1,3-Me/H and one 1,3-Me/Me diaxial interaction in *trans* isomer

Assertion - Reasoning Type

This section contains 0 questions numbered 337 to 336. Each question contains STATEMENT 1 (Assertion) and STATEMENT 2 (Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

- a) Statement 1 is True, Statement 2 is True; Statement 2 is correct explanation for Statement 1
- b) Statement 1 is True, Statement 2 is True; Statement 2 is **not** correct explanation for Statement 1
- c) Statement 1 is True, Statement 2 is False
- d) Statement 1 is False, Statement 2 is True

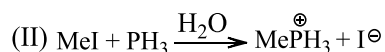
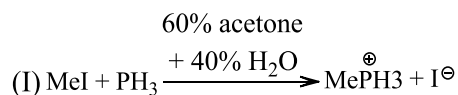
337

Statement 1: 2,3-dimethyl but 2 ene is more stable than but 2 ene.

Statement 2: Twelve hyper conjugation structures can be written for 2,3 dimethyl but 2 ene while but 2 ene has only six.

338

Statement 1:



S_N^2 reactivity of reaction (II) is greater than (I)

Statement 2: Increase in solvent polarity stabilizes the T.S., lowers E_{act} , and increases the rate

339

Statement 1: Cycloalkanes decolourise the purple colour of dilute and cold KMnO_4 or red colour of bromine in carbon tetrachloride

Statement 2: Cycloalkenes undergo the electrophilic addition reactions which are characteristic of alkenes

340

Statement 1: Walden inversion takes place in S_N^2 reaction

Statement 2: Half-life period of S_N^2 reaction is inversely proportional to the concentration of the substrate or nucleophilic or both

341

Statement 1: Acetylene is converted into formic acid with cold and alkaline KMnO_4

Statement 2: Acetylene is converted into formic acid with a rupture of triple bond at high temperature

342

Statement 1: The replacement of hydrogen atom by sulphonic acid group ($-\text{SO}_3\text{H}$) is known as sulphonation

Statement 2: Sulphonation follows free radical mechanism

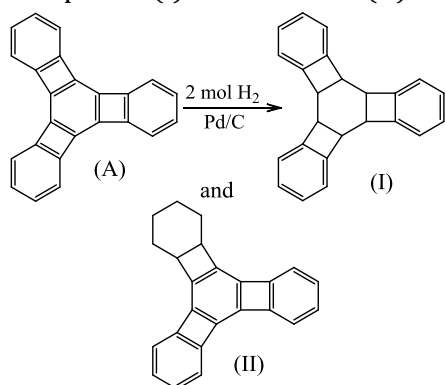
343

Statement 1: E1cB reaction is favoured by stabilization of carbanion and poor leaving group

Statement 2: The reaction is kinetically of the second order and unimolecular

344

Statement 1: Compound (I) is formed not (II)



Statement 2: Due to the reduction of central ring, 3 four-membered anti-aromatic rings become stable to form (I). In (II), due to the reduction of terminal ring, only one anti-aromatic ring can be stabilised

345

Statement 1: Chlorination of allylic hydrogen is difficult than vinylic hydrogen

Statement 2: Allyl radical is stabilized by resonance

346

Statement 1: The degree of unsaturation of Cyclohexane is 1

Statement 2: The number of degree of unsaturation in a hydrocarbon is given by $\frac{2n_1+2-n_2}{2}$; where n_1 = number of carbon atoms, n_2 = number of hydrogen atoms

347

Statement 1: Acetylene is more reactive than ethylene

Statement 2: The acetylene, there is greater strain and hence is reactive. The strain disappears when addition occurs

348

Statement 1: Acetylene forms acetylide but ethylene does not.

Statement 2: Acetylene is lighter than air.

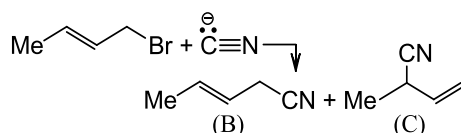
349

Statement 1: Phenol is more reactive than benzene towards electrophilic substitution reaction

Statement 2: In case of phenol, the intermediate carbocation is more resonance stabilised

350

Statement 1:



Statement 2: The product (B) results by SN^2 mechanism and product (C) results by $\text{SN}^{2'}$ mechanism

351

Statement 1: Addition of bromine to *trans*-2-butene yields *meso*-2,3-dibromobutane

Statement 2: Bromine addition is an electrophilic addition

352

Statement 1: Crown ether acts as phase transfer catalysis and increases SN^2 reactivity

Statement 2: They strongly complex cation and leave anion (nucleophile) with increased reactivity

353

Statement 1: RS^{\ominus} is a stronger nucleophile and a better leaving group than RO^{\ominus}

Statement 2: RS^{\ominus} is a weaker base than RO^{\ominus}

354

Statement 1: Rate of ethanolysis of 1° halide $(\text{Br}-\text{CH}_2-\text{O}-\text{CH}_2-\text{Me})$ by SN^1 mechanism is fast

Statement 2: Carbocation is stabilized by resonance

355

Statement 1: Oxidation of toluene with chromyl chloride to get benzaldehyde is carried out in presence of acetic anhydride.

Statement 2: Presence of CH_3 group in toluene activates benzene ring.

356

Statement 1: 1-Butene on reaction with HBr in the presence of a peroxide produces 1-bromobutane

Statement 2: It involves the formation of a primary radical

357

Statement 1: Dimethyl sulphide is commonly used for the reduction of an ozonide of an alkene to get the carbonyl compound

Statement 2: It reduces the ozonide giving water-soluble dimethyl sulphoxide and excess of it evaporates

358

Statement 1: 1° allylic halides are more reactive than 1° RX in SN^1 reaction

Statement 2: Allylic carbocation intermediate is stabilized by resonance:

359

Statement 1: Heavy metal ions Ag^+ or Pb^{2+} decrease SN^1 reactivity

Statement 2: They aid ionization of RX

360

Statement 1: The addition of Br_2 to 1-butane gives two optical isomers

Statement 2: The product contains one asymmetric carbon

361

Statement 1: Addition of bromine to *trans*-2-butene yields meso-2,3-dibromo butane

Statement 2: Bromine addition to an alkene is an electrophilic addition

Matrix-Match Type

This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

362.

Column-I	Column- II
(A) $\text{Me}-\text{CH}_2-\text{CH}_2-\text{Cl} + \text{LiAlD}_4 \rightarrow$	(p) Minor E
(B) $\text{Me}_3\text{C}-\text{Cl} + \text{HCOOH} \rightarrow$	(q) No reaction
(C) $\text{Me}_3\text{C}-\text{Cl} + \text{HCOOH} + \text{HCOO}^\ominus$ (Small amount)	(r) SN^2
(D) $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{Cl} + \text{I}^\ominus \rightarrow$	(s) SN^1
(E) $\text{Ph}-\text{CH}(\text{OH})-\text{Me} + \text{SOCl}_2 + \text{Pyridine} \rightarrow$	(t) Intramolecular SN^2

CODES :

	A	B	C	D	E
a)	r	s	p,s	t	q
b)	p,s	t	q	r	q
c)	s	t	q	r	q
d)	r	t	q	p,s	q
e)	t	p,s	s	r	q

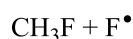
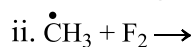
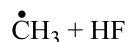
363.

Column-I

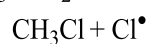
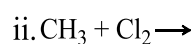
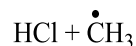
Column- II



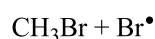
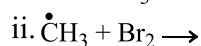
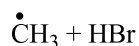
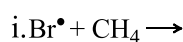
Chain propagation step:



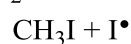
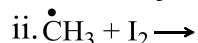
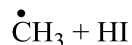
Chain propagation step:



Chain-propagation step:



Chain-propagation step:



CODES :

	A	B	C	D
a)	p	q	r	s
b)	p	s	r	q
c)	p	s	q	r
d)	q	s	p	r

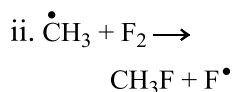
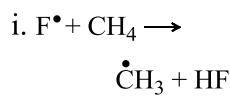
364.

Column-I

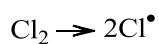
Column- II



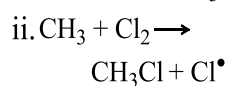
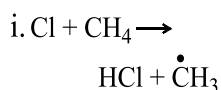
Chain propagation step:



(B) Chain-initiation step:



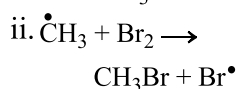
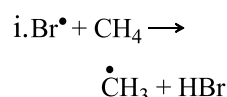
Chain propagation step:



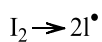
(C) Chain-initiation step:



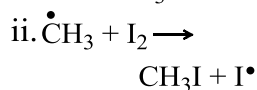
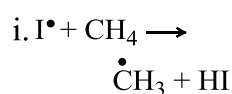
Chain-propagation step:



(D) Chain-initiation step:



Chain-propagation step:



(q)

242.7	15.9	-102.5
-------	------	--------

(r)

192.5	77.8	-31.4
-------	------	-------

(s)

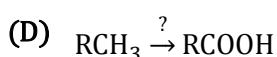
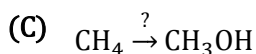
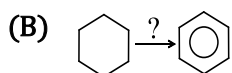
150.7	140.2	+46.0
-------	-------	-------

CODES :

	A	B	C	D
a)	p	q	r	s
b)	p	s	r	q
c)	p	s	q	r
d)	q	s	p	r

365.

Column-I



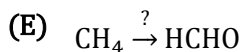
Column- II

(p) O_2 at 100 atm 470 K in the presence of Cu tube

(q) $O_2 + MoO_2$
(Molybdenum oxide)

(r) $Al_2O_3 + Cr_2O_3$ at 600° C

(s) S or Se or Pt at 600° C



(t) O_2 in the presence of catalyst $(\text{CH}_3\text{COO})_2\text{Mn}$
(Manganese acetate at 370 – 430 K)

CODES :

	A	B	C	D	E
a)	R,s	r,s	p	t	q
b)	r,s	p	t	r,s,c	q
c)	r,s,c	q	t	r,s	q
d)	r,s,c	q	p	r,s	q
e)	r,s	p	q	r,s,c	q

366.

Column-I

Column- II

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(A) With saturated alkyl groups, a Saytzeff product is always formed when non-bulky base (e.g., EtO^\ominus) is used</p> <p>(B) With saturated 2° RF, a Hofmann product is always formed with bulky or non-bulky base (e.g., EtO^\ominus or $\text{Me}_3\text{C} - \text{O}^\ominus$)</p> <p>(C) $\begin{array}{ccc} \text{COO}^\ominus & \xrightarrow{\text{HNO}_2} & \text{COOH} \\ & & \\ \text{H}-\text{C}-\text{NH}_2 & & \text{H}-\text{C}-\text{OH} \\ & & \\ \text{Me} & & \text{Me} \end{array}$
D(-) Alanine D(-) Lactic acid
(Retention)</p> <p>(D) With a given substrate, same pairs of these may be concurrent</p> | <p>(p) Anichimeric assistance by COO^\ominus ion.
(neighbouring group participation of COO^\ominus)</p> <p>(q) SN^2</p> <p>(r) E1</p> <p>(s) E2</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

CODES :

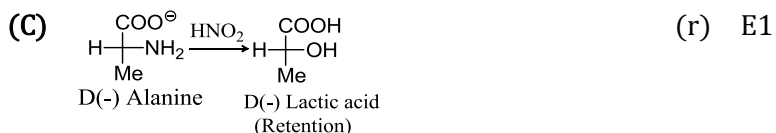
	A	B	C	D
a)	r	s	q,s	p
b)	p	q,s	s	r
c)	p	q,s	p	r
d)	r	s	p	q,s

367.

Column-I

Column- II

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(A) With saturated alkyl groups, a Saytzeff product is always formed when non-bulky base (e.g., EtO^\ominus) is used</p> <p>(B) With saturated 2° RF, a Hofmann product is always formed with bulky or non-bulky base (e.g., EtO^\ominus or $\text{Me}_3\text{C} - \text{O}^\ominus$)</p> | <p>(p) Anichimeric assistance by COO^\ominus ion.
(neighbouring group participation of COO^\ominus)</p> <p>(q) SN^2</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



(r) E1

(D) With a given substrate, same pairs of these may be concurrent (s) E2

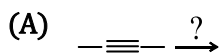
CODES :

	A	B	C	D
a)	r	s	q,s	p
b)	p	q,s	s	r
c)	p	q,s	p	r
d)	r	s	p	q,s

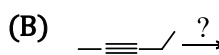
368.

Column-I

Column- II



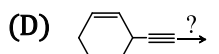
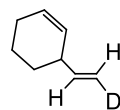
(p) $\text{H}_2 + \text{Ni}_2\text{B}$



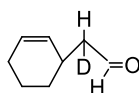
(q) $\text{Si}_2\text{BH} + \text{D}_2\text{O}_2/\text{OD}^\ominus$



(r) $\text{Cs} + \text{Liq. NH}_3 + \text{EtOH}$



(s) $\text{Si}_2\text{BH} + \text{CH}_3\text{COOD}$



(t) $\text{H}_2 + \text{Poisoned Pd}$

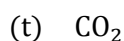
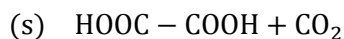
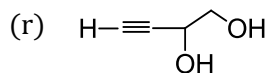
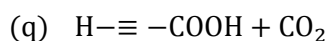
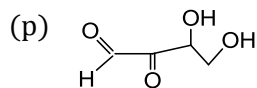
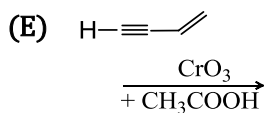
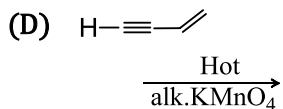
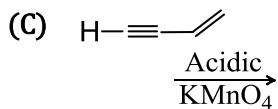
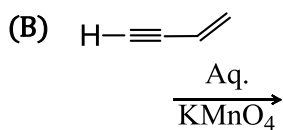
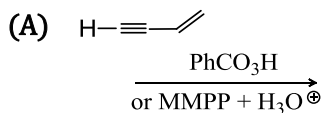
CODES :

	A	B	C	D
a)	r	p,t	s	q
b)	s	p	r	t
c)	s,t	q	t	r
d)	p	r	q	t

369.

Column-I

Column- II

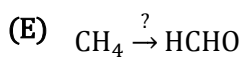
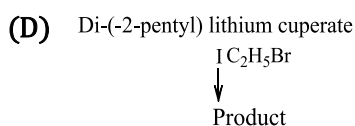
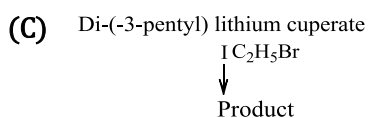
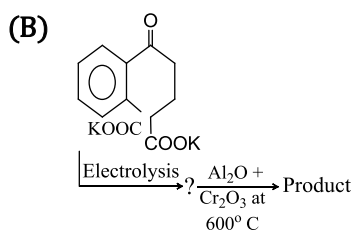
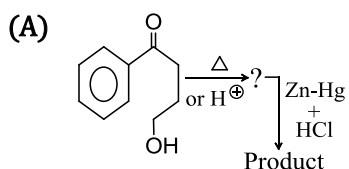


CODES :

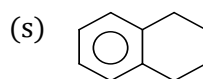
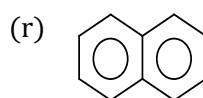
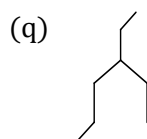
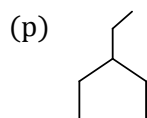
	A	B	C	D	E
a)	q	t	p	r	s
b)	s	r	q	p	s
c)	p	q	r	t	s
d)	r	p	t	s	s

370.

Column-I



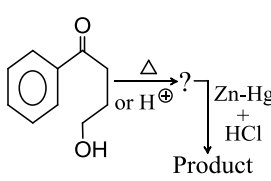
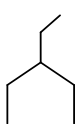
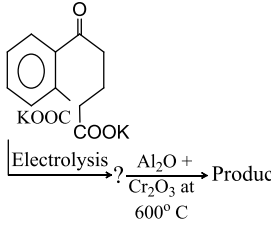
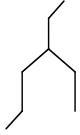
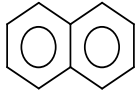
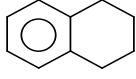

Column- II



CODES :

	A	B	C	D	E
a)	r	s	r	p	q
b)	r	s	p	r	q
c)	s	r	p	q	q
d)	s	p	r	r	q
e)	r	s	r	q	q

371.

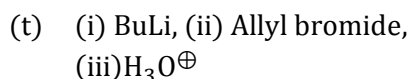
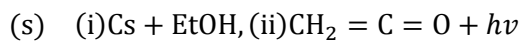
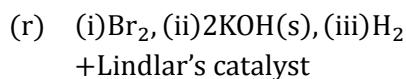
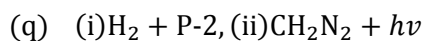
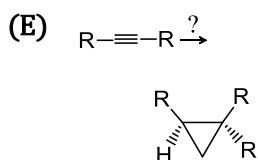
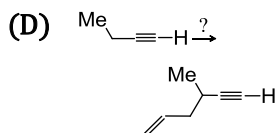
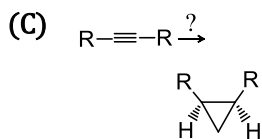
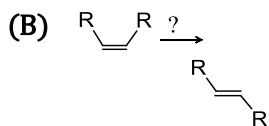
Column-I	Column-II
<p>(A) </p>	<p>(p) </p>
<p>(B) </p>	<p>(q) </p>
<p>(C) Di-(-3-pentyl) lithium cuprate ↓ I C₂H₅Br Product</p>	<p>(r) </p>
<p>(D) Di-(-2-pentyl) lithium cuprate ↓ I C₂H₃Br Product</p>	<p>(s) </p>
<p>(E) CH₄ $\xrightarrow{?}$ HCHO</p>	<p>(t) </p>

CODES :

	A	B	C	D	E
a)	r	s	r	p	q
b)	r	s	p	r	q
c)	s	r	p	q	q
d)	s	p	r	r	q
e)	r	s	r	q	q

372.

Column-I	Column-II
<p>(A) </p>	<p>(p) (i)Cl₂, (ii)2KOH(s), (iii)K + EtOH</p>



CODES:

	A	B	C	D	E
a)	r	p	q	t	s
b)	t	q	p	s	s
c)	p	r	s	q	s
d)	s	t	r	p	s

373.

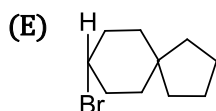
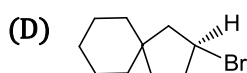
Column-I

Column- II

(A) 1,2-Dimethyl cyclopropane

(B) 1,2-Dimethyl cyclobutane

(C) 1,3-Dimethyl cyclobutane



(p) Two isomers, both *cis* and *trans*; optically inactive

(q) Pair of enantiomers

(r) Three isomers: *cis* meso and *trans* is optically active

(s) Does not show isomerism

(t)

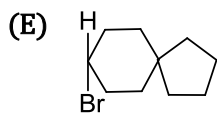
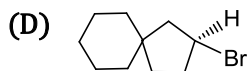
CODES:

	A	B	C	D	E
a)	r	r	p	q	s
b)	r	q	p	r	s
c)	p	s	p	r	s
d)	r	s	q	r	s

374.

Column-I

- (A) 1,2-Dimethyl cyclopropane
 (B) 1,2-Dimethyl cyclobutane
 (C) 1,3-Dimethyl cyclobutane

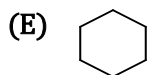
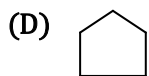
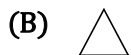
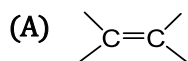


CODES :

	A	B	C	D	E
a)	r	r	p	q	s
b)	r	q	p	r	s
c)	p	s	p	r	s
d)	r	s	q	r	s

375.

Column-I



CODES :

	A	B	C	D	E
a)	r	q	t	p	s
b)	t	p	s	q	s
c)	t	s	p	r	s
d)	q	p	s	r	s
e)	t	s	p	r	s

Column- II

- (p) Two isomers, both *cis* and *trans*; optically inactive
 (q) Pair of enantiomers
 (r) Three isomers: *cis* meso and *trans* optically active
 (s) Does not show isomerism
 (t)

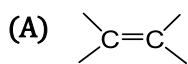
Column- II

- (p) 24°, 44'
 (q) 0°, 44'
 (r) -5°, 16'
 (s) 9°, 44'
 (t) 54°, 44'

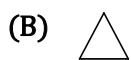
376.

Column-I

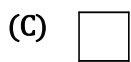
Column- II



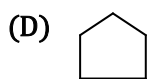
(p) 24°, 44'



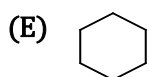
(q) 0°, 44'



(r) -5°, 16'



(s) 9°, 44'



(t) 54°, 44'

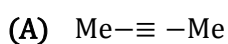
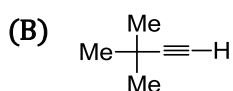
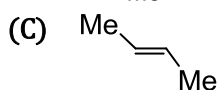
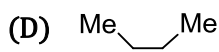
CODES :

	A	B	C	D	E
a)	r	q	t	p	s
b)	t	p	s	q	s
c)	t	s	p	r	s
d)	q	p	s	r	s
e)	t	s	p	r	s

377.

Column-I

Column- II

(p) $[\text{Ag}(\text{NH}_3)_2]^\oplus$ (q) NaNH_2 (r) $\text{D}_2 + \text{Ni}_2\text{B}$ 

(s) MMPP

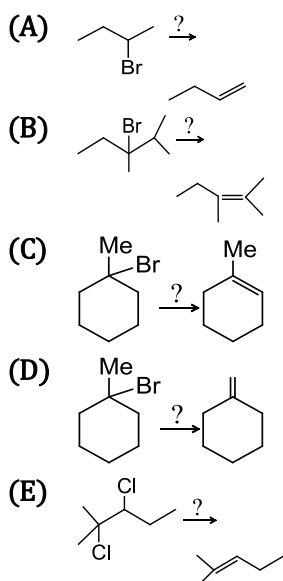
CODES :

	A	B	C	D
a)	Q,r	p,q,r	s	s
b)	s	q,r	p,q,r	q
c)	p,q,r	r,s	q,r	s
d)	q	q,r	r,s	p,q,r

378.

Column-I

Column- II



- (p) KI + Acetone
- (q) Zn + CH₃COOH
- (r) EtOK + EtOH
- (s) $\text{>ONa} + \text{>OH}$
- (t) NaOH + CH₃OH

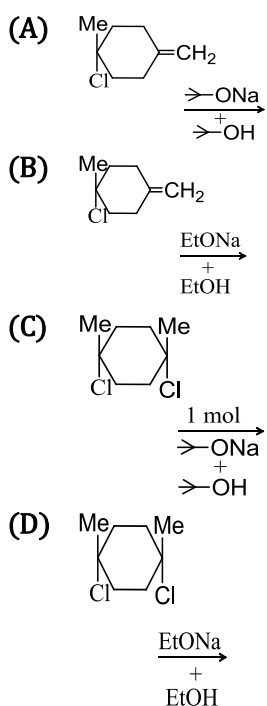
CODES :

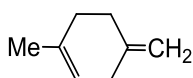
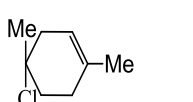
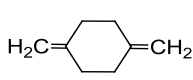
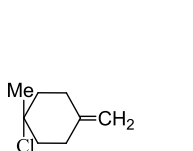
	A	B	C	D	E
a)	r	s	q	e	p
b)	s	r,t	r,t	s	p
c)	s,r	r,q	e	r	p
d)	p	r	q	t	p

379.

Column-I

Column- II



- (p) 
- (q) 
- (r) 
- (s) 

CODES :

	A	B	C	D
a)	r	t	q	s
b)	r	p	s	q
c)	p	q	r	t
d)	r	p	s	q

380.

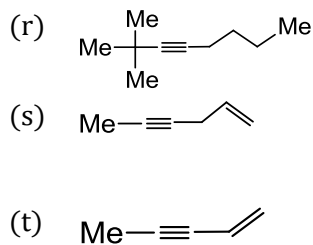
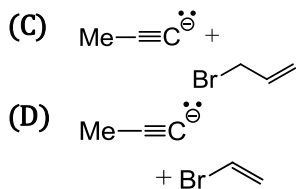
	Column-I	Column-II
(A)		(p)
(B)		(q)
(C)		(r)
(D)		(s)

CODES :

	A	B	C	D
a)	r	t	q	s
b)	r	p	s	q
c)	p	q	r	t
d)	r	p	s	q

381.

	Column-I	Column-II
(A)		(p)
(B)		(q) No reaction

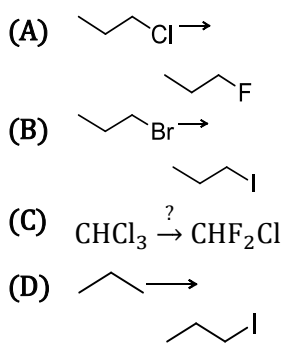


CODES :

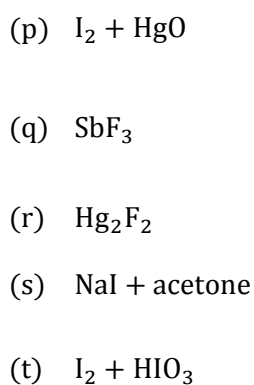
	A	B	C	D
a)	r	p	s	q
b)	p	q	r	s
c)	s	r	q	p
d)	q	s	p	r

382.

Column-I



Column- II

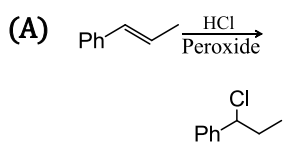


CODES :

	A	B	C	D
a)	Q,r	p,t	q,r	s
b)	q,r	s	q,r	p,t
c)	q,r	p,t	q,r	s
d)	p,t	q,r	q,r	s

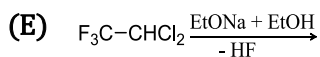
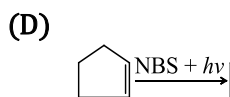
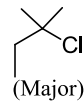
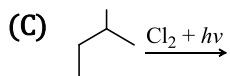
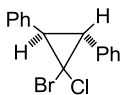
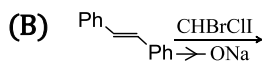
383.

Column-I



Column- II





(q) Free radical

(r) Carbanion

(s) Carbocation

(t)

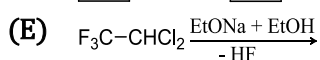
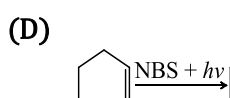
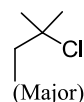
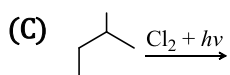
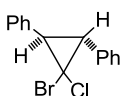
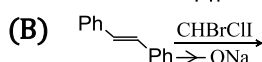
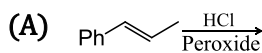
CODES :

	A	B	C	D	E
a)	p	q	r	s	t
b)	s	p	q	q	t
c)	t	s	r	q	t
d)	r	q	s	t	t

384.

Column-I

Column- II



(p) Carbene

(q) Free radical

(r) Carbanion

(s) Carbocation

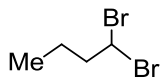
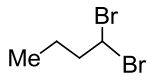
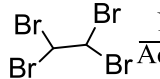
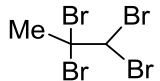
(t)

CODES :

A	B	C	D	E
---	---	---	---	---

- a) p q r s t
 b) s p q q t
 c) t s r q t
 d) r q s t t

385.

Column-I	Column-II
(A)  $\xrightarrow[\text{(2) H}_3\text{O}^+]{\text{(1) 3NaNH}_2}$	(p) But-1-yne
(B)  $\xrightarrow{\text{(1) 2KOH (s)}}$	(q) But-2-yne
(C) Bromoform + Ag $\xrightarrow{\Delta}$	(r) Ethyne
(D)  $\xrightarrow[\text{Acetone}]{\text{NaI}}$	(s) Propyne
(E)  $\xrightarrow{\text{Mg + EtOH}}$	(t)

CODES :

- | | A | B | C | D | E |
|----|---|---|---|---|---|
| a) | r | s | p | q | r |
| b) | p | q | r | r | r |
| c) | q | r | s | t | r |
| d) | s | p | q | r | r |

386.

Column-I	Column-II
(A) Chair form	(p) Four skew and two eclipsed positions
(B) Boat form	(q) Least stable form
(C) Half chair form	(r) Bond opposition strain
(D) Twist or skew boat form	(s) All (C – H) bonds on adjacent C are in skew position, i.e., six skew positions
	(t) Free from angle strain

CODES :

	A	B	C	D
a)	P,r,t	q,t	t	s,t
b)	s,t	p,r,t	q,t	t
c)	t	q,t	s,t	p,r,t
d)	q,t	t	p,r,t	s,t

387.

Column-I

- (A) Chair form
 (B) Boat form
 (C) Half chair form
 (D) Twist or skew boat form

Column- II

- (p) Four skew and two eclipsed positions
 (q) Least stable form
 (r) Bond opposition strain
 (s) All (C – H) bonds on adjacent C are in skew position, i.e., six skew positions
 (t) Free from angle strain

CODES :

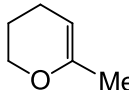



	A	B	C	D
a)	P,r,t	q,t	t	s,t
b)	s,t	p,r,t	q,t	t
c)	t	q,t	s,t	p,r,t
d)	q,t	t	p,r,t	s,t

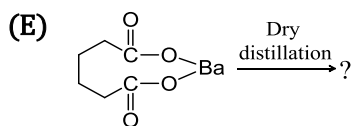
388.

Column-I

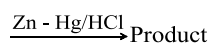
- (A) $\text{DEM} + \begin{array}{c} \text{Br} \\ | \\ \text{---} \\ | \\ \text{Br} \end{array} \xrightarrow[-2\text{EtOH}]{2\text{NaOEt}} ?$
 $\xrightarrow[\text{(ii) } \Delta, -\text{CO}_2]{\text{(i) H}_3\text{O}^{\oplus}}$ Product
 (iii) Soda lime
- (B) $\text{EAA} + \begin{array}{c} \text{Br} \\ | \\ \text{---} \\ | \\ \text{Br} \end{array} \xrightarrow[-2\text{EtOH}]{2\text{NaOEt}} ?$
 $\xrightarrow[\text{(ii) Soda lime}]{\text{(i) H}_3\text{O}^{\oplus}}$ Product
- (C) $\begin{array}{c} \text{Br} \\ | \\ \text{---} \\ | \\ \text{Br} \end{array} + 2\text{Na} \rightarrow \text{Product}$
- (D) $\text{Cyclopentanone} + \text{CH}_2\text{N}_2 \xrightarrow{h\nu} ?$
 $\xrightarrow[\text{OH}^-]{\text{NH}_2\text{NH}_2}$ Product

Column- II

- (p) 
- (q) 
- (r) 
- (s) 



(t)



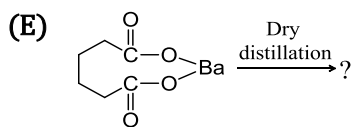
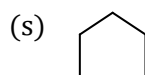
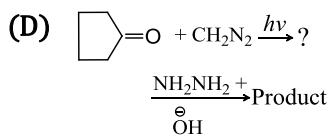
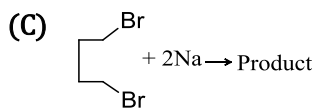
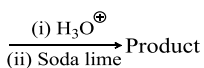
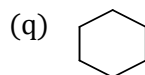
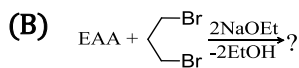
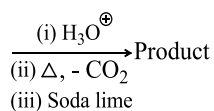
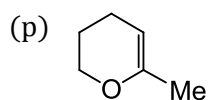
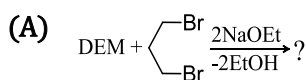
CODES :

	A	B	C	D	E
a)	s	p	r	r	q
b)	q	p	r	r	q
c)	r	s	p	r	q
d)	r	p	r	q	q
e)	q	s	r	r	q

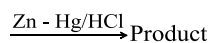
389.

Column-I

Column- II



(t)



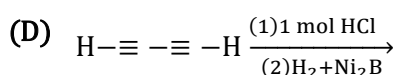
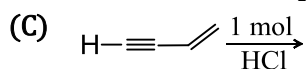
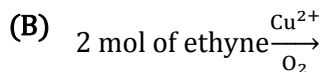
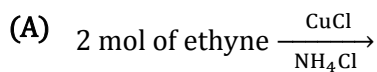
CODES :

	A	B	C	D	E
a)	s	p	r	r	q
b)	q	p	r	r	q
c)	r	s	p	r	q
d)	r	p	r	q	q

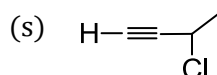
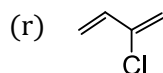
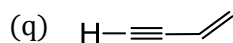
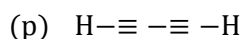
e) q s r r q

390.

Column-I



Column- II



CODES :

	A	B	C	D
a)	r	s	q	p
b)	p	q	s	r
c)	q	p	r	r
d)	s	r	p	q

391. Match the following lists

Column-I

(A) Benzene

(B) Ethylene

(C) Acetaldehyde

(D) Chloroform

Column- II

(1) Phosgene

(2) Silver mirror

(3) Mustard gas

(4) $(4n + 2)\pi$ electrons

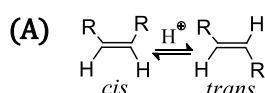
(5) Carbylamine

CODES :

	A	B	C	D
a)	4	3	2	1
b)	3	2	1	4
c)	2	4	5	3
d)	5	1	4	3

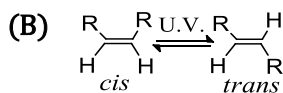
392. Interconversion of *cis*- and *trans*-alkenes takes place by three methods- acid catalyst, U.V. radiation, and heating with I_2 . Match the following

Column-I

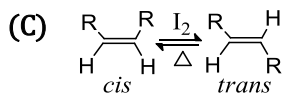


Column- II

(p) *cis*-Form predominates



(q) *trans*-Form predominates



(r) Both *cis*- and *trans*-forms predominate

(s) Rate- or kinetically controlled product is favoured

(t) Thermodynamically or equilibrium - controlled product is favoured

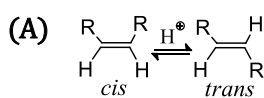
CODES :

	A	B	C	D
a)	Q,t	p,s	r	
b)	r	t	q	
c)	r	p	s	
d)	p	q	r	

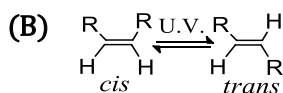
393. Interconversion of *cis*- and *trans*-alkenes takes place by three methods- acid catalyst, U.V. radiation, and heating with I₂. Match the following

Column-I

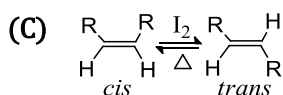
Column- II



(p) *cis*-Form predominates



(q) *trans*-Form predominates



(r) Both *cis*- and *trans*-forms predominate

(s) Rate- or kinetically controlled product is favoured

(t) Thermodynamically or equilibrium - controlled product is favoured

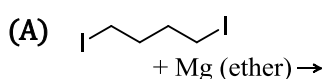
CODES :

	A	B	C	D
a)	Q,t	p,s	r	
b)	r	t	q	
c)	r	p	s	
d)	p	q	r	

394.

Column-I

Column- II



(p) S_N²

- (B) $\text{Me-CH}_2\text{-CH}_2\text{-Br} + \text{PMe}_3 \rightarrow$ (q) SN^1
- (C) CH_3Br does not react by which mechanism (r) E2
- (D) $\text{Me-CH(Cl)-Et} \xrightarrow[\text{Acetone}]{\text{I}^\ominus}$ (s) Intramolecular SN^2
- (E) $\text{Me}_3\text{C-Cl} \xrightarrow{\text{CN}^\ominus}$ (t) E1

CODES :

	A	B	C	D	E
a)	r	s	p	q,r,t	p
b)	s	p	q,r,t	p	p
c)	s	q,r,t	p	r	p
d)	r	s	q,r,t	p	p
e)	s	q,r,t	p	r	p

395.

Column-I

Column- II

- (A) $\text{I-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-I} + \text{Mg (ether)} \rightarrow$ (p) SN^2
- (B) $\text{Me-CH}_2\text{-CH}_2\text{-Br} + \text{PMe}_3 \rightarrow$ (q) SN^1
- (C) CH_3Br does not react by which mechanism (r) E2
- (D) $\text{Me-CH(Cl)-Et} \xrightarrow[\text{Acetone}]{\text{I}^\ominus}$ (s) Intramolecular SN^2
- (E) $\text{Me}_3\text{C-Cl} \xrightarrow{\text{CN}^\ominus}$ (t) E1

CODES :

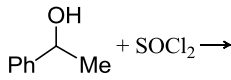
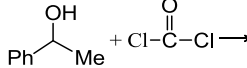
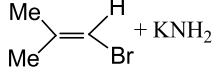
	A	B	C	D	E
a)	r	s	p	q,r,t	p
b)	s	p	q,r,t	p	p
c)	s	q,r,t	p	r	p
d)	r	s	q,r,t	p	p
e)	s	q,r,t	p	r	p

396.

Column-I

Column- II

- (A) $2^\circ \text{RBr} + \text{HCOOH} + \text{Solvent with high dielectric constant}$ (p) E1

- (B) $t\text{-BuCl} + \text{MeCOOH}$
 $+ \text{MeCOO}^{\ominus}\text{K}^{\oplus}$ (Small) (q) E2
- (C)  (r) SN¹
- (D)  (s) SN²
- (E)  (t) SNⁱ

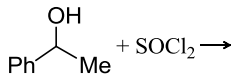
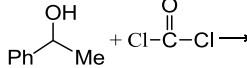
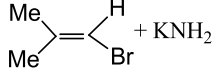
CODES :

	A	B	C	D	E
a)	r	p,r	t	s	t
b)	p,r	t	t	r	t
c)	r	p,r	t	t	t
d)	r	s	t	p,r	t
e)	p,r	s	t	r	t

397.

Column-I

Column- II

- (A) 2° RBr + HCOOH + Solvent with high dielectric constant (p) E1
- (B) $t\text{-BuCl} + \text{MeCOOH}$
 $+ \text{MeCOO}^{\ominus}\text{K}^{\oplus}$ (Small) (q) E2
- (C)  (r) SN¹
- (D)  (s) SN²
- (E)  (t) SNⁱ

CODES :

	A	B	C	D	E
a)	r	p,r	t	s	t
b)	p,r	t	t	r	t
c)	r	p,r	t	t	t
d)	r	s	t	p,r	t
e)	p,r	s	t	r	t

398.

Column-I

Column- II

- (A) *cis*-1,2-Dimethyl cyclohexane (p) (1e, 2e)

(B) *trans*-1,2-Dimethyl cyclohexane

(C) *cis*-Cyclohexane-1,3-diol

(D) *cis*-Cyclohexane-1,4-diol

(q) Boat form (both OH at axial position)

(r) (1a, 2e) or (1e, 2a)

(s) Chair form (both OH at axial position)

CODES :

	A	B	C	D
a)	r	p	q	s
b)	p	q	s	r
c)	r	p	s	q
d)	p	s	q	r

399.

Column-I

Column- II

(A) *cis*-1,2-Dimethyl cyclohexane

(B) *trans*-1,2-Dimethyl cyclohexane

(C) *cis*-Cyclohexane-1,3-diol

(D) *cis*-Cyclohexane-1,4-diol

(p) (1e, 2e)

(q) Boat form (both OH at axial position)

(r) (1a, 2e) or (1e, 2a)

(s) Chair form (both OH at axial position)

CODES :

	A	B	C	D
a)	r	p	q	s
b)	p	q	s	r
c)	r	p	s	q
d)	p	s	q	r

400.

Column-I

Column- II

(A) Pent-2-yne $\xrightarrow[\text{+Hg}^{2+}]{\text{Dil. H}_2\text{SO}_4}$

(B) Pent-2-yne
 $\xrightarrow[\text{(2) H}_2\text{O}_2 + \text{OH}^-]{\text{(1) BH}_3 + \text{THF}}$

(C) Pent-2-yne
 $\xrightarrow[\text{(2) H}_2\text{O}_2 + \text{OH}^-]{\text{(1) Sia}_2\text{BH}}$

(D) But-2-yne $\xrightarrow[\text{(2) Br}_2]{\text{(1) H}_2 + \text{Ni}_2\text{B}}$

(E) But-2-yne $\xrightarrow[\text{(2) Br}_2]{\text{(1) Na + EtOH}}$

(p) *rac*-2,3-Dibromo butane

(q) *meso*-2,3-Dibromo butane

(r) Pentan-2-one

(s) Pentan-3-one

(t)

CODES :

	A	B	C	D	E
a)	r	p	r,s	r	r,s
b)	r,s	r,s	r	p	r,s
c)	p,q	p	q	r,s	r,s
d)	q	p,q	r,s	p	r,s

401.

	Column-I	Column- II
(A)	Gasoline	(p) $C_{10} - C_{13}$
(B)	Kerosene oil	(q) C_{30} onwards
(C)	Diesel oil	(r) $C_{18} - C_{30}$
(D)	Paraffin wax	(s) $C_7 - C_9$
(E)	Bitumen	(t) $C_{13} - C_{18}$

CODES :

	A	B	C	D	E
a)	q	p	t	r	s
b)	q	s	t	r	s
c)	r	p	q	s	s
d)	s	p	t	r	s
e)	p	q	s	r	s

402.

	Column-I	Column- II
(A)	Gasoline	(p) $C_{10} - C_{13}$
(B)	Kerosene oil	(q) C_{30} onwards
(C)	Diesel oil	(r) $C_{18} - C_{30}$
(D)	Paraffin wax	(s) $C_7 - C_9$
(E)	Bitumen	(t) $C_{13} - C_{18}$

CODES :

	A	B	C	D	E
a)	q	p	t	r	s

- b) q s t r s
- c) r p q s s
- d) s p t r s
- e) p q s r s

Linked Comprehension Type

This section contain(s) 36 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

Paragraph for Question Nos. 403 to -403

In the benzene ring in an aromatic compound is attacked, we sometimes say that this is an attack on the nucleus, as opposed to the side chain. This is an unfortunate use of the word because it does not mean that benzene rings are attacked by nucleophiles. Indeed, the reverse is true. The typical reagent to bring about substitution in a benzene ring is an electrophile. Due to decolalisation of electrons, there are several differences between the reactions of the benzene ring and other unsaturated compounds

403. The class of reactions given by benzene is

- | | |
|-------------------------------|------------------------------|
| a) Electrophilic substitution | b) Nucleophilic substitution |
| c) Nucleophilic addition | d) Electrophilic addition |

Paragraph for Question Nos. 404 to - 404

Dehydration of 1-butanol and 2-butanol with $\text{concH}_2\text{SO}_4$ gives the same mixture of 1-butene and 2-butene in which the more highly substituted alkene, *ie*, 2-butene predominates (Saytzeff rule). The formation of this mixture from 1-butanol can be explained by the rearrangement of the initially formed less stable 1° carbocation to the more stable 2° carbocation, which then loses a proton in accordance with Saytzeff rule to afford a mixture of 2-butene and 1-butene

404. In the acid catalyst dehydration of alcohols to alkenes, the reactive intermediate involved is a

- | | | | |
|------------|-----------------|----------------|--------------|
| a) Carbene | b) Free radical | c) Carbocation | d) Carbanion |
|------------|-----------------|----------------|--------------|

Paragraph for Question Nos. 405 to - 405

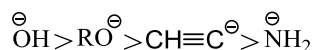
The leaving group is that functional group which is ejected with \bar{e}' s of the σ -bond in a reaction. Better the leaving group, faster is the reaction. The relative leaving ability of the leaving group X in (R – X) increased by:

- The polarisability of (R – X) bond
- The stability of X^\ominus
- The degree of stabilization through salvation of X
- The strength of (R – X) bond

The leaving group tendency is also called fugacity

405. Which statement is wrong?

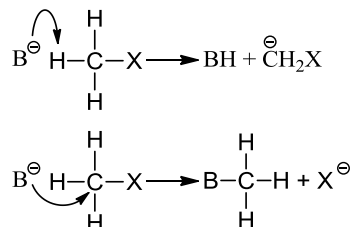
- In polar aprotic solvents such as DMSO, DMF, and DMA, the fugacity order is $\text{I}^\ominus > \text{Br}^\ominus > \text{Cl}^\ominus > \text{F}^\ominus$
- Strong bases are good leaving groups
- The leaving group order of the following is:



d) Charged species are good leaving groups than neutral species

Paragraph for Question Nos. 406 to - 406

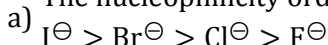
The rate of S_N^2 reaction depends on the effectiveness of the nucleophile in ejecting the leaving group. Nucleophilicity is the affinity for C atom, while basicity is the affinity for proton



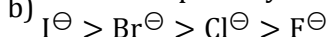
In both cases, a new bond is formed. If a new bond is formed between the anion and proton, the species acts as a base. If a new bond is formed between the anion and C atom, the species acts as nucleophile

406. Which of the following statements is wrong?

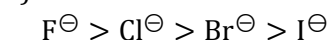
The nucleophilicity order in non-polar solvents (e.g., CCl_4 , CS_2) of the following is:



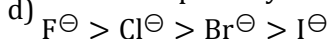
The nucleophilicity order in polar protic solvents (e.g., H_2O) of the following is:



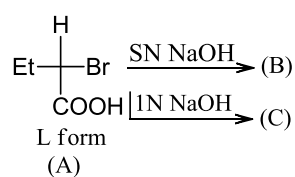
The nucleophilicity order in weakly polar protic solvents (e.g., nitro benzene, acetone) of the following is:



The nucleophilicity order in polar aprotic solvents (e.g., DMSO, DMF) of the following is:



Paragraph for Question Nos. 407 to - 407



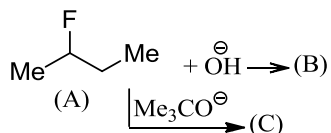
407. Which statement is wrong in the formation of (B) from (A)

- It proceeds by S_N^2 mechanism
- The configuration of product (B) is D form
- It proceeds by S_N^1 mechanism
- The Walden inversion occurs

Paragraph for Question Nos. 408 to - 408

In elimination reaction, the major product is either Saytzeff (more-substituted alkene) or Hofmann product (less-substituted alkene) depending on the nature of the substrate and the nature of the base

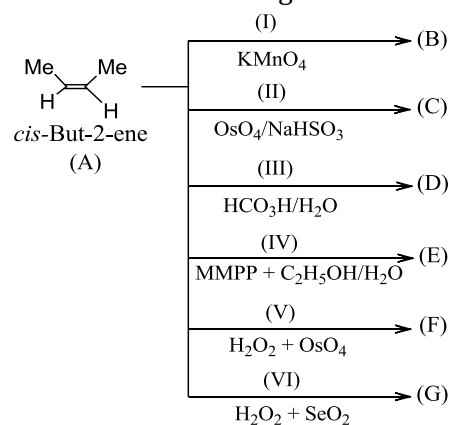
408. Which statement is correct about the reactions?



- a) Both products (B) and (C) are Hofmann product ($\text{CH}_2=\text{C}(\text{Me})\text{Me}$)
 Both products (B) and (C) are Saytzeff product
- b) ($\text{Me}-\text{CH}=\text{C}(\text{Me})\text{Me}$)
- c) Product (B) is Hofmann and (C) is Saytzeff product
- d) Product (B) is Saytzeff and (C) is Hofmann product

Paragraph for Question Nos. 409 to - 409

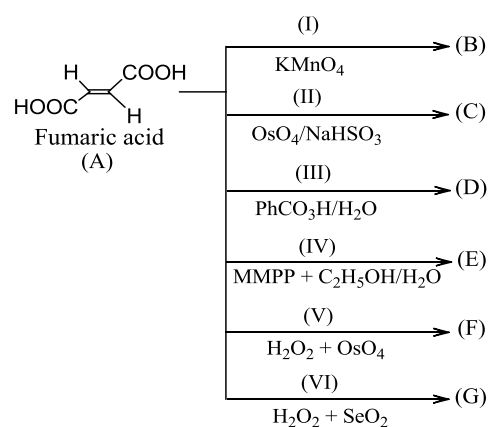
Consider the following reactions:



409. Which of the following are stereospecific reactions?

- a) (I), (II) b) (I), (II), (III) c) (III), (IV), (V) d) All

Paragraph for Question Nos. 410 to - 410

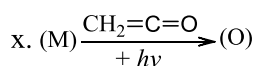
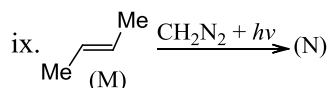
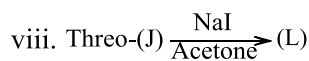
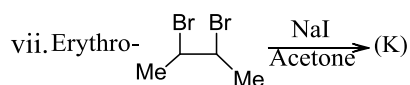
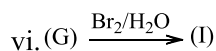
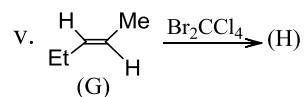
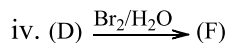
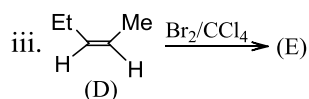
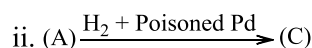
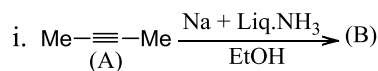


410. Which of the following are stereospecific reactions?

- a) (I), (II) b) (I), (II), (III) c) (III), (IV), (V) d) All

Paragraph for Question Nos. 411 to - 412

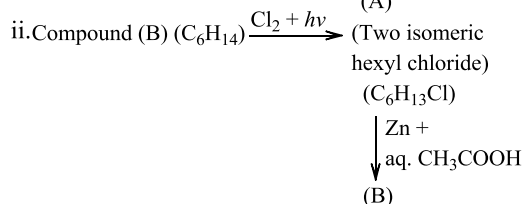
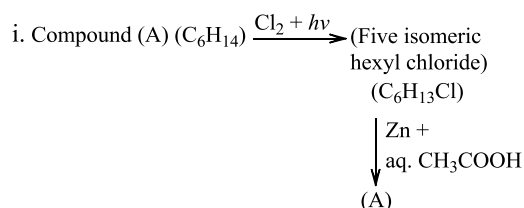
Consider the following reactions:



411. Which statement is wrong about the reactions (i) and (ii)?

- The product (B) is *trans*-but-2-ene and (C) is *cis*-but-2-ene
- The product (B) is *cis*-but-2-ene (C) is *trans*-but-2-ene
- The formation of (B) and (C) takes place by anti- and *syn*-additions of H₂, respectively
- In the formation of (B), one of the intermediate species is radical anion

Paragraph for Question Nos. 412 to - 413



412. Compound (A) is:

- 2,3-Dimethylbutane
- 2-Methylpentane
- 2,2-Dimethylbutane
- 3-Methylpentane

Paragraph for Question Nos. 413 to - 414

A schematic analysis of the reaction of one enantiomer with racemic mixture is shown below:



The (+)-form of chiral molecules + A racemic mixture of other molecules with 50%(*d*) and 50%(*l*)

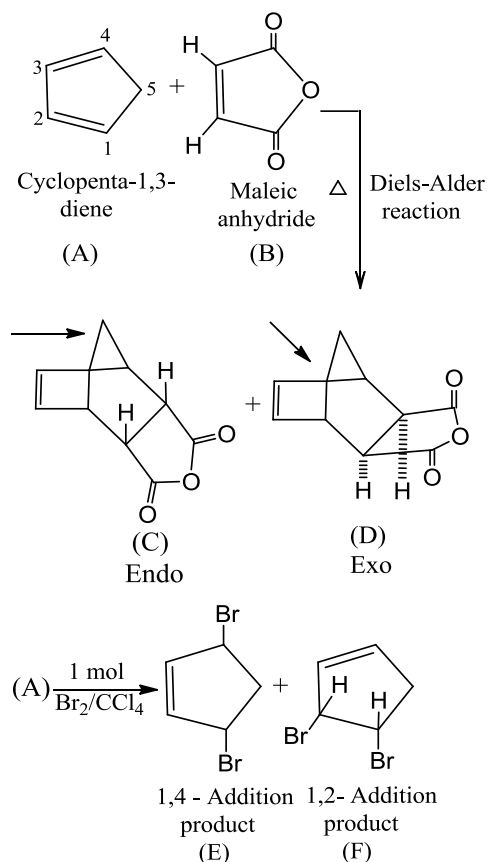
The products (*d-d*) and (*d-l*) are clearly neither identical nor enantiomers (non-superimposable mirror images) as the mirror image of (*d-d*) is (*l-l*) not (*d-l*). They are diastereomers, 'stereoisomers that are not mirror images'

The formation of diastereomers allows the separation of enantiomers (called resolution) which is not easy as enantiomers have identical physical properties. One general procedure for separating enantiomers is to allow them to react with naturally occurring chiral molecule to form a pair of diastereomers. These can be separated easily as they have different physical properties. If the original chemical reaction can be reversed, the enantiomers can be isolated

413. Which of the following is an example of diastereomers?

- Two gauche forms of butane
- Products of bromination of *cis*-2-butene in the presence of CCl_4
- Gauche and anti forms of butane
- Both (a) and (c)

Paragraph for Question Nos. 414 to - 415



414. Which is the wrong statement in the Diels- Alder reaction (A) with (B)?

- The product (C) is endo stereoisomer, formed in major amount at low temperature, and is a kinetically controlled product
- The products (D) is endo stereoisomer, formed in major amount at high temperature, and is a

thermodynamically controlled product

c) Diels-Alder reaction is a reversible reaction

d) Diels-Alder reaction is highly stereospecific with syn-addition, and the configuration of dienophile is retained

Paragraph for Question Nos. 415 to - 416

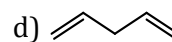
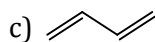
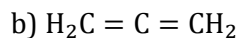
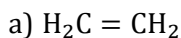
Stabilities of alkanes can be compared by converting these compounds to a common product and comparing the amount of the heat given off. One possibility would be to measure the heat of combustion from converting alkenes to CO_2 and H_2O . The heats of combustion are of large values and measuring small difference in these large numbers is difficult. Alkene of the lowest heat of combustion among isomeric alkenes is of the lowest energy and is most stable

The stability of alkenes is often compared by measuring the heat of hydrogenation (heat given off, $\Delta H^\circ_{\text{h}}$) during catalytic hydrogenation. The heat of hydrogenation is in small number, which provides more accurate energy difference

For a compound containing more than one double bond, $\Delta H^\circ_{\text{h}}$ is the sum of heat of hydrogenation of individual double bonds. For non-conjugated dienes, this additive relationship is found to hold. For conjugated dienes, however, the measured value is slightly lower than expected. Cumulated dienes, which are even less stable than non-conjugated dienes.

The more stable is the alkene, lower is the heat of combustion and heat of hydrogenation. More highly substituted double bonds are usually more stable. In case of cycloalkanes, compounds having higher angle strain are less stable

415. In which of the following is, $\Delta H^\circ_{\text{h}}$ the maximum?



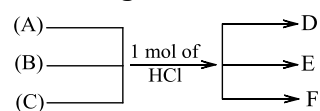
Paragraph for Question Nos. 416 to - 417

i. (A), a compound with lowest number of C atoms, is unsaturated hydrocarbon and is optically active

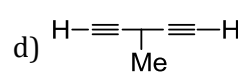
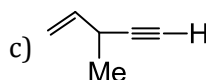
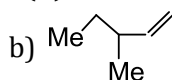
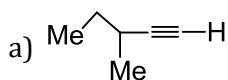
ii. (B), a compound with lowest number of C atoms, is unsaturated hydrocarbon and shows diastereomerism

iii. (C), a compound with lowest number of C atoms and unsaturated hydrocarbon, shows both optical and geometrical isomerism

Following is the reaction sequence of A, B, and C:

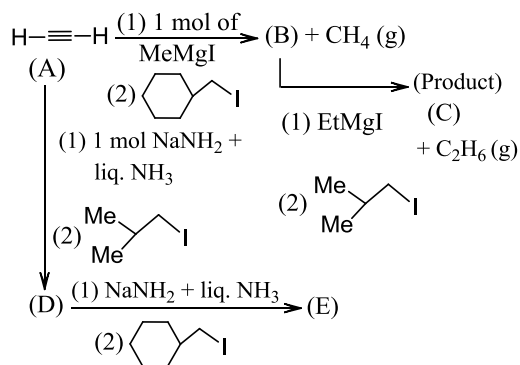


416. The structure of compound (A) is:

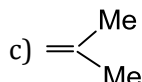
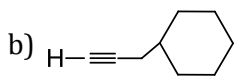
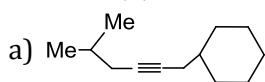


Paragraph for Question Nos. 417 to - 418

In the following sequence of reactions, products (B) to (E) are formed:



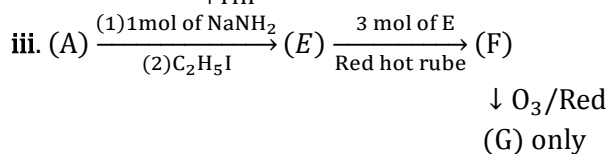
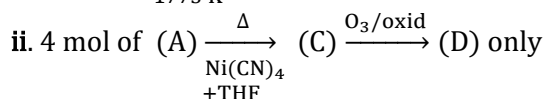
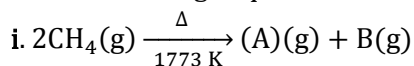
417. Product (C) is:



d) Both (b) and (c)

Paragraph for Question Nos. 418 to - 419

In the following sequence of reactions, the products (A) to (G) are formed:



418. Compounds (A) and (B), respectively, are:

a) Ethane and O₂

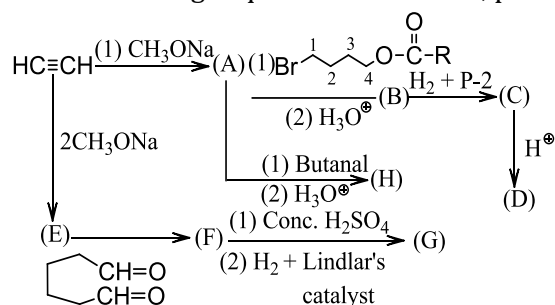
b) Ethene and H₂

c) Ethyne and O₂

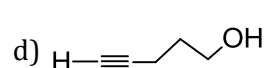
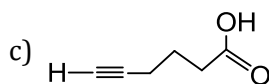
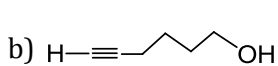
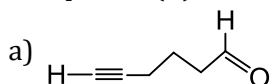
d) Ethyne and H₂

Paragraph for Question Nos. 419 to - 420

In the following sequence of reactions, products (A) to (H) are formed:

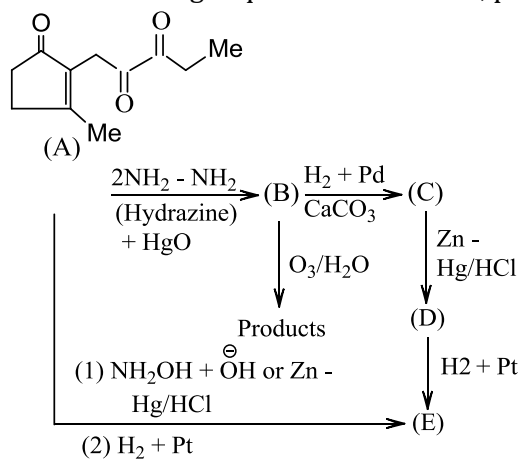


419. Compound (B) is:

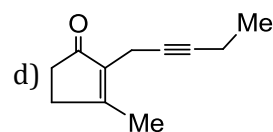
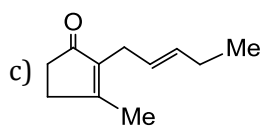
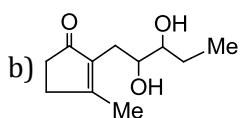
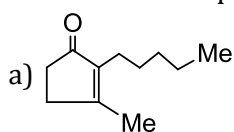


Paragraph for Question Nos. 420 to - 421

In the following sequence of reactions, products A to D are formed:



420. The structure of product (B) is:



13.HYDROCARBONS

: ANSWER KEY :

1)	b	2)	a	3)	d	4)	b	189)	b	190)	b	191)	c	192)	d
5)	c	6)	a	7)	c	8)	c	193)	d	194)	a	195)	c	196)	a
9)	d	10)	c	11)	a	12)	d	197)	b	198)	d	199)	b	200)	b
13)	c	14)	d	15)	c	16)	d	201)	b	202)	c	203)	b	204)	a
17)	c	18)	a	19)	a	20)	a	205)	a	206)	d	207)	b	208)	a
21)	c	22)	b	23)	a	24)	c	209)	a	210)	a	211)	a	212)	a
25)	b	26)	a	27)	b	28)	c	213)	d	214)	a	215)	a	216)	d
29)	c	30)	a	31)	b	32)	c	217)	a	218)	d	219)	c	1)	
33)	c	34)	c	35)	b	36)	b		a,c,d	2)	a,b,c	3)	b,d	4)	
37)	d	38)	d	39)	b	40)	b		a,b,c						
41)	d	42)	a	43)	b	44)	b	5)	d	6)	a,b	7)	a,b	8)	
45)	d	46)	d	47)	c	48)	a		a,c,d						
49)	d	50)	c	51)	b	52)	a	9)	a,b,c	10)	a,b,c	11)	c	12)	d
53)	a	54)	c	55)	c	56)	c	13)	a,c	14)	a,b,c	15)	c,d	16)	
57)	a	58)	a	59)	a	60)	d		b,c						
61)	b	62)	d	63)	d	64)	c	17)	b,d	18)	a,b,c	19)	b,c,d	20)	
65)	d	66)	b	67)	a	68)	a		a,b,d						
69)	d	70)	c	71)	c	72)	a	21)	b,c,d	22)	a,b,c	23)	a,b,c	24)	
73)	a	74)	c	75)	d	76)	a		a,b,c,d						
77)	a	78)	b	79)	b	80)	d	25)	a,b,c,d	26)	a,c	27)	b,d	28)	
81)	b	82)	b	83)	a	84)	b		a,d						
85)	c	86)	c	87)	c	88)	b	29)	a,b,d	30)	a,c,d	31)	a,b	32)	
89)	b	90)	d	91)	a	92)	b		a,b,c,d						
93)	c	94)	a	95)	b	96)	b	33)	b,d	34)	a,b,d	35)	a,b,c,d	36)	
97)	b	98)	c	99)	d	100)	a		a,d						
101)	d	102)	c	103)	b	104)	b	37)	b,d	38)	a,b	39)	a,b,d	40)	
105)	c	106)	b	107)	d	108)	c		a,c						
109)	b	110)	a	111)	c	112)	a	41)	a,b,d	42)	b,c,d	43)	a,b,d	44)	d
113)	b	114)	a	115)	c	116)	b	45)	a,d	46)	d	47)	a,b,c,d	48)	
117)	c	118)	a	119)	c	120)	d		a,c,d						
121)	c	122)	b	123)	a	124)	b	49)	a,b,c	50)	a,b,c,d	51)	a,b,c,d	52)	
125)	a	126)	c	127)	c	128)	a		a,c						
129)	a	130)	c	131)	d	132)	c	53)	a,c,d	54)	a,c	55)	a,b,c,d	56)	
133)	b	134)	c	135)	b	136)	d		a,b,c,d						
137)	c	138)	d	139)	c	140)	c	57)	a,c	58)	d	59)	a,b,c	60)	
141)	c	142)	c	143)	a	144)	d		a,c,d						
145)	c	146)	b	147)	c	148)	b	61)	a,c	62)	a,b,c	63)	b,d	64)	
149)	a	150)	d	151)	a	152)	a		c,d						
153)	c	154)	a	155)	c	156)	b	65)	a,b,c	66)	b,c	67)	a,b,c	68)	b
157)	c	158)	b	159)	a	160)	a	69)	a,b,c	70)	c	71)	a,b,c	72)	b
161)	c	162)	c	163)	d	164)	c	73)	a,b,c	74)	a,b,d	75)	a,d	76)	
165)	a	166)	a	167)	a	168)	b		a,c,d						
169)	d	170)	a	171)	d	172)	a	77)	a,d	78)	a,b	79)	a,c	80)	
173)	a	174)	a	175)	b	176)	b		a,b,c,d						
177)	a	178)	a	179)	a	180)	b	81)	a,c	82)	a,c,d	83)	a,c,d	84)	
181)	a	182)	c	183)	b	184)	b		c,d						
185)	b	186)	d	187)	a	188)	a	85)	a,c,d	86)	a,d	87)	b,c	88)	d

89)	a,b,c	90)	b,c	91)	c,d	92)	
	a,c						
93)	a,b,c	94)	a,b,c	95)	d	96)	d
97)	a,c	98)	b,c	99)	a,b,c,d	100)	
	a,c						
101)	b, c	102)	a,b,c,d	103)	a,c,d	104)	
	a,b,c,d						
105)	a,c	106)	a,b	107)	b,c,d	108)	
	a,c,d						
109)	a,c	110)	a,b,c	111)	a,d	112)	
	a,b,c						
113)	c	114)	a,c,d	115)	b,d	116)	
	a,c,d						
117)	a,c,d	1)	a	2)	a	3)	a
	4)	b					
5)	d	6)	b	7)	b	8)	a
9)	d	10)	b	11)	a	12)	b
13)	a	14)	a	15)	b	16)	a
17)	a	18)	a	19)	b	20)	c
21)	a	22)	a	23)	d	24)	a
25)	b	1)	a	2)	a	3)	a
	4)	a					
5)	d	6)	d	7)	a	8)	d
9)	c	10)	c	11)	a	12)	a
13)	a	14)	b	15)	b	16)	a
17)	b	18)	d	19)	d	20)	a
21)	b	22)	b	23)	b	24)	b
25)	b	26)	b	27)	d	28)	d
29)	c	30)	a	31)	a	32)	a
33)	b	34)	b	35)	c	36)	c
37)	c	38)	c	39)	b	40)	d
41)	d	1)	a	2)	c	3)	b
	4)	c					
5)	c	6)	a	7)	d	8)	d
9)	b	10)	b	11)	c	12)	
	a,b						
13)	b	14)	c	15)	d	16)	d
17)	b	18)	d				

: HINTS AND SOLUTIONS :

1 (b)
As alkanes and cycloalkanes are non-polar molecules and are insoluble in H₂O, they are also denser than H₂O and that is why they can float on water

2 (a)
The boiling point order is
alkynes > alkenes > straight-chain hydrocarbon > branched-chain hydrocarbon > cycloalkane (with the same number of C atom)
So, the ANSWER is (a)

The melting point order is : alkynes > *trans*-alkene > *cis*-alkene > cycloalkane > branched-chain hydrocarbon > straight-chain hydrocarbon

3 (d)
Meso compound + anti-elimination of Br₂ → *trans*-alkene

4 (b)
Cycloalkanes are more acidic than the corresponding alkanes

5 (c)
The melting point of even number of C atoms is greater than the next lower and next higher C atom (due to the alternation effect)
So, C₁₀ > C₈ > C₉ > C₇

6 (a)
Alkaline permanganate solution is known as Baeyer's reagent

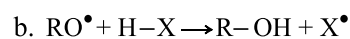
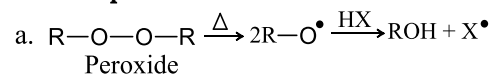
7 (c)
cis-Compound (with two different groups) + Syn-hydroxylation (cold alk. KMnO₄) or anti-hydroxylation (mCPBA) → Product is always racemic

9 (d)
The statement is self-explanatory

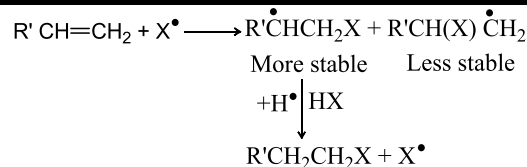
10 (c)
ArSNi is favoured by EWG. EW power of -NO₂ > -SO₃H > -C≡N > -CHO

13 (c)
In the presence of peroxide, HCl and HI react with alkene as follows:

First step:

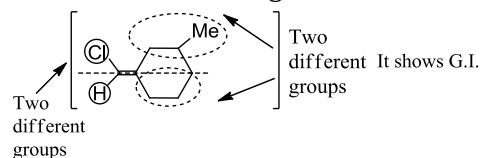


Second step:



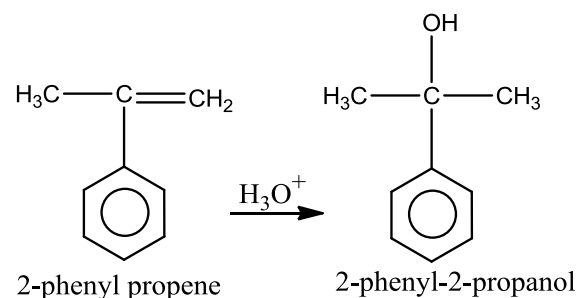
For HCl, step I (b) is endothermic and step II is exothermic, while for HI, step I (b) is exothermic and step II is endothermic. Hence, in each case, one of the steps is exothermic, due to this reason HCl and HI do not give anti-Markovnikov's addition to alkenes

14 (d)
Allenes do not show geometrical isomers



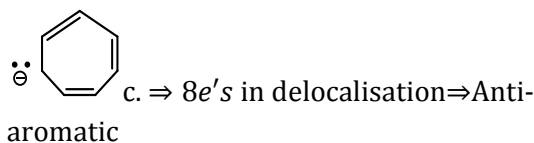
15 (c)
Birch reduction converts (C≡C) to (C=C) in anti addition of H₂. So the stereochemistry around both the double bonds should be *trans* and the answer is (c)

18 (a)
Acidic hydration of 2-phenyl propene follows electrophilic reaction mechanism forming an intermediate 3° carbocation (more stable), thereby forming 2-phenyl-2-propanol.



19 (a)
3° RX and 1° alkoxide ions give elimination reaction, whereas 1° RX and 3° alkoxide ions undergo S_N² reaction (Williamson's synthesis). Alternatively, nucleophile (MeO[⊖]) cannot attack 3° C atom having high \bar{e} density hence elimination occurs to give alkene

20 (a)
 a. ⇒ 6e's in delocalisation ⇒ Aromatic



The most stable is aromatic compound (a)

21 (c)

There are two factors that determine the reactivity of the halogenation of alkanes

1. Lesser the positive value of E_{act} of the first chain propagating step, more reactive is the halogen

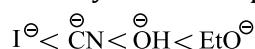
2. Higher the negative value of overall heat of reaction (ΔH_r°), more reactive is the halogen. This explains high reactivity and explosive violence with which F_2 reacts with CH_4

26 (a)

Nucleophilicity is parallel to basicity

Acidity: $HI > HCN > H_2O > EtOH$

Basicity and nucleophilicity



27 (b)

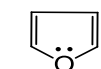
a. $10\pi e^-$'s in delocalisation \Rightarrow Aromatic

b. $10\pi e^-$'s in delocalisation, but is non-aromatic because ring is non-planar, as the H atoms that point to the interior to the ring interfere with each other

Note: Annulene with 10 C and 14 C are *n*

on - aromatic, but dehydro [10] and [14]

annulenes are aromatic



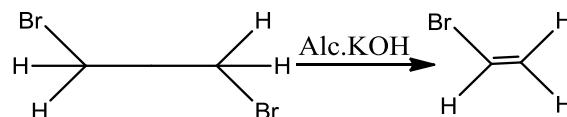
c. $\ddot{O}^- = 6\pi e^-$'s in delocalisation (only one lone pair is delocalised) \Rightarrow Aromatic



d. $H^- = 6\pi e^-$'s in delocalisation \Rightarrow Aromatic

So the answer is (b)

28 (c)



Vinylic bromide is more stable stronger base ($-NH_2^-$) is required for elimination.

30 (a)

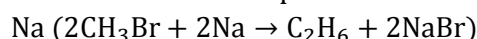
Proceed as in Solution 55-57

32 (c)

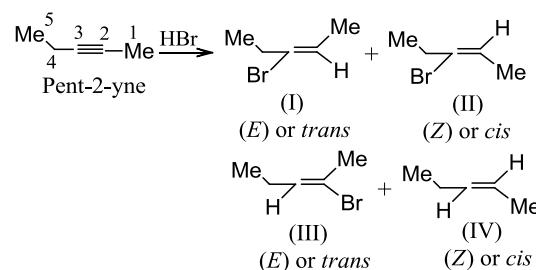
Hydrogenation of triple bond to double bond by alkali metal in the presence of liq. NH_3 and ethanol by $LiAlH_4$ takes place by anti-addition, so the product is *trans, trans* (III)

33 (c)

Wurtz reaction takes place with Na



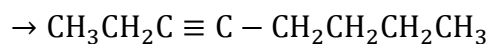
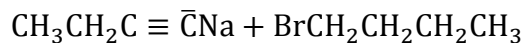
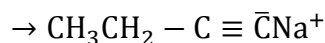
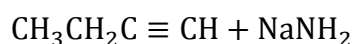
35 (b)



I and III are structural isomers; I and II, III and IV are diastereomers (or four configurational isomers)

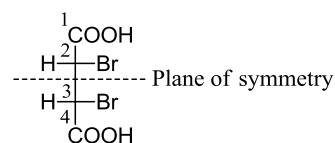
37 (d)

3-octyne is obtained by the reaction of 1-bromobutane and but-1-yne in presence of sodamide.

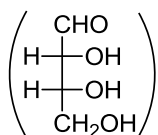


3-octyne

38 (d)



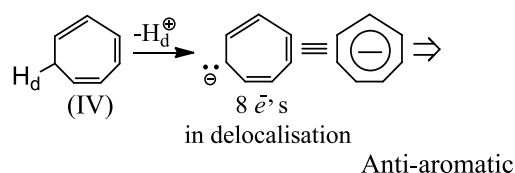
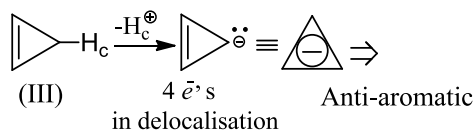
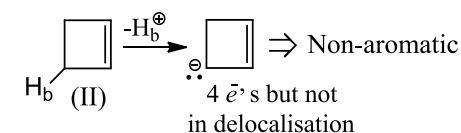
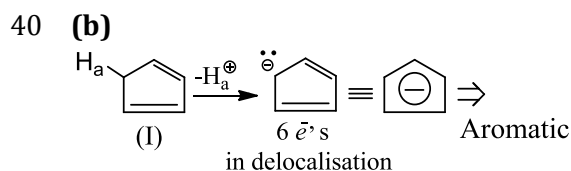
Erythro-or meso-2,3- dibromobutane-1,4-dioic acids are same. Erythro means two similar groups on the same side derived from aldotetrose, erythrose



Meso compound or Erythro compound + Anti-elimination

↓

trans-Alkene



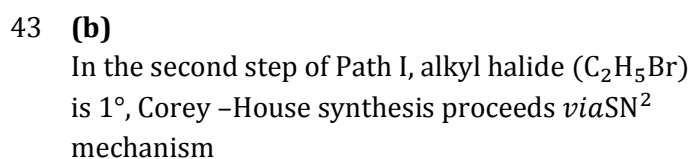
The order of Aromatic stability is : Aromatic >

Non-aromatic > Anti-aromatic

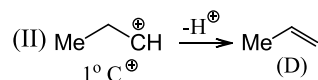
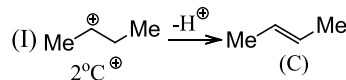
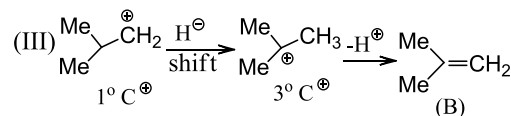
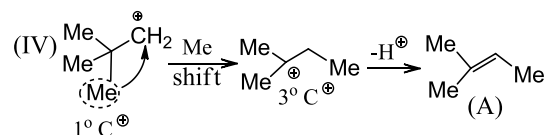
(I) > (II) > (IV) > (III)

(IV) has more resonating structure than (III), and is, therefore, more stable

\therefore H_a in (I) is more acidic since it will give H^\oplus faster to become a stable aromatic anion



In the second step of Path II, alkyl halide

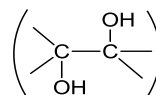


Stability of alkene : (A) > (B) > (C) > (D) (More-substituted alkene, more stable)

45 (d)

1. And (b) reduce both the (C = C) to (C - C) (sys-addition)

2. Anti-hydroxylation of both (C = C) to



1. Reduces only unhindered (C = C) to (C - C)

46 (d)

Alkenes and alkynes decolourise alkaline KMnO_4 solution (Baeyer's test for unsaturation)

47 (c)

The order of acidic character: Alcohols >

Alkynes > Alkenes > Alkanes

48 (a)

When both the C atoms are 2° as in compound (A) diborane preferentially attacks on the C atom with smaller (R) group and exclusive product arises from bonding at the C atom with smaller (R) group because bulky diborane is more sensitive to steric effects

51 (b)

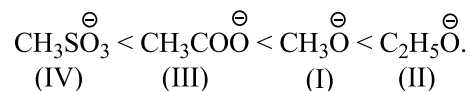
$3^\circ > 2^\circ > 1^\circ$

53 (a)

In the nucleophilic centre, nucleophilicity is parallel to basic character. Stronger the acid, weaker is the conjugated base

Acidic character order: $\text{CH}_3\text{SO}_3\text{H} > \text{CH}_3\text{COOH} > \text{CH}_3\text{OH} > \text{C}_2\text{H}_5\text{OH}$

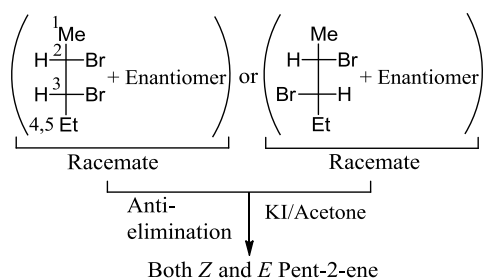
Basic and nucleophilicity order:



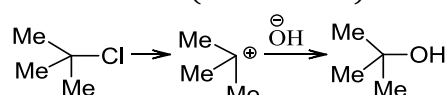
54 (c)

2,3- Dibromopentane, meso isomer is not

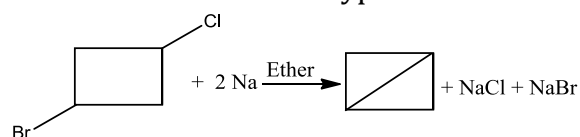
possible, since the two terminal groups are different



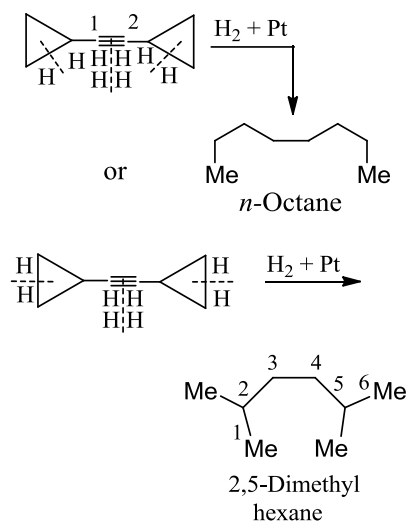
- 61 (b) Hydrolysis of 3° RX is independent of nucleophilic concentration (SN¹ reaction)



- 62 (d) The reaction is Wurtz's type reaction.



- 63 (d) Both the cyclopropane rings are unstable because they are highly strained. They undergo hydrogenation with H₂ + Pt and give *n*-octane and (or) 2,5-dimethyl hexane. Hydrogenation with P-2 catalyst converts (C ≡ C) to (C = C) only. So the answer is (d)



- 66 (b) Unsymmetrical alkyne gives two products with catalytic hydration and with HBO reaction, whereas with $\text{SiA}_2\text{BH} + \text{H}_2\text{O}_2 + \ominus\text{OH}$, it gives only one product. More bulky SiA_2BH attacks on the less hindered triple bond to give only one product

- 67 (a) Two asymmetric C atoms with the same terminal

group (n = number of asymmetric C atom and is even)

$$\text{Number of O.A.I.} = 2^{n-1} = 2$$

$$\text{Number of meso forms} = 2^{(n-2)} = 1$$

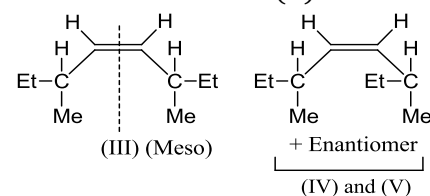
$$\text{Total optical isomers} = 3$$

$$\text{One double bond} = 2 \text{ diastereomers}$$

$$\text{Total stereoisomers} = 3 \times 2 = 6$$

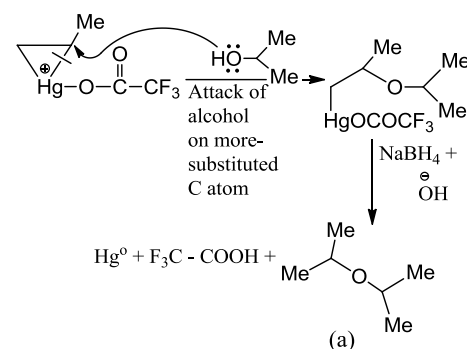
- 68 (a) H atom attached to *sp*-C atom is more acidic than *sp*²-C atom, which in turn is more acidic than the one attached to *sp*³-C atom

- 71 (c) If compound (a) is *cis*, we get two diastereomers, (III) and (IV). (III) is meso (O.I.A.) due to plane of symmetry. (IV) is O.A. (two enantiomers). Total stereoisomers when (A) is *cis* = 3



- 72 (a) Cycloalkanes, due to their compact nature, have high boiling and melting points than the corresponding alkanes
(III) > (IV) > (I) > (II)

- 76 (a) Proceed as in solution 55



- 78 (b) It is an optically inactive compound

By partial hydrogenation of (–C ≡ C–), an alkene is formed

- 80 (d) Cyclobutane, cyclopentane, and cyclohexane are more stable than cyclopropane and do not undergo catalytic hydrogenation at normal condition of temperature

(H₂ + pt) converts (C ≡ C) to (C – C)
 Birch reduction gives anti-addition of H₂ and
 converts (C ≡ C) to (C=C). So the answer is (d)

81 **(b)**
 Straight-chain compound has knocking property
 (making more rattling sound)

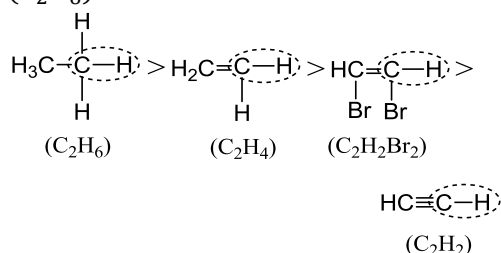
83 **(a)**
 More-stable or more-substituted alkene has the
 lowest (more negative) ΔH°_C, ΔH°_{formation}, and
 ΔH°_h. The order of stability of alkene
 :IV>III>II>I. So the lowest ΔH°_C is of (IV) and the
 highest is of (I)

84 **(b)**
 Acidity: HBr > MeOH > Me₂NH > Me₃CH
 Basicity and nucleophilicity:
 Br[⊖] < MeO[⊖] < Me₂N[⊖] < Me₃C[⊖]

i.e., (IV)>(III)>(II)>(I)

86 **(c)**
 Hexane does not dissolve in conc. H₂SO₄

87 **(c)**
 (C – H) bond distance is the longest in alkanes
 (C₂H₆)



88 **(b)**
 a. a = 1° H atoms, b = 2° H atom

b. Isobutene a = 1° H atoms

c. a = 2° H atoms

d. a = 1° H atoms, b = 3° H atoms

89 **(b)**
 a. ⇒ 2πe⁻'s in delocalisation ⇒ Aromatic

b. ⇒ 4πe⁻'s in delocalisation ⇒ Anti-aromatic

It is [10]annulene and is non-aromatic as

explained in Solution 20 (b)

d. ⇒ 4πe⁻'s but not in delocalisation ⇒ non-aromatic

So answer is (b)

90 **(d)**
 BuLi is a very strong base; it abstracts proton
 from propargyl position as well as from the
 terminal position to give dianion (d) as an
 intermediate species

91 **(a)**
 ⇒ Aromatic
 in delocalisation

⇒ Non-aromatic
 4 e⁻'s but not
 in delocalisation

⇒ Anti-aromatic
 4 e⁻'s
 in delocalisation

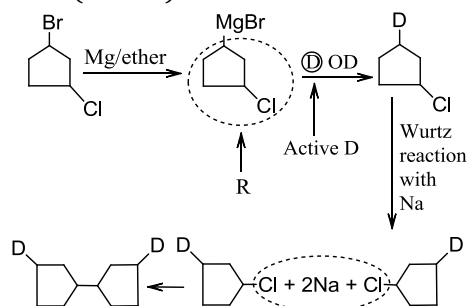
⇒ Anti-aromatic
 8 e⁻'s
 in delocalisation

The order of Aromatic stability is : Aromatic >
 Non-aromatic > Anti-aromatic
 (I) > (II) > (IV) > (III)

(IV) has more resonating structure than (III), and
 is, therefore, more stable

∴ H_a in (I) is more acidic since it will give H[⊕]
 faster to become a stable aromatic anion

92 **(b)**
 (C – Br) bond is weaker than (C – Cl) bond.
 Grignard reagent is formed more predominantly
 with (C – Br)



93 **(c)**
 (I) and (IV) are enantiomers and have the same
 physical and chemical properties, so they have the

same vapour pressure

94 (a)

Both 6π e^- 's and in delocalisation, both aromatic, but (II) is more stable than (I) because (II) is uncharged structure

96 (b)

Aldehydes and ketones undergo NA reaction

97 (b)

Hydrogenation of the triple bond to double bond by Lindlar's catalyst or by P-2 or Brown catalyst, i.e., $H_2 + Ni_2B$ takes place by syn-addition, so the product is *cis, cis* (II)

101 (d)

For C atom alkane, van der Waals forces of attraction are weak and boiling point is the lowest. As far as the boiling points are concerned, alkenes have more boiling point than alkanes with the same number of C atoms. Due to the presence of π -bond, alkenes are slightly polar. More is the number of π -bonds, more is the polarity and higher is the boiling point. Thus, the decreasing order of boiling points is:

$c > b > a > d$

102 (c)

Cycloalkanes, due to their compact nature, have high boiling and melting points than the corresponding alkanes (III) > (IV) > (I) > (II)

103 (b)

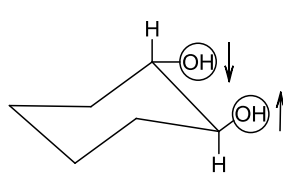
The Diels-Alder reaction proceeds faster when dienophiles have \bar{e} -withdrawing groups and dienes have \bar{e} -donating group

104 (b)

With the increase in C atoms and decrease in branching (or straight chain), the boiling points of alkanes increase. So, *n*-hexane has the highest boiling point

107 (d)

1. and (b) give syn-hydroxylation
2. Breaks the double bond
3. Gives anti-hydroxylation, since in (B) two (OH) groups are in anti-position



[One (OH) is down and one (OH) is in up position, so anti-position]

[Both (OH) in equatorial position]

109 (b)

Alkenes and ethyne ($CH \equiv CH$) dissolve in cold $concH_2SO_4$. So the answer is (b)

111 (c)

- (a) SE reaction (Friedel-Crafts alkylation)
- (b) SN^1 reaction
- (c) Free radical substitution. In the presence of light of peroxide, free radicals are generated
- (d) NA (nucleophilic addition) reaction

116 (b)

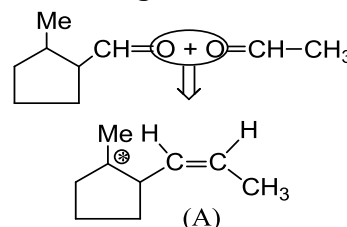
Nucleophilic addition (NA) reaction is favoured by EWG, so the answer is (b)

120 (d)

The statement is self-explanatory

121 (c)

Proceeding reverse, the structure of (A) is:



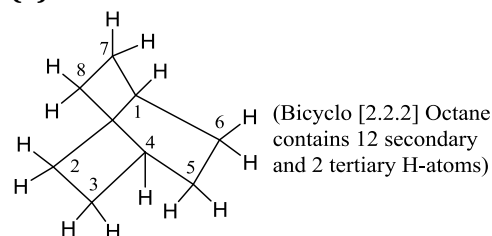
(A) Has one asymmetric C atom \Rightarrow two optical isomers and has one (C = C) with two different groups \Rightarrow two geometrical isomers.

Total number of stereoisomers = 4

122 (b)

- More the number of C atoms, more is the heat of combustion. So, the correct order is (a)
 - Cyclopropane has the highest heat of combustion per (CH_2) group
 - Except cyclopropane, cycloalkanes are non-planar
- So, the ANSwer is (b)

125 (a)



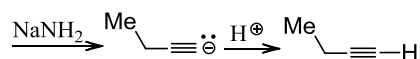
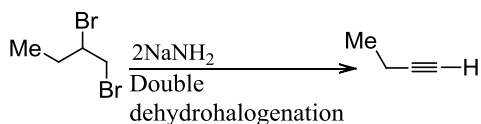
(Bicyclo [2.2.2] Octane contains 12 secondary and 2 tertiary H-atoms)

C-1 and C-4 contain two tertiary H atoms. Rest contain 2° H atoms

126 (c)

Apply formula ($N = S - A + 1$) to determine the number of rings

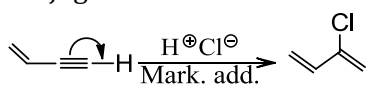
127 (c)



Double dehydrohalogenation requires 2 mol of NaNH_2 . The terminal alkyne is converted to alkynyl anion as soon as it is formed. Thus, 3 mol of NaNH_2 of the base are used in the overall reaction

128 (a)

Although double bond is more reactive than triple bond, electrophilic addition of 1 mol of HCl takes place at triple bond because it gives more stable conjugated diene

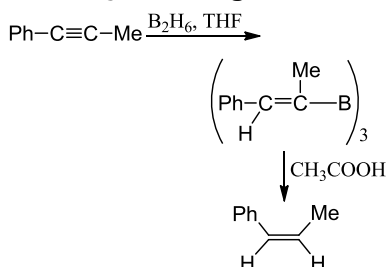


129 (a)

The greater the number of C atoms and straight chain, the higher is the boiling point. So, I is greater than II. More is the branching, less is the surface area, so lower is the boiling point. Therefore, III is greater than IV

130 (c)

Hydroboration reaction first gives R_3B and then with CH_3COOH , it gives *cis*-alkene

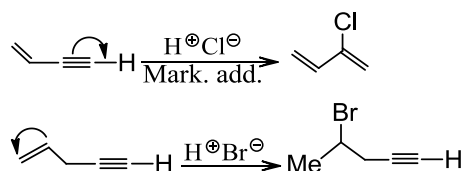


131 (d)

Lower the E_{act} of first step of chain propagation reaction, more easily the bond can be broken. Also this bond breaking will take place comparatively at a lower temperature

132 (c)

In this case, electrophilic addition of 1 mol of HCl takes place at double bond, since double bond is more reactive than triple bond. However, addition of triple bond does not lead to the formation of stable conjugated diene as in the case of
Although double bond is more reactive than triple bond, electrophilic addition of 1 mol of HCl takes place at triple bond because it gives more stable conjugated diene



133 (b)

Reagent $\text{NH}_2\text{NH}_2 + \text{O}_2$ converts double bond to single bond

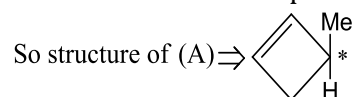
Reagent $\text{NH}_2\text{NH}_2 + \text{HgO}$ converts α -diketone to (\equiv). Reagent Wolff-Kishner or Clemmensen

reduction converts (>C=O) group to ($-\text{CH}_2-$) group

So the answer is (b)

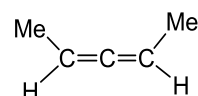
134 (c)

D.U. of (A) and (B) is 2° and 1° , respectively. (A) and (B) must have 4C or 5C-ring, but 5C-ring alkene will not show optical isomerism

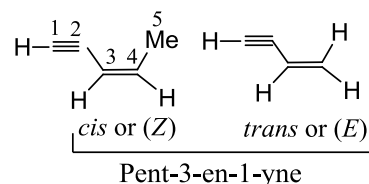


Similarly, D.U. of (c) and (D) = 2 and 0, respectively. (C) and (D) cannot have ring;

therefore, only allenes with two different groups are resolvable. So the structure of (C) is:



135 (b)



Minimum number of C atoms required to show diastereomers is five

136 (d)

Only carbocation shows rearrangement (but in same cases radical also rearranges)

138 (d)

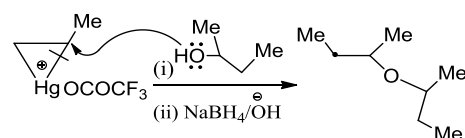
SN^2 solvolysis reaction is bimolecular and the rate law is:

$$\text{Rate} = k[\text{RX}][\text{Solvent}]$$

Since the concentration of the solvent is very large and exceeds the amount of RX , therefore, its concentration is constant. Hence the reaction will follow pseudo first-order rate law

140 (c)

Proceed as in solutions 55 and 56



141 (c)

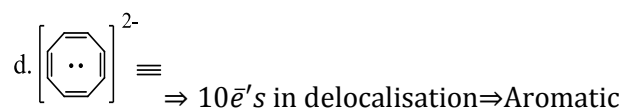
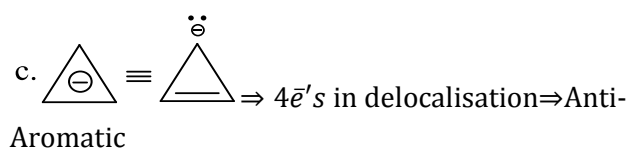
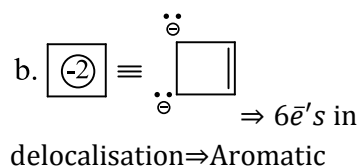
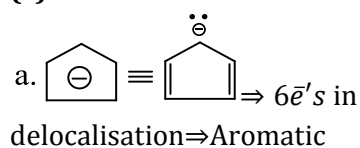
Acidity: $\text{CH}_3^+\text{OH}_2 > \text{H}_3\text{O}^+ > \text{HNO}_3 > \text{HF}$

$\text{p}K_a$: - 2.5 - 1.74 - 1.43.2

Basicity: $\text{CH}_3\text{OH} < \text{H}_2\text{O} < \text{NO}_3^- < \text{F}^-$

[(I)>(II)>(III)>(IV)]

142 (c)



So the least stable is (c)

143 (a)

As the number of C atoms increases, knocking power increases or anti-knocking power decreases

144 (d)

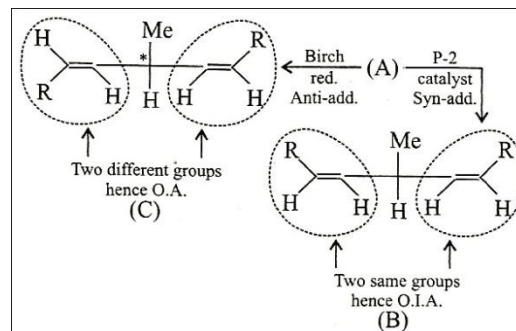
By the decay of plants or animals present in wet or spongy land (called swamps or marsh) and by the action of bacteria on them, methane gas is produced. Because of this method of formation, methane gas is also called marsh gas

146 (b)

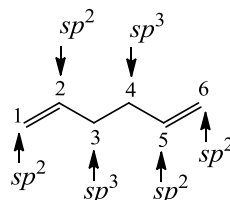
In path I, S_N^2 reaction is not possible because RX is unreactive vinyl bromide. In Path II, nucleophilic addition reaction is favoured-anion $(\text{Me}-\text{C}\equiv\text{C})^-$ is a strong nucleophile-to give the product which on dehydration gives compound A

147 (c)

Both reagents convert $(\text{C}\equiv\text{C})$ to $(\text{C}=\text{C})$. P-2-catalyst adds by syn-addition, while Birch reduction adds by anti-addition



148 (b)



Hence, C_2 and C_3 are sp^2 - and sp^3 -hybridised

149 (a)

(a) is non-aromatic

(b) is aromatic

(c) is anti-aromatic

(d) is aromatic

153 (c)

(I) For Diels-Alder reaction, dienes should have EDG and dienophile should have EWG. So (I) does not react

(II) Diene (buta -1,3-diene) has *s-trans* conformation, so does not react

(III) Undergoes Diels-Alder reaction

(IV) Undergoes intramolecular Diels-Alder reaction

154 (a)

m-Toluidine is a direct substitution product; *o*- and *p*-toluidine are cine-substitution products

157 (c)

Acidity: $\text{HF} > \text{H}_2\text{O} > \text{NH}_3 > \text{CH}_4$

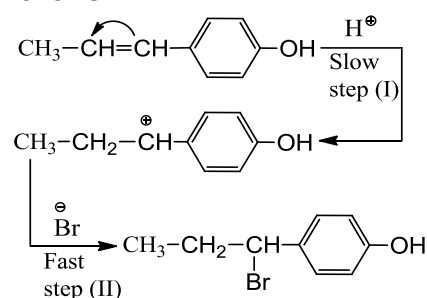
Basicity and nucleophilicity:

$\text{F}^- < \text{OH}^- < \text{NH}_2^- < \text{CH}_3^-$

So CH_3^- is the strongest nucleophile

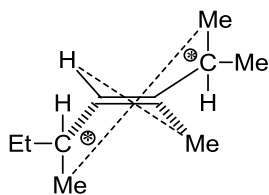
158 (b)

The mechanism of the reaction is represented as follows:



159 (a)

(II) is O.I.A.(meso) due to centre of symmetry



163 (d)

For $2\bar{e}$ or $2F$, 3 mol of gases [2 mol of CO_2 + 1 mol of $CH_3 - CH_3$ (g)] are produced

At 1.0 bar pressure and 298 K, volume of 1 mol of gas = 24.7 litres

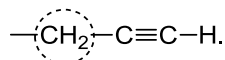
\therefore volume of gases at anode = $24.7 \times 3 = 74.1$ litres

164 (c)

EDG increases SE reactivity and EWG decreases SE reactivity. (III) $Ph - CH_3$ (+I and H.C.effect) > (IV) (C_6H_6) > (II) $Ph - Cl$ (-I effect, +R effect, but -I effect decides reactivity, whereas +R effect decides orientation, i.e., *o*- and *p*-directing) > (I) $(Ph - NO_2)$ (-I and -R effects)

165 (a)

Circled number of C atoms required to show diastereomers is five



166 (a)

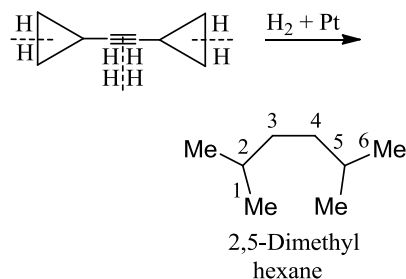
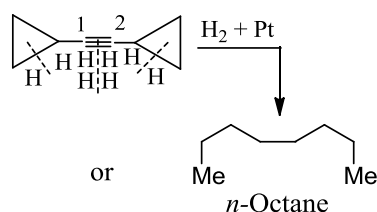
Since I^\ominus is a better leaving group, so the reaction (a) is the best method

168 (b)

Inversion occurs in SN^2 reaction, so a product with opposite optical rotation is obtained

169 (d)

Both the cyclopropane rings are unstable because they are highly strained. They undergo hydrogenation with $H_2 + Pt$ and give *n*-octane and (or) 2,5-dimethyl hexane. Hydrogenation with P-2 catalyst converts $(C \equiv C)$ to $(C = C)$ only. So the answer is (d)

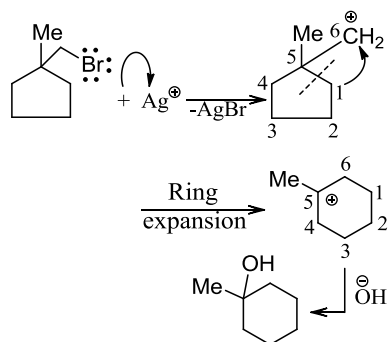


170 (a)

2° RX in polar medium undergoes SN^1 mechanism

171 (d)

Ag^+ catalyses SN^1 reaction, so rearrangement occurs



173 (a)

The order of electrophilic addition (EA) is: alkene > alkyne. But if alkene has EWG, reactivity of alkene is less than that of alkyne. Due to EWG, \bar{e} density at $(C = C)$ or nucleophilicity decreases, so addition of electrophilic to $(C = C)$ is slow. So the decreasing order of EA is:

(II) (alkene) > (I) (alkyne) > (III) (alkene with one EWG) > (IV) (alkene with two EWG)

174 (a)

Acidity: $H_3O^+ > EtOH_2^+ > MeCOOH > H_2O > EtOH$.

Basicity and nucleophilicity: $H_2O < MeOH <$

$MeCOO^\ominus < OH^\ominus < EtO^\ominus$ (i.e., (V) > (IV) > (III) > (II)

> (I))

177 (a)

1. Meso compound + Anti-elimination of $Br_2 \rightarrow$ *trans* or *E*-But-2-ene

2. Racemic compound + Anti-elimination of

$\text{Br}_2 \rightarrow \text{cis or Z- But-2-ene}$

So the answer is (a)

178 (a)

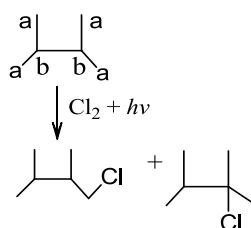
Stability of alkene $\propto \frac{1}{\text{Heat of hydrogenation}}$

Hence, the reactivity of alkene \propto heat of hydrogenation of alkenes

In these, *cis*-alkenes are more reactive because of greater strain at the double bond

179 (a)

The isomeric hexane should have two different types of H atoms and four similar types of H atoms to give two monochlorinated products

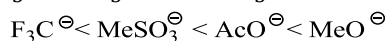


In 2, 3-dimethyl butane, H atoms at positions 'a' and 'b' are the same and at 'b' are the same. So, two positions are available for chlorination

180 (b)

Weaker the base, better is the leaving group

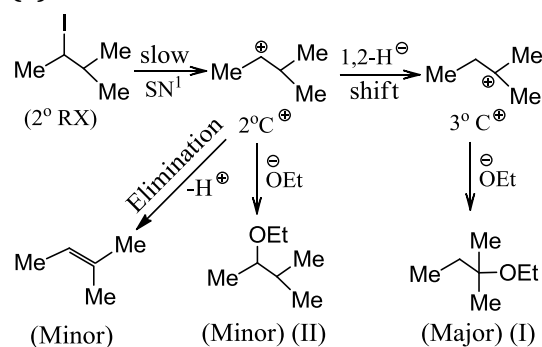
Acidity: $\text{F}_3\text{C} - \text{SO}_3\text{H} > \text{MeSO}_3\text{H} > \text{AcOH} > \text{MeOH}$



Basicity: (iv) (iii) (i) (ii)

Leaving group: (iv) > (iii) > (i) > (ii)

181 (a)



There can be elimination from 2° and 3° carbocation to give alkene. Also, alkene predominates over substitution is 3°C^\oplus

185 (b)

Ring strain = $(\Delta H_c^\circ \text{ of cyclobutane} - 4 \times \Delta H_c^\circ \text{ of per } (\text{CH}_2) \text{ group of cyclohexane}) = 2744 - (4 \times 660) = 104 \text{ kJ mol}^{-1}$

186 (d)

(A) (II), I^\ominus is a better leaving group Br^\ominus .

(B) (V), 1°RX undergoes SN^2 reaction than 3°RX .

(A) (VI), Vinyl halide (V) does not undergo SN^1 or

SN^2 reaction; (VI) is 1°RX , therefore undergoes SN^2

190 (b)

(a) Beckmann rearrangement reaction

(b) Bimolecular reduction to pinacol

(c) Curtius rearrangement reaction

(d) Lossen rearrangement reaction

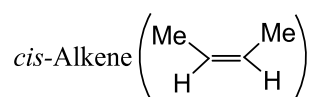
191 (c)

I. Meso compound (two same groups) + Anti-

elimination \rightarrow *trans*-Alkene $\left(\begin{array}{c} \text{H} & \text{Me} \\ & \backslash / \\ & \text{C} = \text{C} \\ & / \backslash \\ \text{Me} & \text{H} \end{array} \right)$

II. (\pm) Compound (two same groups) + Anti-elimination

\downarrow



III. (\pm) Compound (two different groups) (but two eliminating groups in anti-position) + Anti-

elimination \rightarrow *trans*-Alkene $\left(\begin{array}{c} \text{H} & \text{Me} \\ & \backslash / \\ & \text{C} = \text{C} \\ & / \backslash \\ \text{Et} & \text{H} \end{array} \right)$

IV. (\pm) Compound (two different groups) (but two eliminating groups is syn-position) + anti-

elimination \rightarrow *cis*-Alkene $\left(\begin{array}{c} \text{H} & \text{H} \\ & \backslash / \\ & \text{C} = \text{C} \\ & / \backslash \\ \text{Et} & \text{Me} \end{array} \right)$

193 (d)

All the three reactions, i.e., alkylation, cyclisation, and isomerisation convert straight-chain hydrocarbons to branched-chain or cyclic compounds, which changes the percentage of straight-chain hydrocarbon. Hence, the octane number is changed

194 (a)

(I) \Rightarrow aromatic, (II) = non-aromatic ($4\pi e^-$'s but not in delocalisation)

(III) \Rightarrow anti-aromatic ($4\pi e^-$'s but in delocalisation). So the order of stability is: (I) > (II) > (III)

197 (b)

3. Williamson's synthesis used for the preparation of ether

4. Kolbe's reaction is used for the preparation of alkanes, alkenes, and alkynes

5. Wurtz reaction is used for the preparation of higher alkanes (even number and symmetrical alkanes when R group is the same). With two different R groups mixed, alkanes and alkenes are obtained

6. Sandmeyer reaction is used for the

preparation of various compounds from diazo compounds

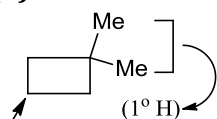
198 (d)

$C_1 - C_4$ are gases, $C_5 - C_{17}$ are liquids, and C_{18} onwards are colourless waxy solids

200 (b)

3° RX and 1° alkoxide ions give elimination reaction, whereas 1° RX and 3° alkoxide ions undergo S_N2 reaction (Williamson's synthesis). Alternatively, nucleophile (MeO^\ominus) cannot attack 3° C atom having high \bar{e} density hence elimination occurs to give alkene

201 (b)



2° H atom

(1,1-Dimethylcyclobutane contains both 1° and 2° H atoms)

202 (c)

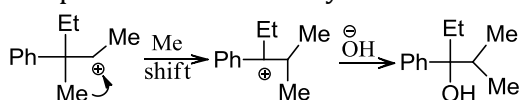
RF with bulky or non-bulky base always gives Hoffmann product. However, RCl with bulky base gives Hofmann but non-bulky base gives Saytzeff product

203 (b)

All have the same number of C atoms. *n*-Octane is a straight-chain compound that has a large surface area. So, there are more van der Waals forces of attraction resulting in a high boiling point

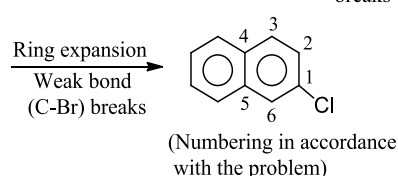
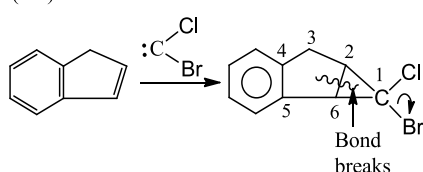
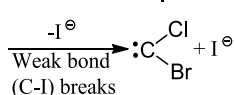
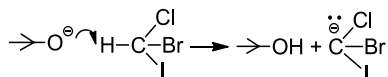
204 (a)

The product is obtained by Me shift



205 (a)

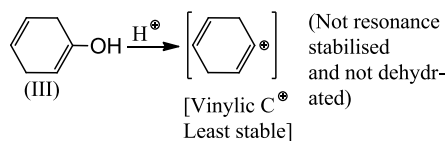
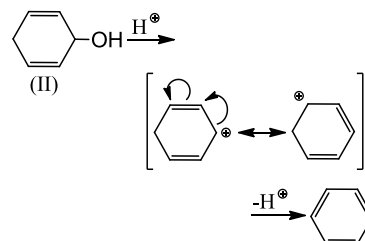
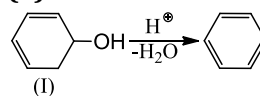
Addition of carbene ($:C(Cl)Br$) and ring expansion



207 (b)

Cumulative diene (allene) is the least stable and, hence, ΔH°_h is the maximum

209 (a)



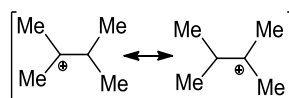
So (I) is the most easily hydrated

210 (a)

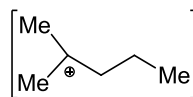
Lower is the heat of combustion, more stable is the compound. Lesser is the angle strain, more stable is the compound. So, the ANSwer is (a) (I > II > III)

212 (a)

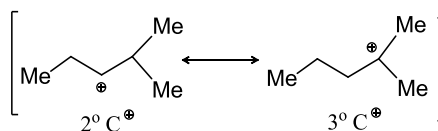
ii. It has one $3^\circ C^\oplus$ structure



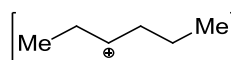
iii. It has one $3^\circ C^\oplus$ structure



iv. It can rearrange to more stable $3^\circ C^\oplus$



v. It has only one $2^\circ C^\oplus$

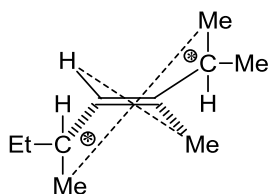


So the decreasing order of dehydration is:

(ii) > (iii) > (iv) > (i)

213 (d)

(II) is O.I.A. (meso) due to centre of symmetry



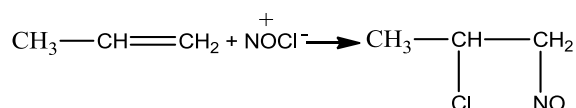
214 (a)

The statement is self-explanatory

215 (a)

Methane

217 (a)



This reaction is an example of electrophilic addition reaction and in it addition takes place according to Markownikoff's rule.

218 (d)

(a) Syn-hydroxylation (stereospecific): product is meso (one product) hence regioselective

(b) *trans*-Compound + Anti-hydroxylation (stereospecific); product is meso (one product) hence regioselective

(c) CH_2N_2 produces singlet carbene and the reaction is both stereospecific and regioselective

(d) $\text{CH}_2 = \text{C} = \text{O}$ produces triplet carbene and the reaction is both non-stereospecific and non-regioselective

219 (c)

POCl_3 is used for the dehydration of alcohol to alkene, other (a), (b), and (c) are used for the dehydrohalogenation of alkyl halide to alkene

220 (a,c,d)

Rule: (With two same groups)

i. Meso-compound + Anti-elimination of $\text{Br}_2 \rightarrow$ *trans*-Alkene

ii. (\pm) Compound + Anti-elimination of $\text{Br}_2 \rightarrow$ *cis*-Alkene

a. According to the rule (i)

b. *trans*-Compound (with two different groups)+Anti-addition of two (OH) groups \rightarrow (\pm) or racemic compound

So the answer is wrong

c. *cis*-Compound (with two same groups)+Anti-addition of two (OH) groups \rightarrow (\pm) or racemic compound. So it is the correct answer

d

221 (a,b,c)

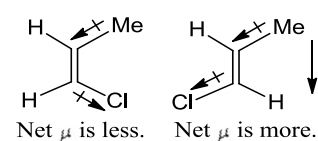
Here, (d) is the reduction of the ($\text{C} = \text{O}$) group to (CH_2); reduction reactions (a, b, c) are NA reactions

223 (a,b,c)

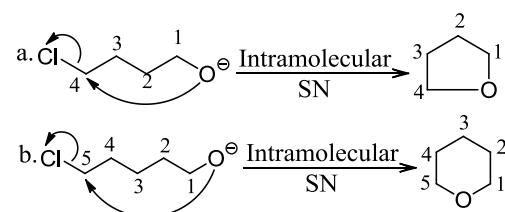
Strong nucleophiles such as NO_2^\ominus , RO^\ominus , and CN^\ominus can displace weak nucleophile, X^\ominus

224 (d)

The statements (a), (b), and (c) are explanation in themselves, but statement (d) is wrong. As (I) is a *cis*-compound, so its boiling point should be higher than that of the *trans*-compound (II), according to the statements. However, the dipole moment of (II) > (I) and higher dipole moment means more polar and high boiling point



225 (a,b)



Also, (c) and (d) would give more strained three- and four-membered ring, respectively

226 (a,b)

Highly strained cyclopropane can undergo catalytic hydrogenation under ordinary condition of temperature to give propane, but cyclobutane, cyclopentane, and cyclohexane cannot undergo the same. So, cyclopropane is called unsaturated compound

227 (a,c,d)

The option (b) is wrong. SN^1 reaction proceeds with racemisation and retention of configuration. On the other hand, (a), (c), and (d) are self-explanatory

228 (a,b,c)

A and c \Rightarrow aromatic (delocalisation of πe^- 's) so they do not give Baeyer's test or decolourisation of Br_2 Solution (test of unsaturation)

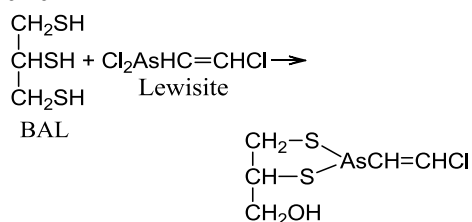
b. Due to EWG, four F atoms, \bar{e} density or nucleophilicity around ($\text{C} = \text{C}$) decreases and the compound does not give test for unsaturation

d. It is an unsaturated compound and gives the test for unsaturation

230 (c)

BAL (British anti-Lewisite gas)

(HSCH₂ – CHSH – CH₂OH). Reaction of Lewisite and BAL



231 (d)

Statements are self explanatory

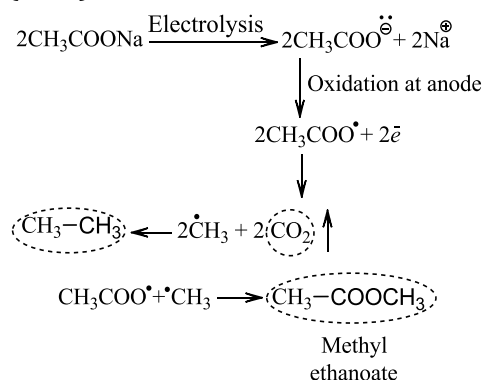
232 (a,c)

In a S_N² reaction proceeds by inversion of configuration, so the product is *cis*

In polar solvent (e.g., H₂O), S_N¹ reaction occurs, and reaction and racemisation take place if bond to the asymmetric C atom is broken

So the correct answer for S_N¹ reaction is (c)

233 (a,b,c)

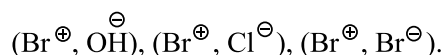


The products at anode are (a), (b), and (c)

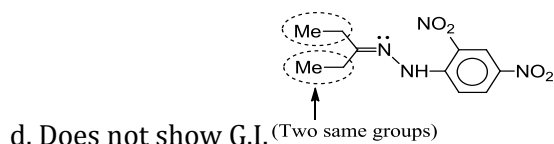
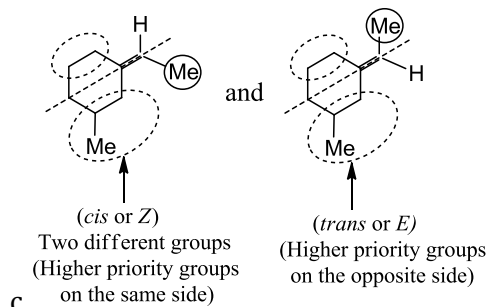
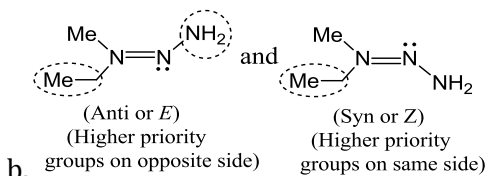
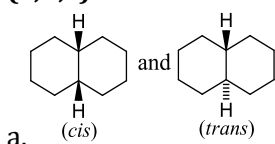
At cathode reduction of H₂O gives H₂(g)

234 (c,d)

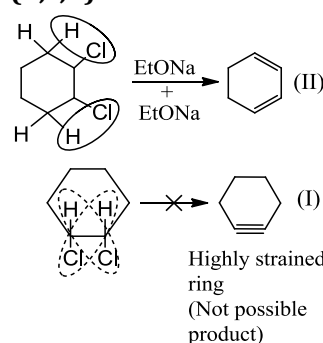
Cl[⊕] cannot be produced rather CsCl on ionisation will give Cs[⊕] and Cl[⊖]. So products with the following pairs in anti-positions are possible



237 (a,b,c)



238 (b,c,d)



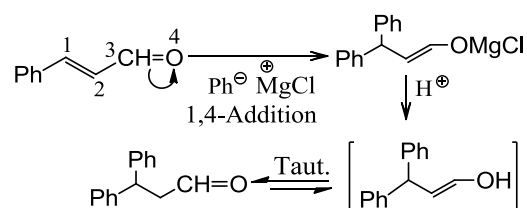
(II) is a more stable (conjugated diene) than (III) (isolated diene)

239 (a,b,d)

All the statements are self-explanatory

240 (b,c,d)

For the explanation of reaction (a) and (b): (C = O) is a stronger bond than (C = C), and thus the preferential addition is to (C = C). So (b) is correct



For reaction (d):

Due to steric hindrance and +I effect of three (Me) groups, the reactivity of the (C = O) group is decreased, and hence the reaction occurs at (C = C) bond

242 (a,b,c)

Isomer (I) is slow to react in an E2 reaction because in its more stable conformation, all the bromine atoms are in equatorial and an anti-periplanar transition state cannot be achieved. i.e., in isomer (I) there is not even a single H and Cl in

anti-position for elimination reaction to occur

243 (a,b,c,d)

The statements (c) and (d) are explanations of (a) and (b)

246 (b,d)

a. Wrong (by the definition of cetane number)

b. True (by the definition of cetane number)

c. Wrong (higher cetane number means higher percentage of straight-chain hydrocarbon (C₁₆H₃₂), whose knocking property is high)

Therefore, cetane number of 90 has high knocking property (makes more rattling sound)

d. True (cetane number determines the quality of diesel fuel in terms of spontaneous ignition)

Higher cetane number means that fuel ignites faster but makes more rattling sound (i.e., more knocking)

247 (a,d)

The statement a and d are wrong if T.S. leading to buta-1, 3-diene has low $\Delta G_{\text{activation}}$, then reaction of (II) will occur more rapidly

248 (a,b,d)

Reactants (a,b,d) contain asymmetric C atom so in SN¹ reaction they would give racemised and retention product. Reactant (c) does not contain any asymmetric C atom

249 (a,c,d)

Acidic character of the following is:

MeOH > H₂O > EtOH

pK_a 15.5 15.7 16

Basic and nucleophilic character is:

MeO[⊖] < OH[⊖] < EtO[⊖]

251 (a,b,c,d)

All the statements are self-explanatory

254 (a,b,c,d)

- Gives CH₄(g), which is also called Marsh gas
- It also CH₄(g), which is a constituent of CNG
- It gives acetylene (HC ≡ CH) gas with O₂ used for welding
- It gives phosphine (PH₃) gas used in Holme's signal

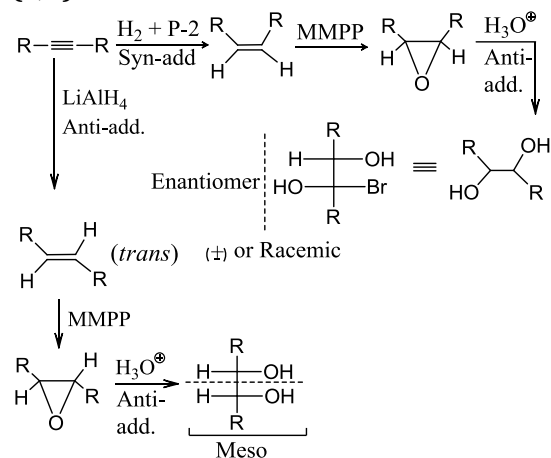
255 (a,d)

Statement (d) explains the formation of D

256 (b,d)

All these reagents react with terminal alkyne and (b) and (d) are the terminal alkyne

257 (a,b)



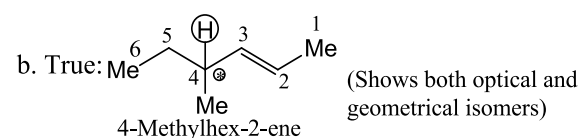
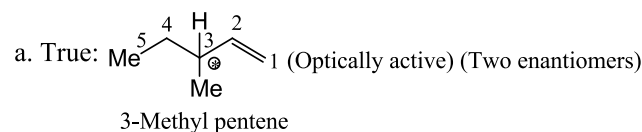
Rule: cis compound + anti-addition of Br₂ →

Product is racemic

trans compound + anti-addition of Br₂ →

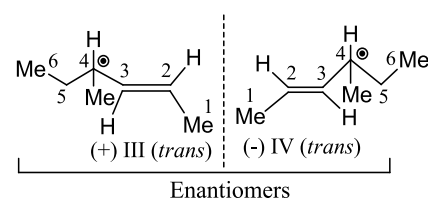
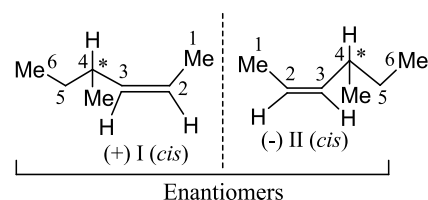
Product is meso (when R = R')

258 (a,b,d)



c. False: only two isomers are possible

d. True: four stereoisomers are as follows:



(I), (II) and (II), (IV) ⇒ enantiomers ⇒ two pairs of enantiomers of four O.A. isomers

(I), (III); (II), (IV); (I), (IV); and (II), (III) ⇒ four pairs

of diastereomers

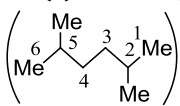
In total, four stereoisomers are possible

259 (a,c)

Statements are self explanatory

260 (a,b,d)

Lower the ΔH_C^0 , more stable is the compound. So *trans* alkane is more stable than *cis* alkene. The statement (c) is wrong because 2, 5-dimethyl

hexane  is more stable (due to smaller surface area) than octane. Therefore, ΔH_C^0 of 2, 5-dimethyl hexane should be lower than octane

261 (b,c,d)

Here, (a) is wrong: carbocation is more \bar{e} deficient than R°

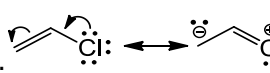
Further, (b), (c), and (d) are self-explanatory

262 (a,b,d)

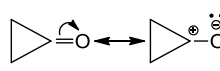
Statements are self explanatory

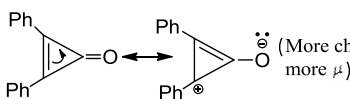
264 (a,d)

a. In nitrobenzene, small angle so high dipole moment (μ)

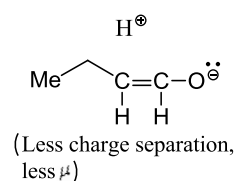
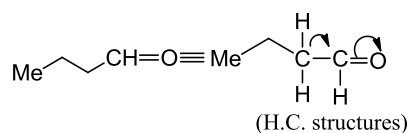
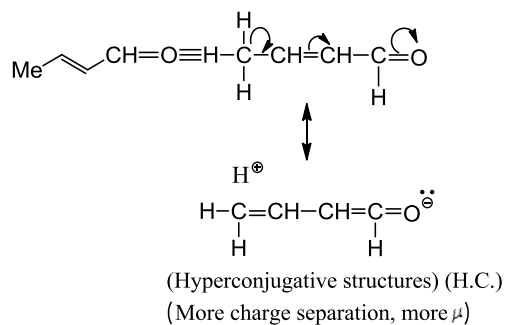
b.  (low μ , distance is less, due to double bond)

$CH_3 \rightarrow CH_2 \rightarrow Cl \leftrightarrow \overset{+\delta}{CH_2} - CH_2 - \overset{-\delta}{Cl}$ [High μ , more charge separation and large distance (single bond, more bond length), since, $\mu = q \times d$ (charge \times distance)]

 (Less charge separation, less μ)

c.  (More charge separation, more μ)


d.



265 (d)

Statements are self explanatory

266 (a,b,c,d)

All these reagents convert  group to $(-CH_2-)$ group

267 (a,c,d)

The statement (d) is the explanation of all parts

268 (a,b,c)

E1 and SN^1 reactions proceed by carbonation intermediate formation, so rearrangement may occur. $SN^{2'}$ is due to allylic rearrangement

269 (a,b,c,d)

Same product is obtained with HBO and catalytic hydration reaction with symmetrical alkene or alkyne

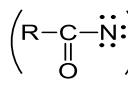
272 (a,c,d)

Benzene (C_6H_6) and hexadeutero benzene (C_6D_6) have approximately the same reaction rate.

274 (a,b,c,d)

- It is Hofmann bromamide reaction
- It is Lossen rearrangement reaction
- It is Curtius rearrangement reaction
- It is Schmidt rearrangement reaction

All these reactions proceed by intermediate

 species and the intermediate compound involved is $(R - N = C = O)$

275 (a,b,c,d)

The reaction occurs by a free radical mechanism and so a mixture of product is obtained

277 (d)

1,3- Butadiene shows the smallest heat of hydrogenation due to its higher stability which is due to resonance

trans-2-Butene is more stable than *cis*-2-butene on the basis of heat of hydrogenation

1-Butene is less stable 2-butene due to hyperconjugation (shows six no bond resonating structures),(hyperconjugative structures, while 1-butene due to hyperconjugative shows two no bond resonating structures.(Resonance is more powerful than hyperconjugation)

Order of stability:

1,3-Butadiene > *trans*-2-Butene > *cis*-2-Butene > 1- Butene

Heat of hydrogenation

1-Butene > *cis*-2-Butene > *trans*-2-Butene > 1,3-Butadiene

278 (a,b,c)

Statement (d) is false. Due to delocalisation of πe^- 's, benzene neither undergoes oxidation nor it gives test for unsaturation, i.e., Baeyer's reagent test and decolourisation of Br_2 solution

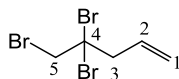
279 (a,c,d)

Any membered ring can be fused *cis*, but two five-membered or large rings can also be fused *trans*

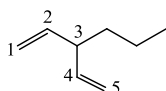
280 (a,c)

The statements (a) and (c) are explanations in them-selves

281 (a,b,c)



a.The correct name is 4,4,5-Tribromopent-1-ene [has priority and numbering starts from the double bond]



b.The correct name is 3-Propylpenta-1,4-diene (Chain must include both the double bonds).



c.The correct name is 1-Methyl cyclohept-1-ene [Number 1 is assigned to the (C = C)bonded to the methyl

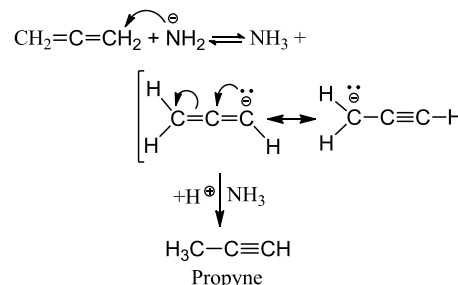
group].

d.The name is correct

282 (b,d)

The statements are self-explanatory

285 (b,c)



Alkynes are more stable than cumulative diene, so compound (B) should have more negative heat of hydrogenation

286 (a,b,c)

a. RS^- is a stronger nucleophile than RO^- but it is a weaker base than RO^- [as explained in (b) above]

So, SN^2 is more predominant than E2, and consequently $SN^2/E2$ ratio is higher

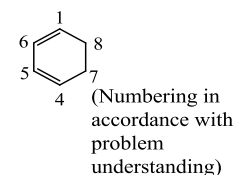
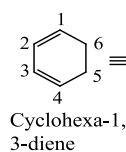
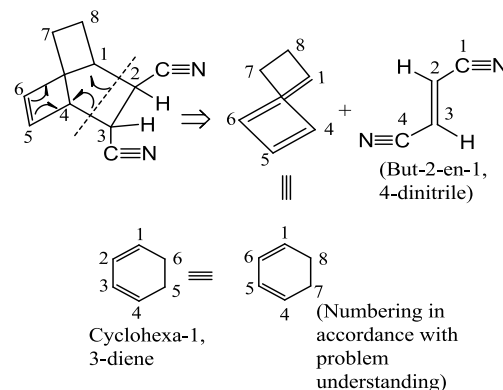
b. 1° RX undergoes SN^2 reaction and 3° RX undergoes SN^1 and E1 reactions. So $SN^2/E2$ is higher for 1° RX

c. EtO^- is a stronger base, so E2 reaction is predominant to give (I) as the major product

d. With CN^- (acting both as nucleophile and base) both SN^1 and E1 reactions may occur. Hence the product formed by SN^1 reaction is wrong. It would give elimination product also

287 (b)

1,-4-Addition product



288 (a,b,c)

Active methylene group should have EWG around

it

289 (c)

Terminal alkyne containing four or more C atoms on reaction with alk. KOH isomerizes to internal alkynes, which do not give all the tests mentioned. Although (b) are (d) are also terminal alkynes, they do not have sufficient C atoms to be converted to internal alkynes. So the answer is (c)

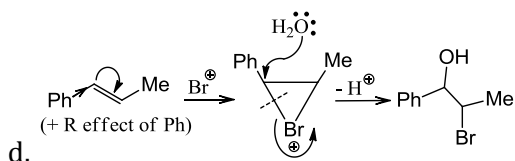
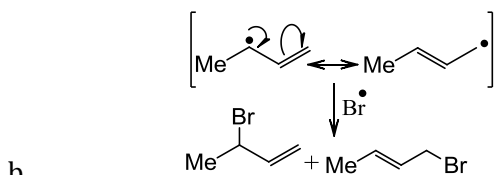
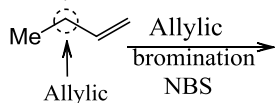
290 (a,b,c)

D.U. of (A) and (C) = 1°, so the answers (a) and (b) are correct. On hydrogenation, (+) compound can give either (+) or (-) compound. Since (+) and (-) cannot be determined from the structure, it depends on the nature of compound, so answer (c) is also correct.

Moreover, on hydrogenation of (A) or (C), chiral or asymmetric centre has not been produced, it was already in the compound (A) or (C). So the product can either be (+) or (-)

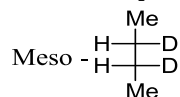
292 (a,b,c)

a. It is faster since H and Cl (two eliminating groups) are in anti-position



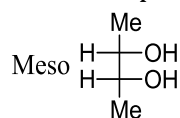
293 (a,b,d)

a. *cis*-Compound + *Syn*-addition of D₂ →



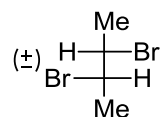
Since addition of D₂ is *syn* (stereospecific) and one product is formed predominantly (regioselective)

b. *cis*-Compound + *Syn*-hydroxylation →

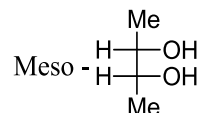


Hence it is both stereospecific and regioselective

c. *cis*-Compound + *Anti*-addition of Br₂ →



So the reaction is stereospecific (*anti*-addition) but non-regioselective since two compounds of ⊕ and ⊖ form are formed in equal amounts
d. *trans*-Compound + *Anti*-hydroxylation →



So it is both stereospecific and regioselective

294 (a,d)

1. True. *trans*-Cyclohexene is too strained



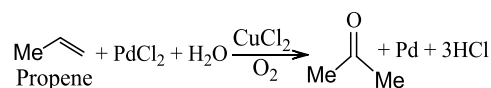
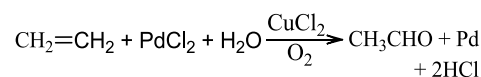
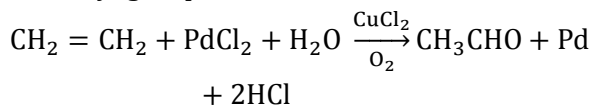
2. False. Eight-membered or larger rings can have a *trans*-substituted (C = C) in the rings. So eight-membered or larger rings are more stable in *trans* forms

3. False

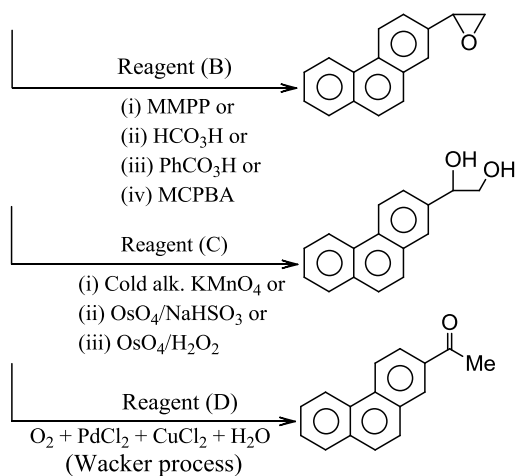
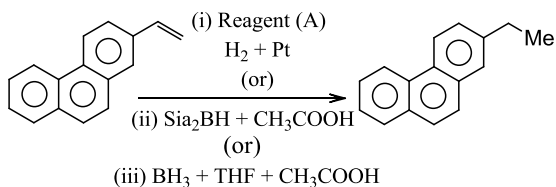
4. True

295 (a,c,d)

Wacker process is used to convert alkene to carbonyl group

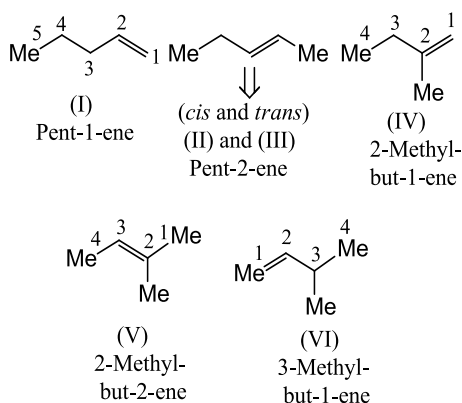


(The reaction proceeds via the addition of H[⊕] and [⊖]OH by Markovnikov's rule followed by oxidation)



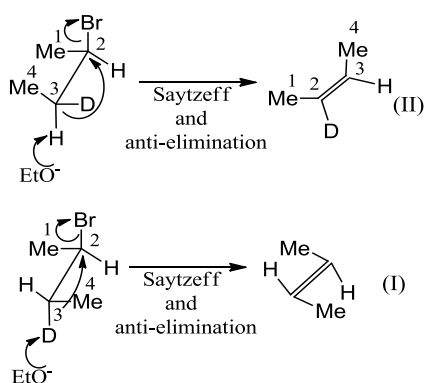
300 (a,c)

D.U for (A) = 1°. So it is alkene or cyclic. Considering only alkene, various structures of (A) are as follows:

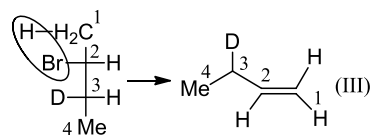


301 (a,c,d)

The statement (c) is an explanation in itself

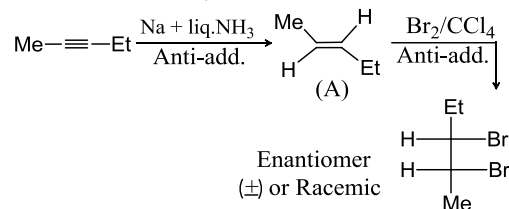


Small amount of (III) is obtained by Hofmann elimination (less-substituted alkene)

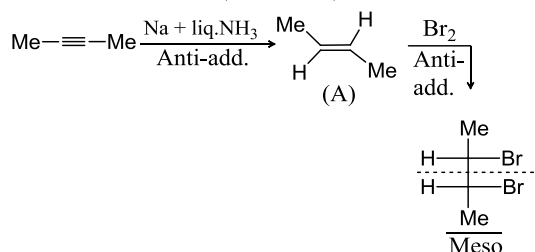


302 (a,c,d)

If R and R' are different (i.e., R ≠ R') (If R = Me, R' = Et)



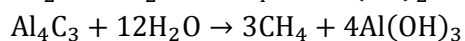
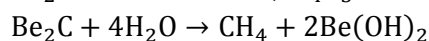
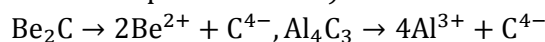
If R and R' are same (i.e., R = R')



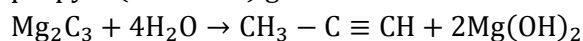
If R and R' are same (i.e., R = R')

303 (c,d)

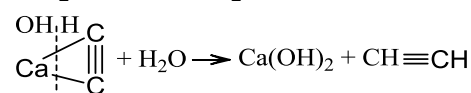
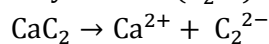
Carbides of Be and Al contain methinide ion (C⁴⁻) and thus give CH₄ gas (due to the diagonal relationship of Be with Al)



Whereas the carbides of Mg, i.e., Mg₂C₃, contain propynide ion (C₃⁴⁻) and hence give propyne (M≡-H) gas



The carbides of rest of the second group, i.e., Ca, Sr, and Ba (CaC₂, SrC₂, and BaC₂) give ethyne (acetylene) gas because they contain acetylide or ethynide ion (C₂²⁻)



304 (a,c,d)

Internal alkyne on reaction with NaNH₂ isomerises to terminal alkyne, which gives all the tests mentioned. Here (a), (c), and (d) are internal alkynes

305 (a,d)

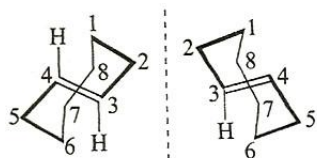
a. True

b. False

c. False

d. True

Enantiomers of *trans*-cyclooctene



307 (d)

All the statements are self-explanatory

308 (a,b,c)

Here, (d) is the reduction reaction

309 (b,c)

Due to strain in three-membered ring, on hydrogenation, ring opens but four-membered ring does not show ring opening reaction at ordinary conditions

310 (c,d)

1° RX undergoes SN² reaction

311 (a,c)

The statement is self-explanatory

312 (a,b,c)

The reaction (a) is Arndt-Eistert reaction

The reactions (b) and (c) are Wolff rearrangement reactions

The reaction (d) is Hofmann bromamide rearrangement reaction

It involves acylnitrene intermediate $\left(\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\ddot{\text{N}}: \right)$ and migration of alkyl group to N atom occurs to form $(\text{R}-\text{N}=\text{C}=\text{O})$

(a,b,c) involves the formation of $\left(\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\ddot{\text{C}}\text{H} \right)$ intermediate in which R migrates to carbene to form $\text{R}-\text{CH}=\text{C}=\text{O}$

313 (a,b,c)

Statements are self explanatory

314 (d)

Compound III is chiral and shows optical isomerism. Statements a, b, and c are self explanatory

315 (d)

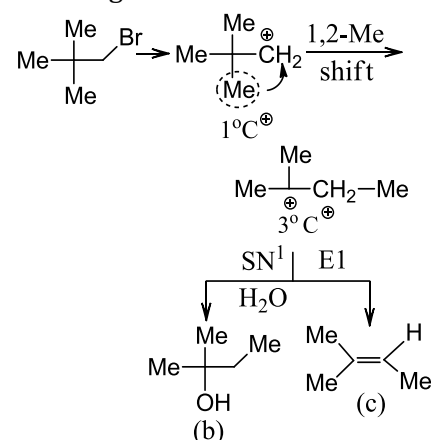
(a), (b), and (c) are aromatic compounds and do not give test for unsaturation as explained in problem 32

(d) is an unsaturated compound and gives the test

for unsaturation

317 (b,c)

Both SN¹ and E1 reactions may occur by the rearrangement of 1° C⁺ to 3° C⁺ by 1,2-Me shift



318 (a,b,c,d)

Diels-Alder reaction takes in the following cases:

1. Dienes with EDG
 2. Dienophile with EWG
 3. Dienes should have *S-cis* conformation and should be non-linear
 4. is not possible because diyne is linear
 5. and (c) are not possible in both the cases dienes have *S-trans* conformation
1. is not possible dienes have EWG and dienophiles have EDG (it should be reverse)

319 (a,c)

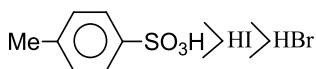
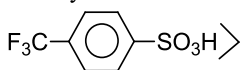
Point (c) is self-explanatory

320 (b, c)

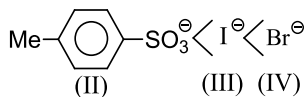
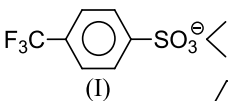
The (b, c) statement (d) is wrong. The correct statement should be: (II) is predominant because two eliminating group (H and OH) are in anti-position and now this statement explains all the parts. Product (II) is formed in major amount

321 (a,b,c,d)

Acidity order :



Basicity order:



Weaker the base, stronger is the leaving group

Fugacity order: (I) > (II) > (III) > (IV)

b. Acidity: RSH > ROH

Basicity: RS[⊖] > RO[⊖]

Nucleophilicity is antiparallel to basicity when there are different nucleophilic centres belonging to the same group of the periodic table

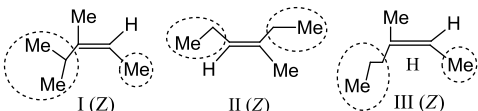
Nucleophilicity: RS[⊖] > RO[⊖]

c. Basicity: $\ddot{\text{N}}\text{H}_3 > \text{H}_2\ddot{\text{O}}$: (since ENof O > N). The LP \bar{e} 's in H₂O are more strongly held by more ENO atom, so it is less basic and less nucleophilic

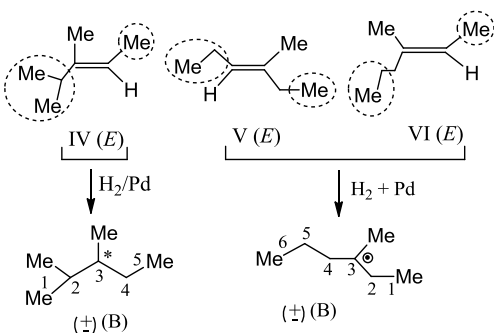
d. Stronger the base, stronger is the nucleophile

322 (a,c,d)

In compound (A), there are, all *cis* or *Z*, three structure isomers

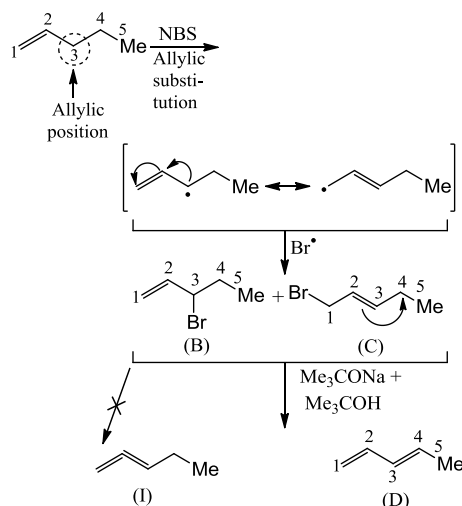


In compound (C), there are, all *trans* or *E*, three structure isomers.



Since on hydrogenation of compound (I)-(VI), an asymmetric or chiral centre has been produced, (B) can be (+) and (-) both, so racemate is formed

324 (a,c)



Product (D) (conjugated diene) is more stable than cumulative diene

325 (a,b)

In ArSN (elimination-addition reaction *via* benzyne intermediate), it is essential that an H atom should be present at *o*-position to the halogen

326 (b,c,d)

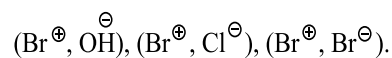
Benzene can't undergo an elimination reaction

327 (a,c,d)

When alkyne is symmetrical, the same product is obtained by (i) catalytic hydration, (ii) mercuration demercuration, and (iii) hydroboration oxidation reactions

328 (a,c)

Cl[⊕] cannot be produced rather CsCl on ionisation will give Cs[⊕] and Cl[⊖]. So products with the following pairs in anti-positions are possible

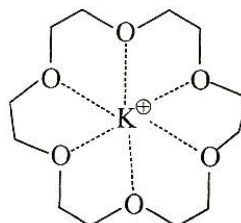


329 (a,b,c)

a. The statement is self-explanatory

b. Protic solvent helps in the ionization of substrate (RX), an essential condition for SN¹ reaction

c. Crown ethers strongly complex metallic cations of the salts in the interior (the 'hole') of the ring by forming ion-dipole bonds 18-crown-6, that strongly complex and trap K[⊕] as shown

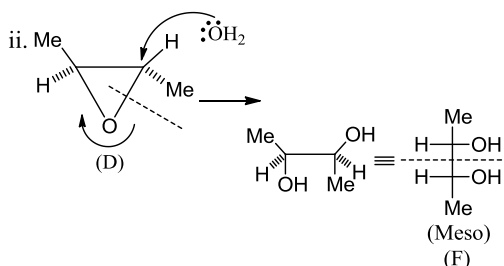
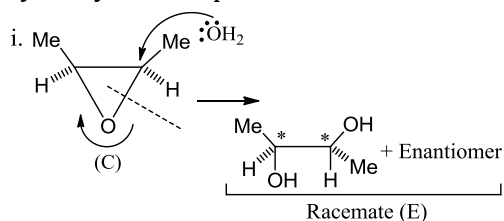


In non-polar or weakly polar solvents, salt exists as ion pairs. Ion pairing decreases the reactivity of anion (which acts as nucleophile). By complexing, the crown ether leaves a 'bare' anion (i.e., nucleophile) with increased reactivity. That is why they act as a phase-transfer catalyst by transferring an ionic salt from an aqueous medium or from a solid into a weakly polar solvent

d. The statement is wrong, since S_N2 reaction does not proceed by the formation of carbocation which is produced by the ionization of substrate (RX) by protic solvent

330 (a,d)

Hydroxylation of (C) and (D) is anti. Compound (A) is *cis* + anti-hydroxylation \Rightarrow product is racemic Compound (B) is *trans* + anti-hydroxylation \Rightarrow product is meso



331 (a,b,c)

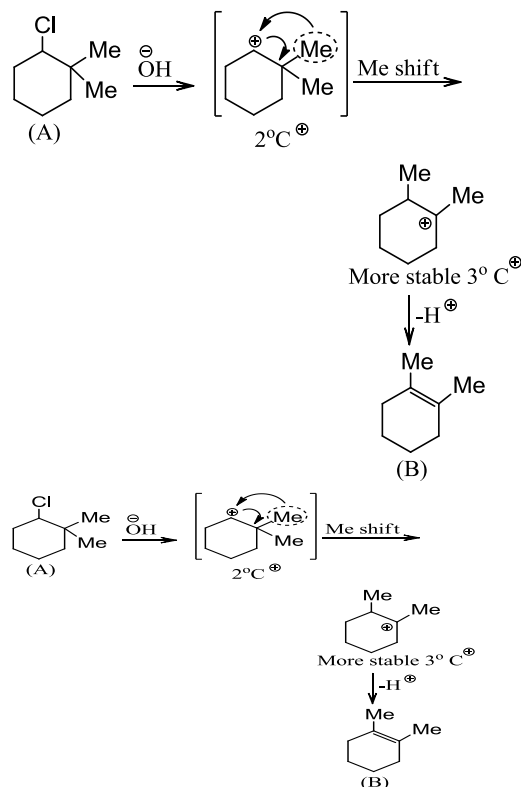
Statements are self explanatory

333 (a,c,d)

O_3 followed by treatment with H_2O , oxidation with hot $KMnO_4/KOH$ followed by acidification and Lemieux reagent, i.e., an aqueous solution of sodium periodate ($NaIO_4$) and a trace of potassium permanganate, all these reagents can perform the reaction

334 (b,d)

(l)



335 (a,c,d)

Chiral centres are at carbon number: 3,5,8,9, 10,13,14,17, and 20 (total nine chiral centres)
 4°C are at C-10 and C-13

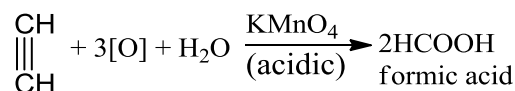
3°C are at C-8, C-9, C-14, C-17, C-20, and C-25

340 (b)

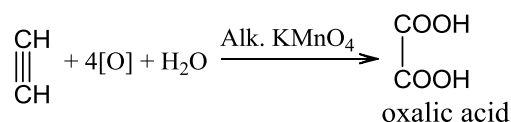
$T_{1/2}$ of second order reaction $\propto (a)^{-1}$, where (a) is the initial concentration of the reactant or nucleophile or both

341 (d)

Acetylene is converted into formic acid with acidified $KMnO_4$

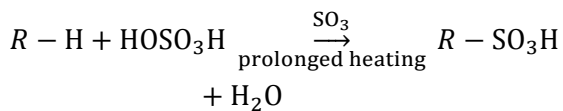


Acetylene is converted into oxalic acid with cold, dilute alkaline $KMnO_4$



342 (b)

Lower alkenes do not undergo sulphonation but higher members are sulphonated slowly when treated with fuming sulphuric acid at about 400°C



345 (d)

Chlorination proceeds by free radical mechanism and chlorination of allylic H is easier than vinylic H

346 (b)

The number of pairs of hydrogen atoms that a molecular formula lacks to be an alkane ($\text{C}_n\text{H}_{2n+2}$) is called degree of unsaturation

347 (a)

When carbon atoms are linked by double bond, the valency bonds undergo bending and are distorted from their normal directions. This bending produces strain in the molecule with the result it becomes unstable and hence more reactive

348 (b)

Acetylene reacts with ammoniacal AgNO_3 solution or ammoniacal Cu_2Cl_2 or sodamide to form an acetylide because it contains acidic hydrogens.

349 (a)

Both statements are correct and statement II is the correct explanation of Statement I

351 (b)

trans-Alkene + Anti-addition of $\text{Br}_2 \rightarrow$ Meso compound. Addition takes place by Br^\oplus (electrophilic addition). Both the statements are correct but statement II is not the correct explanation of statement I

353 (a)

Acidity: $\text{RSH} > \text{ROH}$

Basicity: $\text{RS}^\ominus < \text{RO}^\ominus$

When nucleophilic centres are different and belong to the same group, nucleophilicity is antiparallel to basicity

Nucleophilicity: $\text{RS}^\ominus > \text{RO}^\ominus$

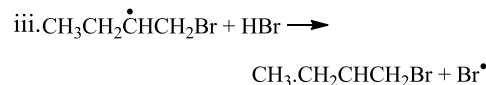
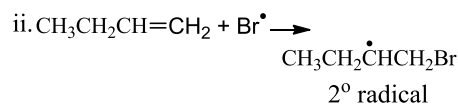
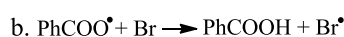
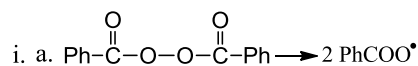
Weaker the base, better is the leaving group. So the leaving group ability of $\text{RS}^\ominus > \text{RO}^\ominus$

355 (b)

Oxidation of toluene with chromyl chloride gives benzaldehyde which reacts with acetic anhydride to give benzylidene acetate and thus, further oxidation of benzaldehyde to benzoic acid is checked by acetic anhydride. The benzylidene acetate on treatment with HCl regenerates benzaldehyde.

356 (c)

Statement (I) is correct but statement (II) is incorrect because 1-butene on reaction with HBr in the presence of peroxide produces 1-promobutane. In this reaction, the intermediate product is a secondary free radical



357 (a)

Both statement (I) and statement (II) are correct and statement (II) is the correct explanation of statement (I)

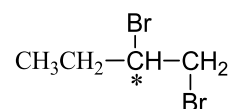
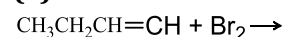
358 (a)

Both statements are correct

359 (d)

Heavy metal ions Ag^+ or Pb^{2+} increase SN^1 reactivity by increasing the ionization of substrate

360 (a)



Number of optical isomers = $2^n = 2^1 = 2$

Hence, both statement (I) and statement (II) are correct and statement (II) is the correct explanation of statement (I)

361 (b)

Statement (I) is correct but statement (II) is not

the correct explanation of the statement (I)
(addition of Br₂ to *trans*-2-butene is ionic, while it is an electrophilic addition in alkenes)

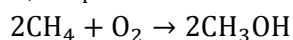
365 (a)

(a) and (b) reactions are cyclisation and aromatisation. Both reactions are carried out as given in (r) and (s)

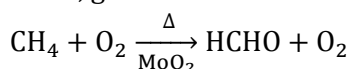
∴ (a) and (b) ⇒ (c) and (d)

For (r), (s), and (t)

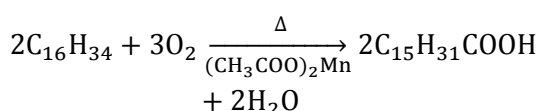
i. When CH₄ and O₂ (9 : 1) are heated at 100 atm pressure and passed through copper wires at 470 K, CH₄ is oxidised to CH₃OH



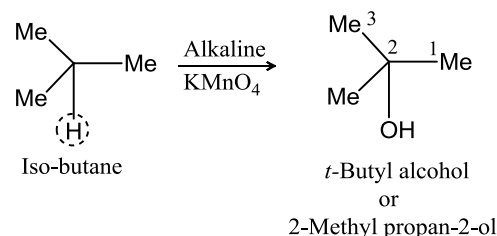
ii. CH₄ and O₂, when heated with molybdenum oxide, give methanol



iii. Higher alkane (C₁₆) on oxidation with manganese acetate at 370-430 K produces higher fatty acids

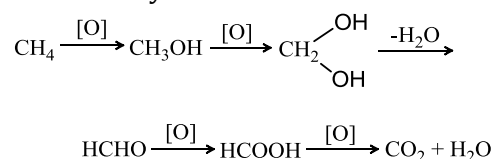


iv. With alkaline KMnO₄, 3° H atom is oxidised to (-OH) group



Because of the +I effect of the three CH₃ groups, \bar{e} density at 3° C atom is relatively high, which accounts for its easier oxidation

v. Partial oxidation: When CH₄ and C₂H₆ are treated with O₂ at high pressure and low temperature, H atom changes to (-OH) group, successively

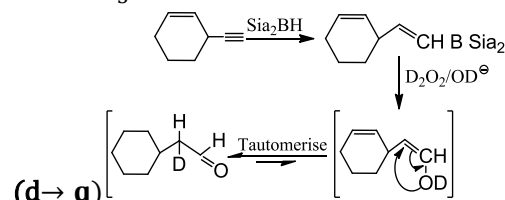


368 (a)

(a → r) Product is *trans* and (C ≡ C) to (C = C), so antiaddition takes place by Birch reduction

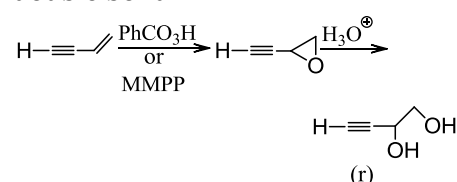
(a → p, t) Product is *cis* and (C ≡ C) to (C = C), so synaddition takes place by P-2 catalyst (p) and Lindlar's catalyst (t)

(c → s) Sia₂BH reduces less-hindered (C ≡ C) to (C = C) and addition of H and D is syn. D comes from CH₃COOD

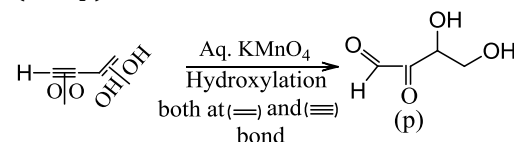


369 (d)

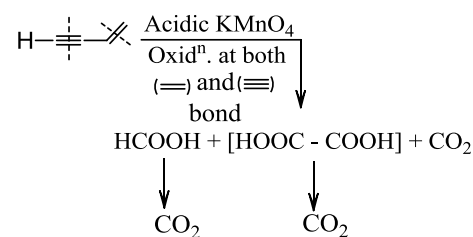
(a → r) PhCO₃H or MMPP is more reactive at the double bond



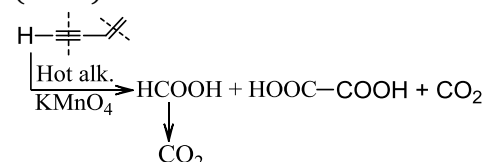
(b → p)



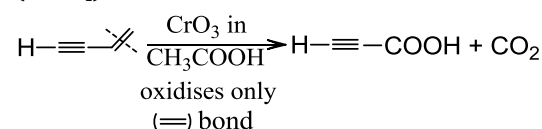
(c → t)



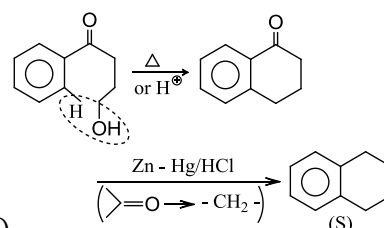
(d → s)



(e → q)

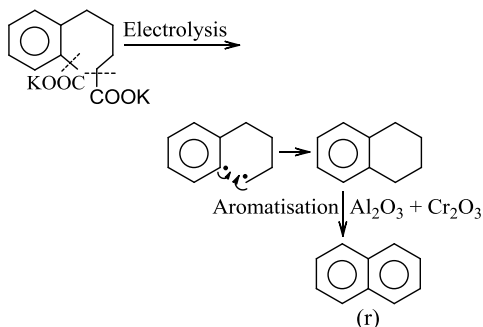


370 (c)

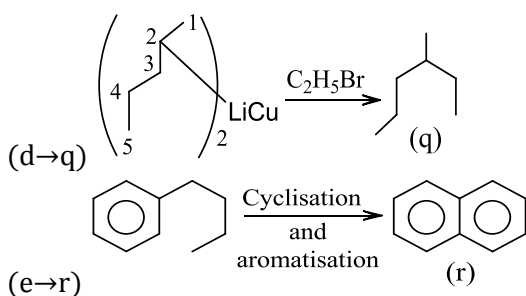
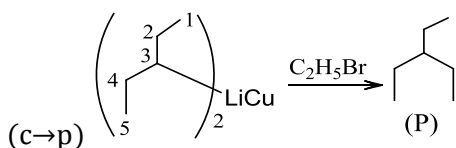


(a → s)

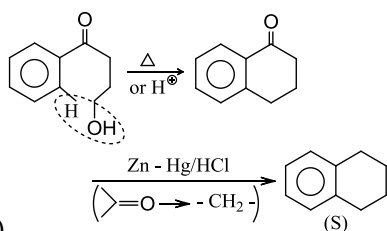
(b → r) It is intramolecular Kolbe's electrolytic reaction



Also, (c) and (d) reactions shown below are Corey–House synthesis:

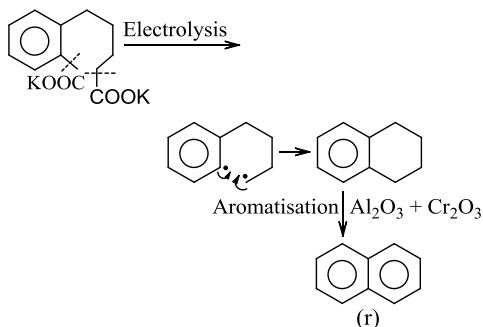


371 (c)

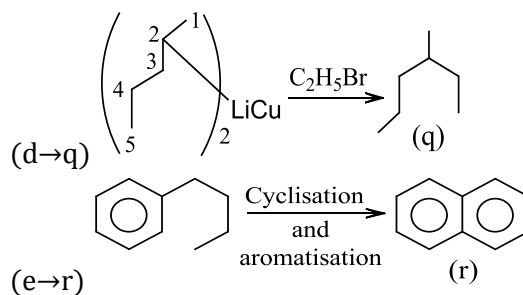
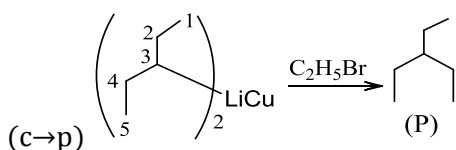


(a→s)

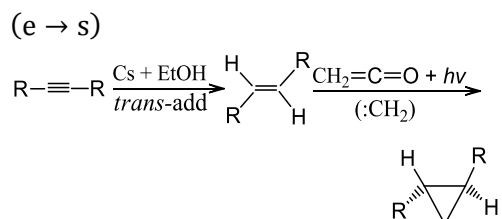
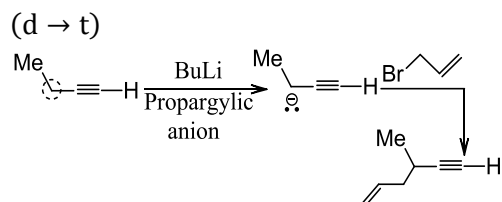
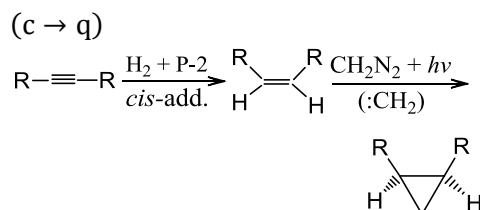
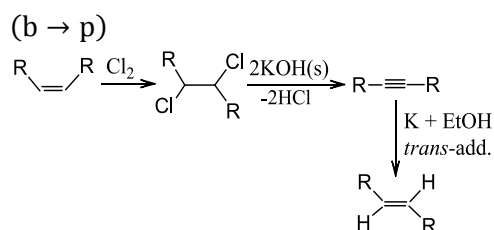
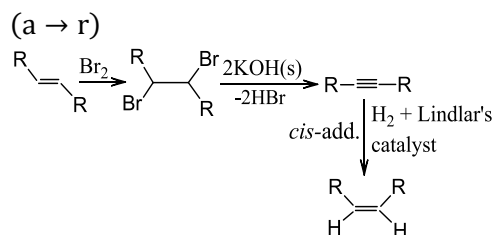
(b→r) It is intramolecular Kolbe's electrolytic reaction



Also, (c) and (d) reactions shown below are Corey–House synthesis:

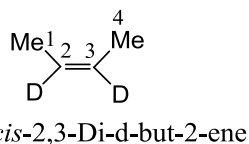
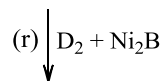
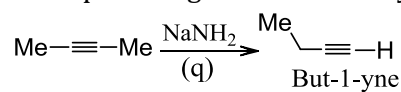


372 (a)

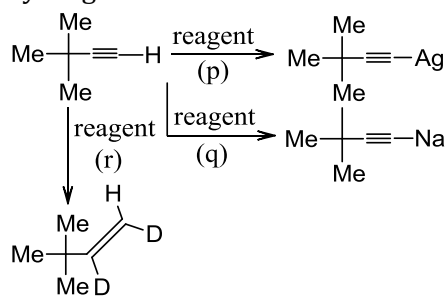


377 (a)

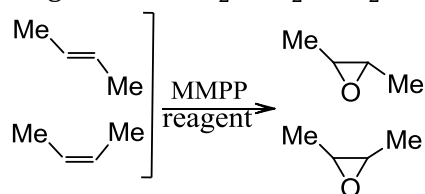
(a → q,r) internal alkynes do not react with Tollens reagent, but with NaNH_2 isomerisation takes place to give terminal alkynes



(b → p,q,r) Terminal alkynes react with both Tollens reagent and NaNH₂ to undergo hydrogenation



(c → s)(d → s) Alkenes do not react with Tollens reagent or NaNH₂ or D₂ + Ni₂B



378 (b)

(a → s) Hofmann elimination (less-substituted alkene), so bulky base (s) is required
 (b → r, t) Saytzeff elimination (more-substituted alkene), so less bulky base (r and t) are required
 (c → r, t) Same explanation as in (b)
 (d → s) Same explanation as in (a)
 (e → p, q) Anti-dehalogenation can be carried out by (p) or reduction of (R-X) to (R-H) by reagent (q)

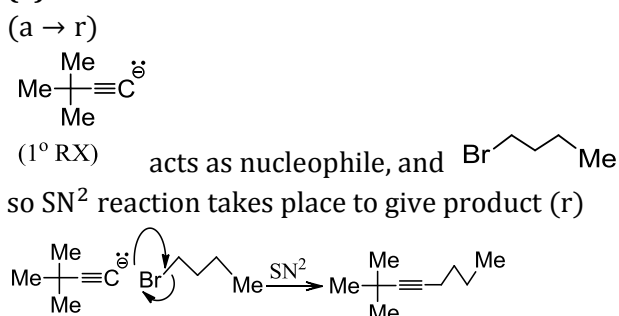
379 (d)

(a → r) Bulky base, Hofmann elimination, less-substituted alkene as in (R) is obtained
 (b → p) Simple base, Saytzeff elimination, more-substituted alkene as in (p) is obtained
 (c → s) Same explanation as in (a)
 (d → q) Same explanation as in (b)

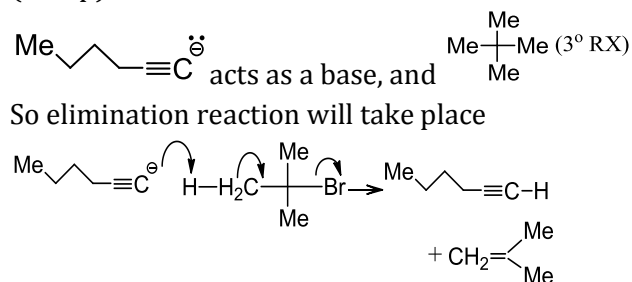
380 (d)

(a → r) Bulky base, Hofmann elimination, less-substituted alkene as in (R) is obtained
 (b → p) Simple base, Saytzeff elimination, more-substituted alkene as in (p) is obtained
 (c → s) Same explanation as in (a)
 (d → q) Same explanation as in (b)

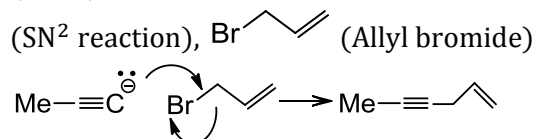
381 (a)



(b → p)



(c → s)



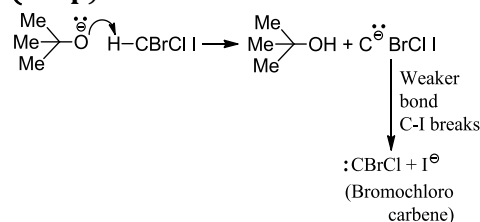
(d → q) Alkyl halide is Br-CH=CH₂ (vinyl bromide), which does not react. Hence, no reaction takes place

382 (b)

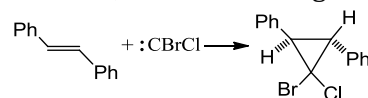
Reactions (a) and (c) are Swart reactions which are carried out by SbF₃ or Hg₂F₂, or AsF₃, AgF, CoF₃, etc
 So, the ANSWER is both (q) and (r)
 Reaction (b) is Finkelstein reaction and is carried out by NaI + Acetone. So, the ANSWER is (s)
 Reaction (d) is iodination that is carried by I₂ in the presence of an oxidizing agent, such as HNO₃, HgO, or HIO₃. So, the ANSWER is (p) and (t)

383 (b)

(a → s) HCl with peroxide does not undergo anti-Markovnikov's addition unlike HBr + peroxide, so reaction does not proceed by free-radical mechanism but by carbocation
 (b → p) Proceed via carbene mechanism

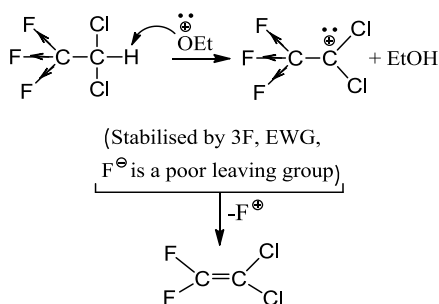


It is a stereospecific and stereoselective reaction; *trans* reactant gives *trans* product



(c → q) Proceeds via free-radical mechanism
 (d → q) Proceeds via free-radical mechanism
 (e → r) It is an example of E1cB (elimination unimolecular via conjugate base) and proceeds via carbanion mechanism. EWG (electron-withdrawing group) and poor leaving, three F

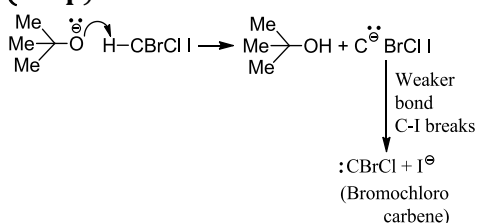
atoms stabilise the carbanion



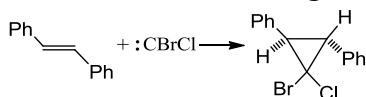
384 (b)

(a → s) HCl with peroxide does not undergo anti-Markovnikov's addition unlike HBr + peroxide, so reaction does not proceed by free-radical mechanism but by carbocation

(b → p) Proceed via carbene mechanism



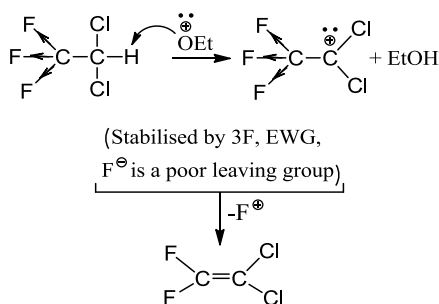
It is a stereospecific and stereoselective reaction; *trans* reactant gives *trans* product



(c → q) Proceeds via free-radical mechanism

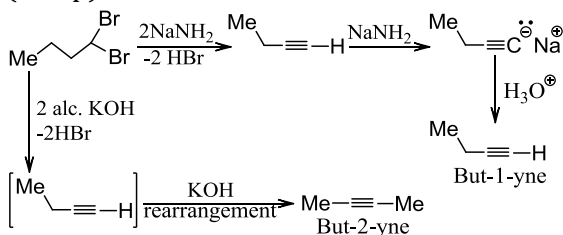
(d → q) Proceeds via free-radical mechanism

(e → r) It is an example of E1cB (elimination unimolecular via conjugate base) and proceeds via carbanion mechanism. EWG (electron-withdrawing group) and poor leaving, three F atoms stabilise the carbanion

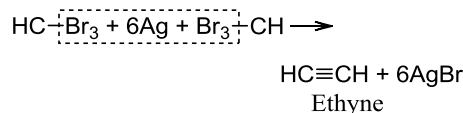


385 (b)

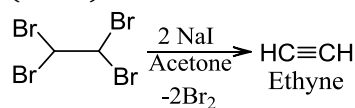
(a → p)



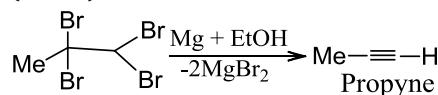
(c → r)



(d → r)



(e → s)



391 (a)

Column I	Column II
Benzene	(4n + 2)π-electrons
Ethylene	Mustard gas
Acetaldehyde	Silver mirror
Chloroform	Phosgene

Benzene has 6π-electrons, *i. e.*, it follows Huckel rule (4n + 2)π-electrons. Ethylene reacts with S₂Cl₂ to give mustard gas (war gas).

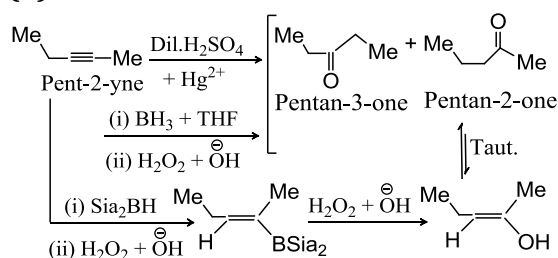
392 (a)

All the statement in Column II are self-explanatory

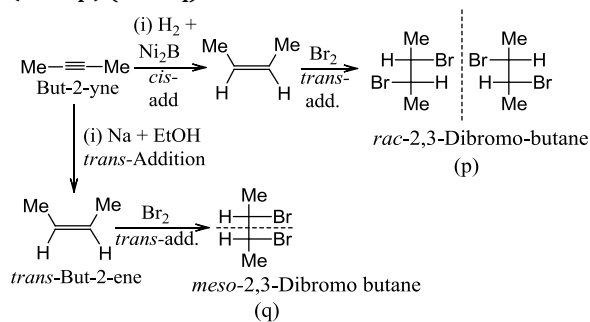
393 (a)

All the statement in Column II are self-explanatory

400 (b)



(d → p)(e → q)



403 (a)

Benzene give electrophilic substitution reactions

404 (c)

Dehydration alcohols to alkene carried out through carbocation

405 (b)

Weak bases are good leaving groups

Acidic order: $\text{H}_2\text{O} > \text{ROH} > \text{CH} \equiv \text{CH} > \text{NH}_3$

Basic order: $\text{OH}^- < \text{RO}^- < \text{CH} \equiv \text{C}^- < \text{NH}_2^-$

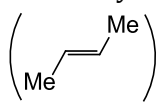
Weaker the base, better is the leaving group

Leaving group order:

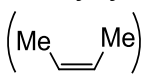
$\text{OH}^- > \text{RO}^- > \text{CH} \equiv \text{C}^- > \text{NH}_2^-$

411 (b)

Reaction (i) proceeds by anti-addition of H_2 , so

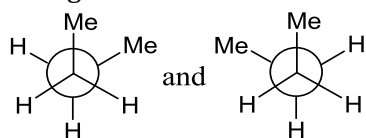
product (B) is  (*trans*-But-2-ene).

Reaction (ii) proceeds by syn-addition of H_2 , so

the product (C) is  (*cis*-But-2-ene)

413 (c)

Two gauche forms of butane are same

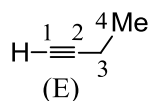
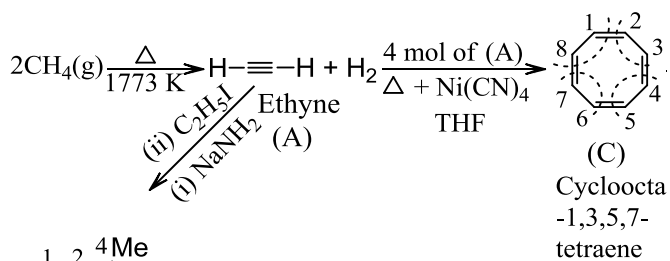


But gauche and anti forms are different. So, they are diastereomers

4 (d)

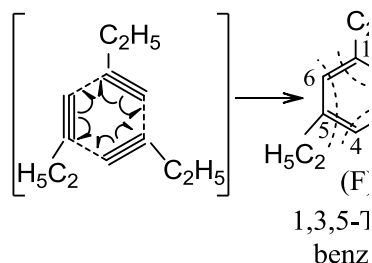
1

8



But-1-yne

3 mol of (E)
Red hot tube

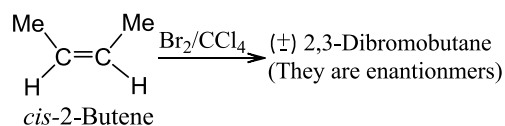
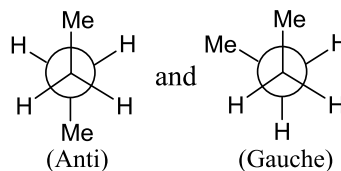


Compound (A) and (B), answer is (d)

4 (b)

1

9



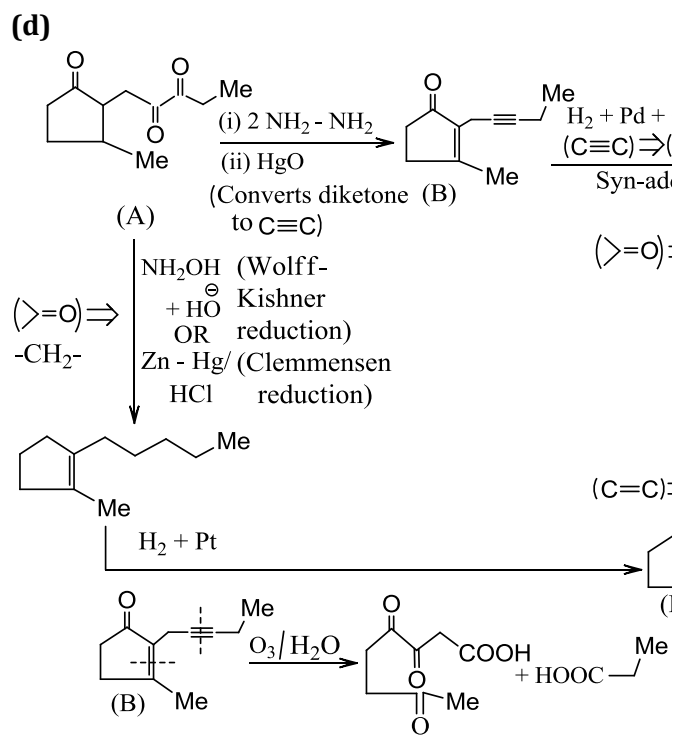
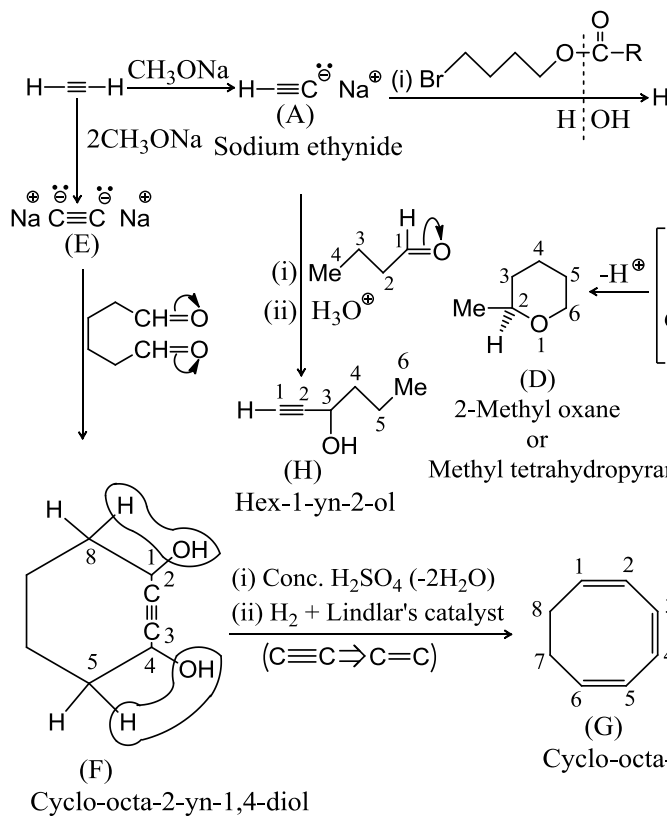
So the ANSwer is (c)

414 (a,b)

All the statements are self-explanatory

415 (b)

Cumulative diene is less stable and, hence, more $\Delta H^\circ_{\text{h}}$ and more $\Delta H^\circ_{\text{c}}$



Compound (B), answer is (d)

Compound (B), answer is (b)