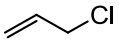
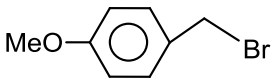
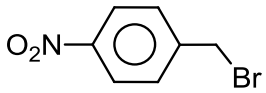
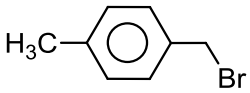
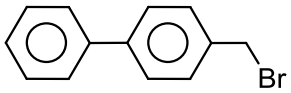
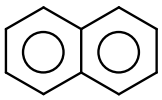
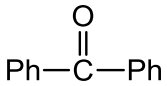
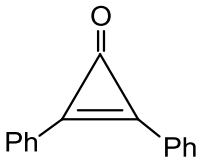
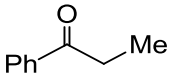
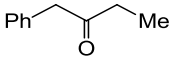
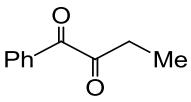
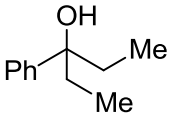
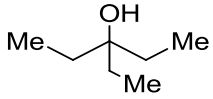
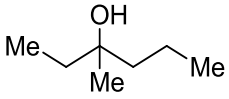
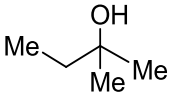
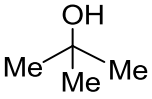
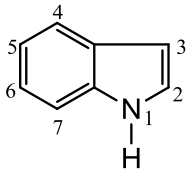
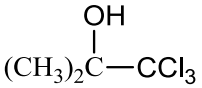
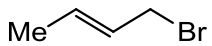
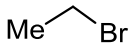
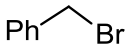
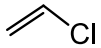
Single Correct Answer Type

1. Benzyl chloride ($C_6H_5CH_2Cl$) can be prepared from toluene by chlorination with:
   a) SO_2Cl_2 b) $SOCl_2$ c) Cl_2 d) NaOCl
2. The decreasing leaving group order (fugacity order) of the following compounds is:
   i.H_2Oii.H_2Siii.H_2Seiv.H_2Te
   a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iii)>(i)>(ii)>(iv) d) (iv)>(ii)>(i)>(iii)
3. Which is least reactive towards nucleophilic substitution (SN^2)?
   a)  b) Me_3C-Cl c) PhCl d) MeCH(Cl) Me
4. Which of the following will give SN^2 mechanism?
   a)  b)  c)  d) 
5. In the given sequence of reactions, predict (X)
   $(X) \xrightarrow[H_2O]{KOH} (Y) \xrightarrow[433K]{Al_2O_3} (Z) \xrightarrow{[O]} 2\ mol\ CH_3COOH$
   a) $CH_3CH_2CH\ (I)CH_3$ b) $CH_3CH_2CH_2CH_2I$ c) $CH_3CH(I)\ CH\ (I)CH_3$ d) $CH_3CH\ (I)CH_2CH_2I$
6. The decreasing basic order of the following is :
   i.$F_3CSO_3^{\ominus}$ii.$Cl_3C-COO^{\ominus}$
   iii.$PhSO_3^{\ominus}$iv. $MeSO_3^{\ominus}$
   a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(iv)>(iii)>(i) d) (iv)>(ii)>(i)>(iii)
7. The decreasing leaving group order of the following is:
   i. $F^{\ominus}$ ii. $Cl^{\ominus}$ iii. $Br^{\ominus}$ iv. $I^{\ominus}$
   a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)
8. The decreasing nucleophilic order of the following compounds is:
   i.$F^{\ominus}$ii.$Cl^{\ominus}$iii.$Br^{\ominus}$iv.$I^{\ominus}$
   a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)
9. Which of the following has the highest dipole moment?
   a)  b)  c)  d) 
10. Benzonitrile on reaction with C_2H_5MgBr, followed by hydrolysis, gives
    a)  b)  c)  d) 
11. Isopropyl alcohol is heated with a suspension of bleaching powder ($CaOCl_2$) with water. The products are:
    a) Ethane and propane b) Ethyne and ethene
    c) Trichloromethane and sodium acetate d) Carbon tetrachloride
12. The product formed by the reaction between 2,2,2-trichloroethanal and chlorobenzene in H_2SO_4 is:
    a) Chloretone b) DDT
    c) Chlorobenzaldichloride d) Benzene sulphonic acid
13. Propyl lithium reacts with ethene to give a compound (A), which on reaction with methanal followed by acidic hydrolysis gives compound (B). The compound (B) is:
    a) Heptan-1-ol b) Heptan-2-ol c) Hexan-1-ol d) Hexan-2-ol
14. Ethylmercaptan is prepared by the reaction of the following, followed by hydrolysis
    a) $C_2H_5MgBr + SO_2$ b) $C_2H_5MgBr + S$ c) $C_2H_5MgBr + CS_2$ d) $C_2H_5MgBr + H_2S$

15. The reaction of t-butyl bromide with sodium methoxide mainly produces:
    a) Isobutane
    b) Isobutylene
    c) t-Butyl methyl ether
    d) Sodium $tert$-butoxide
16. An ethereal solution of 4-nitrochlorobenzene is treated with metallic sodium. The product formed is:
    a) Aminobenzene
    b) 4,4-Dinitrodiphenyl
    c) p-Chloroaniline
    d) Benzene diazonium chloride
17. Which is the most effective ion in anSN^2displacement on methyl bromide?
    a) $C_2H_5O^{\ominus}$ b) $\overset{\ominus}{OH}$ c) $C_6H_5O^{\ominus}$ d) $CH_3COO^{\ominus}$
18. The decreasing basic order of the following compounds is:
    i.NH_3 ii.PH_3 iii.AsH_3iv.SbH_3
    a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)
19. Which of the following 3° alcohols does propyl ester give during reaction with EtMgBr?
    a) 
    b) 
    c) 
    d) 
20. Chlorination of methane proceeds by:
    a) Electrophilic substitution
    b) Nucleophilic substitution
    c) Free radical mechanism
    d) None of these
21. $C_6H_5Cl \xrightarrow[625\ K\ and\ 300atm]{NaOH(aq.)}$ ...The product can be:
    a) Benzal b) Sodium benzoate c) Benzol d) Sodium phenate
22. In order to prepare fluorobenzene from benzene diazonium chloride, which of the following reagents is used?
    a) Fluorine
    b) HF
    c) Hydrofluorosilicic Acid
    d) Fluoroboric acid
23. Which of the following mentioned positions in the given compound is more reactive towards electrophilic substitutions?

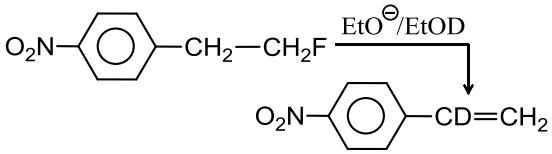


    a) 3 b) 2 c) 5 d) 6
24. Under the influence of air and light, chloroform decomposes into:
    a) CCl_4 b)  c) $COCl_2$ d) CCl_3CHO
25. Which one of the following compounds gives SN^1, SN^2, and $SN^{2\prime}$ mechanisms?
    a) 
    b) 
    c) 
    d) 
26. Coupling reaction between RMgX and R'X takes place to give R − R' in the presence of which of the following reagents?
    a) R′ − OTs b) $CoCl_2$ c) $MnCl_2$ d) All
27. Which of the following reactions is not stereospecific?
    a) SN^2
    b) Addition of Br_2 to ethylene in CCl_4
    c) Electrophilic substitution
    d) Glycol formation from alkenes with alkaline $KMnO_4$
28. In order to get ethanethiol from bromoethane, the reagent used is:
    a) Sodium bisulphide
    b) Sodium sulphide
    c) Potassium thiocyanate
    d) Potassium sulphide
29. Propane is not formed when C_3H_7MgBr is treated with

a) H_2 b) Phenol c) Ethanoic acid d) 2-Butyne

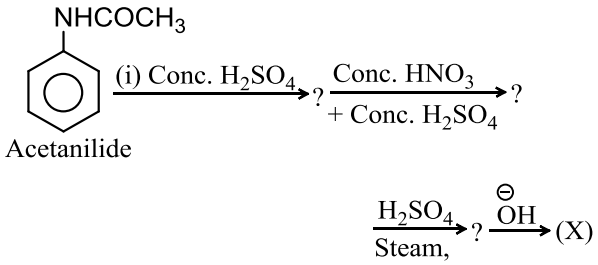
30. *n*-Propyl bromide on treatment with ethanolic potassiumhydroxide produces:
a) Propane b) Propene c) Propyne d) Propanol

31. In the following reaction:



By which mechanism does the reaction proceed?
a) E1 b) E2 c) E1cB d) β-Elimination

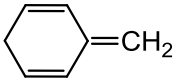
32. The final product (X) in the following reaction is:



a) 2-Nitroaniline b) 3-Nitroaniline c) 4-Nitroaniline d) Sulphanilic acid

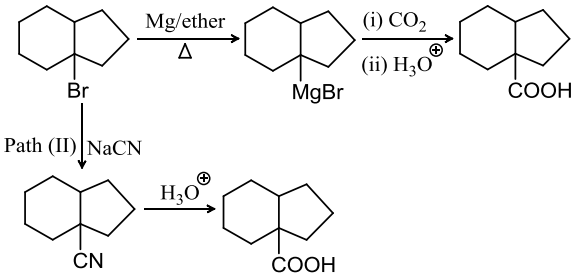
33. Chlorination of toluene in the presence of light and heat followed by the treatment with aqueous NaOH gives:
a) *o*-Cresol b) *p*-Cresol c) 2,4-Dihydroxy toluene d) Benzoic acid

34. The decreasing order of aromaticity of the following is
I. Benzene II. Naphthalene III. Anthracene
a) (I) >(II) > (III) b) (III) >(II) > (I) c) (II) > (I) > (III) d) (II) > (III) > (I)

35. Which of the following is the most stable species?
a)  b)  c)  d) 

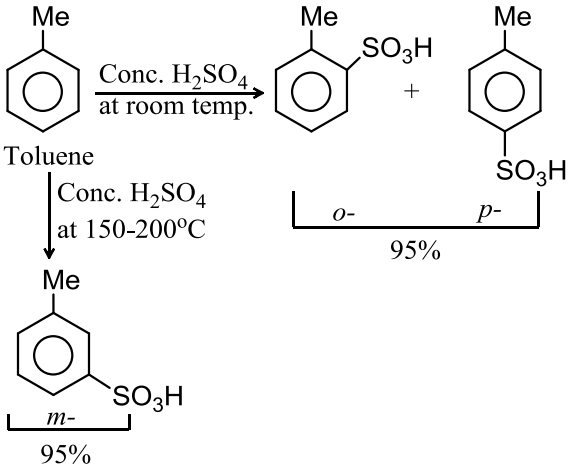
36. The decreasing leaving group order of the following compounds is:
i. $\overset{\ominus}{C}H_3$ ii. $\overset{\ominus}{N}H_2$ iii. $\overset{\ominus}{O}H$ iv. $F^{\ominus}$
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)

37. In the following reaction, the final product can be prepared by two paths (I) and (II).
Which of the following statements is correct?



a) Path (I) is feasible
b) Path (II) is feasible
c) Both paths are feasible
d) Neither of the two paths is feasible

38. For the preparation of chloroethane,
a) HCl gas is passed through ethanol
b) Ethanol is treated with thionyl chloride in the presence of dimethyl amine or pyridine
c) Ethyl sulphide is treated with hydrogen chloride
d) Any of the above methods can be employed

39. 

Which of the following statements is wrong about the reaction?

a) At lower temperature, the reaction is kinetically controlled and o/pdirective effects of the (Me) group operate

b) At a higher temperature, the reaction is thermodynamically controlled, and longer reaction times are employed for equilibrium to be reached. The most stable form of m-toluene sulphonic acid is obtained

c) (Me−)group is activated by +I effect, and o-, p-directing

d) (Me−) group is deactivating by hyperconjugation and is m-directing

40. Which is most reactive towards Br_2 in the presence of $FeBr_3$?

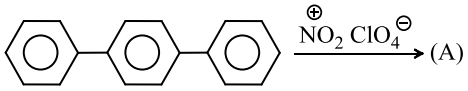
a) Anisole b) Benzene c) Bromobenzene d) Nitrobenzene

41. Which of the following deactivates the aromatic nucleus?

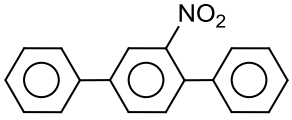
a) $-CH_3$ b) $-Br$ c) $-NH_2$ d) $-NR_2$

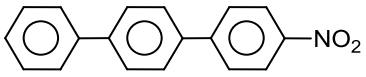
42. 1-Chorobutane on reaction with alcoholic potash gives:

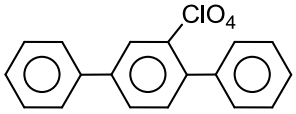
a) 1-Butene b) 1-Butanol c) 2-Butene d) 2-Butanol

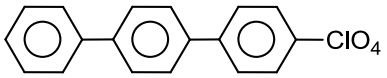
43. 

(A) would be:

a) 

b) 

c) 

d) 

44. The yield of chlorobenzene obtained by reaction of phenols with PCl_5 is less due to the formation of:

a) o-Chlorophenol b) p-Chlorophenol

c) Phosphorus oxychloride d) Triphenyl phosphate

45. Ullmann reaction involves the use of the following reactants:

a) Iodobenzene and sodium b) Benzene and copper

c) Iodobenzene and copper powder d) Benzene diazonium chloride and Cu/HCl

46. The decreasing fugacity order of the following is:

i. Me_2N-NMe_2 ii. $MeNH-NHMe$

iii. H_2N-NH_2 iv. NH_3

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

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

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

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

47. In the reaction $CH_3C\equiv\overset{\ominus}{C}\ \overset{\oplus}{N}a + (CH_3)_2\ CHCl$ the product formed is :

a) 4-Methyl -2-pentyne only

b) Propyne
c) Propyne and propylene
d) Mixture of propene, propyne, and 4-methyl-2- pentyne

48. The decreasing nucleophilic order of the following compounds is:
i.H_2O ii.H_2S iii.H_2Se iv.H_2Te
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iii)>(i)>(ii)>(iv) d) (iv)>(ii)>(i)>(iii)

49. Which of the following sequences would yield *m*-nitro chlorobenzene (Z) from benzene?
a) $\text{Benzene} \xrightarrow{Cl_2/FeCl_3} (X) \xrightarrow[H_2SO_4]{HNO_3} (Z)$
b) $\text{Benzene} \xrightarrow{H_2SO_4/HNO_3} (Z)$
c) $\text{Benzene} \xrightarrow{H_2SO_4/HNO_3} (X) \xrightarrow{FeCl_3/Cl_2} (Z)$
d) All of these above will produce (Z)

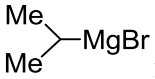
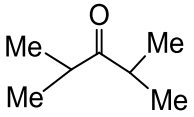
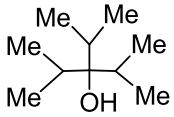
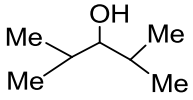
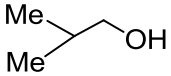
50. Pick up the correct statement about alkyl halides
a) They are associated with each other by H-bonds
b) They dissolve in water quickly
c) They dissolve easily in organic solvents
d) They do not contain any polar bonds in their molecules

51. $Ph—CH(OH)CH_3 \xrightarrow{SOCl_2}$
Specific rotation = $+50^o$

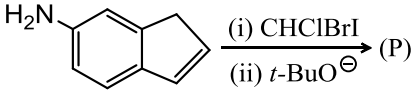
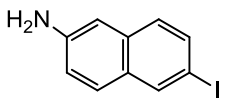
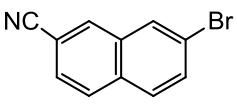
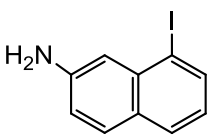
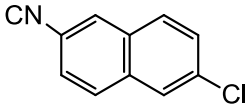
$PhCH(Cl)—CH_3$

by which of the following mechanisms does the reaction proceed?
a) SN^1 b) SN^2 c) SN^i d) E2

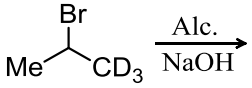
52. Identify (C) in the following series
$C_3H_7I \xrightarrow{KOH(alc.)} (A) \xrightarrow[\Delta]{NBS} (B) \xrightarrow{KCN(aq.)} (C)$
a) $(CH_3)_2CH-CN$ b) $CH_2=CH-CH_2CN$ c) $Br-CH=CH-CN$ d) $CH_2=CH-CH(Br)CN$

53. When  is treated with  followed by hydrolysis, the product is
a) 
b) 
c) 
d) None of these

54. The reaction conditions leading to the best yield of C_2H_5Cl are:
a) C_2H_6 (Excess) $+ Cl_2 \xrightarrow{U.V.llght}$
b) $C_2H_6 + Cl_2$(Excess) $\xrightarrow[\text{Room temp}]{\text{Dark}}$
c) $C_2H_6 + Cl_2$ (Excess) $\xrightarrow{U.V.llght}$
d) $C_2H_6 + Cl_2 \xrightarrow{U.V.llght}$

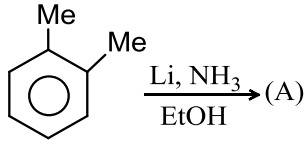
55. In the reaction  , product (P) will be:
a) 
b) 
c) 
d) 

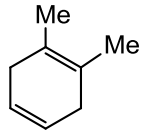
56. Which of the following halides can yield ethane and also methane in a single step?
a) C_2H_5Br b) CH_3I c) $(CH_3)_2CHBr$ d) None

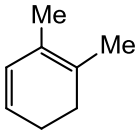
57. 
(Major product)
By which mechanism does the above reaction proceed?
a) E1 b) E2 c) E1cB d) γ-Elimination

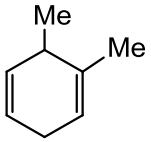
58. $C_6H_5Cl \xrightarrow{Ni-Al/NaOH}$ (A). In this reaction, (A) is:
a) Phenol b) Sodium phenoxide c) Benzol d) Benzene

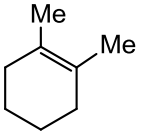
59. Which of the following on reaction with chloroform will give chloretone?
a) HNO_3 b) $(CH_3)_2\ C = O$ c) Chloral d) $(CH_3)_2CHCHO$

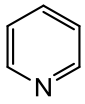
60. 

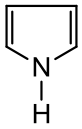
(A) would be:
a) 

b) 

c) 

d) 

61. Which of the following aromatic compounds is least reactive towards electrophilic substitutions?
a) 

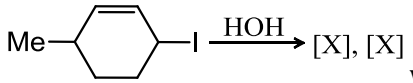
b) 

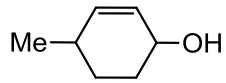
c) 
d) 

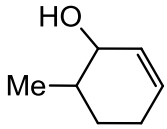
62. The decreasing order of dipole moment of the following is:
I.CH_3ClII. CH_3BrIII. CH_3F
a) (I)>(II)>(III) b) (I)>(III)>(II) c) (II)>(I)>(III) d) (II)>(III)>(I)

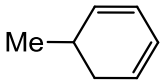
63. Which of the following represents Westrosol?
a) $CHCl_3$ b) CH_2Cl_2 c) $CHCl_2CH_2Cl$ d) $CCl_2 = CHCl$

64. The reaction involving the treatment of benzene diazonium chloride with copper powder and HCl is termed as:
a) Sandmeyer's reaction b) Gattermann's reaction
c) Ullmann's reaction d) Kolbe's reaction

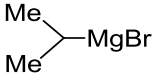
65. In the reaction 

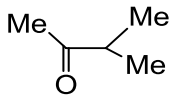
will be:
a) 

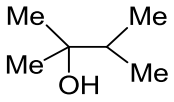
b) 

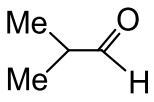
c) Both (a) and (b)
d) 

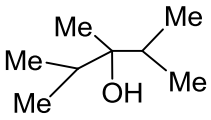
66. The decreasing leaving group order of the following compounds is :
i.$F_3CSO_3^{\ominus}$ii.$Cl_3C - COO^{\ominus}$
iii.$PhSO_3^{\ominus}$iv. $MeSO_3^{\ominus}$
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iii)>(i)>(ii)>(iv) d) (i)>(iii)>(iv)>(ii)

67. When methyl orthoformate is treated with 

MgBr followed by hydrolysis, the product is:
a) 

b) 

c) 

d) 

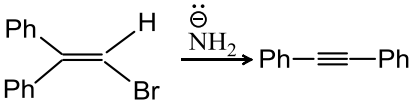
68. The decreasing nucleophilic order of the following compounds is :
i.$F_3CSO_3^{\ominus}$ii.$Cl_3C - COO^{\ominus}$
iii.$PhSO_3^{\ominus}$iv. $MeSO_3^{\ominus}$
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(iv)>(iii)>(i) d) (iv)>(ii)>(i)>(iii)

69. The decreasing leaving group order of the following compounds is:
i.NH_3ii.PH_3iii.AsH_3iv.SbH_3
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)

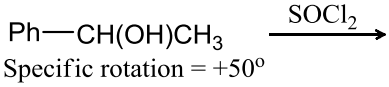
70. When bromoethane is treated with potassium sulphide, the main product formed is:

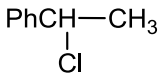
a) Ethanethiol b) Ethanol c) Mustard gas d) Thioethyl ethane

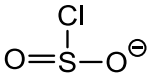
71. Which of the following most readily undergoes nucleophilic substitution?
a) $CH_2 = CHCl$ b) $CH_3CH = CHCl$
c) $H_2C = CHC(Cl) = CH_2$ d) $CH_2 = CHCH_2Cl$

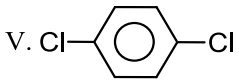
72. 

Which of the following statements is correct about the above reaction?
a) The reaction proceeds by α -elimination *via*the formation of a carbene as an intermediate
b) The reaction proceeds by α -elimination *via*the formation of a carbanion as an intermediate
c) The reaction proceeds by E1 mechanism
d) The reaction proceeds E1cB mechanism

73. 

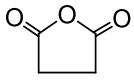
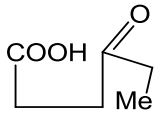


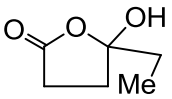
which of the following acts as a leaving group?
a) $\overset{\ominus}{O}H$ b) $Cl^{\ominus}$ c) SO_2 d) 

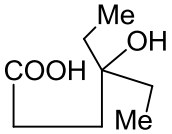
74. Consider the following halogen-containing compounds;
I.$CHCl_3$ II. CCl_4 III. CH_2Cl_2
IV. CH_3Cl V. 

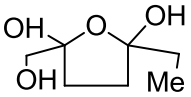
a) (II),(V) b) (II) c) (III),(IV) d) (I),(IV)

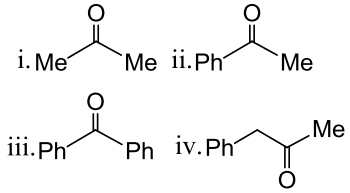
75. Neopentyl chloride on reaction with ethanolic KOH is likely to:
a) Neopentyl alcohol b) Pentylene c) 2-Methyl -2-butene d) Undergo no reaction

76. 
When is treated with C_2H_5MgBr,followed by hydrolysis, the product is:
a) 

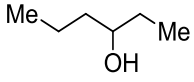
b) 

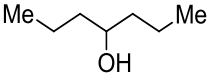
c) 

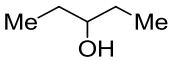
d) 

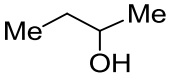
77. Reactivity of MeMgBr with the following in the decreasing order is:


a) (i)>(ii)>(iii)>(iv) b) (iv)>(i)>(ii)>(iii) c) (i)>(iii)>(ii)>(iv) d) (iv)>(ii)>(iii)>(i)

78. Ethyl ester reacts with PrMgBr to give 2°alcohol. The alcohol is:
a) 

b) 

c) 

d) 

79. Which of the following reagents will be able to distinguish between allyl bromide and *n*-propyl bromide?
a) Aqueous $AgNO_3$ b) NaOH, $AgNO_3$ c) Alk. $KMnO_4$ d) Tollens reagent

80. Which of the following is most easily cleaved by HBr
a) 

b) 
c) 

d) 

81. Decreasing nucleophilic order of the following is:

i. Me_2N-NMe_2 ii. $MeNH-NHMe$
iii. H_2N-NH_2 iv. NH_3

a) (i)>(ii)>(iii)>(iv)
b) (iv)>(iii)>(ii)>(i)
c) (iv)>(iii)>(i)>(ii)
d) (iii)>(iv)>(ii)>(i)

82. The decreasing basic order of the following is:

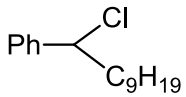
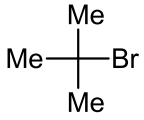
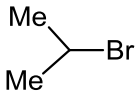
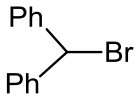
i. $PhSO_3^{\ominus}$ ii. $C_2H_5SO_3^{\ominus}$ iii. $C_2H_5COO^{\ominus}$ iv. $\overset{\ominus}{C}N$
v. $\overset{\ominus}{O}H$

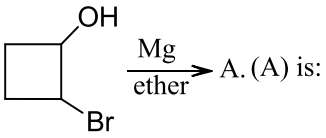
a) (v)>(iv)>(iii)>(ii)>(i)
b) (i)>(ii)>(iii)>(iv)>(v)
c) (iv)>(v)>(iii)>(ii)>(i)
d) (i)>(ii)>(iii)>(v)>(iv)

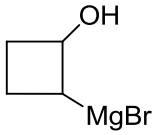
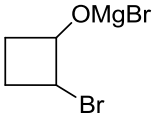
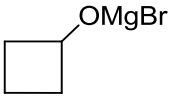
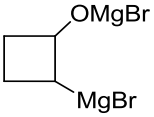
83. Gammexane is the name given to:

a) $C_6H_3Cl_3$
b) $C_6H_4Cl_2$
c) $C_6H_6Cl_6$
d) Diphenyltrichloroethane

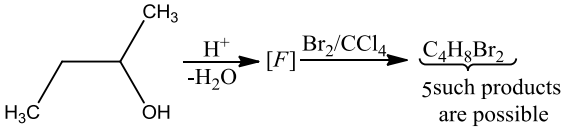
84. Which of the following substrates will give racemised product?

a) 
b) 
c) 
d) 

85. 

a) 
b) 
c) 
d) 

86. How many structures of *F* is possible?



a) 2
b) 5
c) 6
d) 3

87. The decreasing nucleophilic order of the following compounds is:

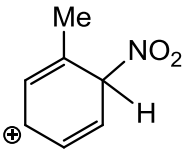
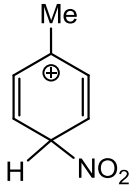
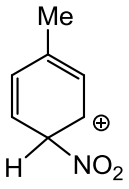
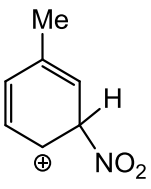
i. $\overset{\ominus}{C}H_3$ ii. $\overset{\ominus}{O}H$ iii. $CH_3COO^{\ominus}$ iv. H_2O

a) (i)>(ii)>(iii)>(iv)
b) (iv)>(iii)>(ii)>(i)
c) (iii)>(ii)>(i)>(iv)
d) (iii)>(ii)>(iv)>(i)

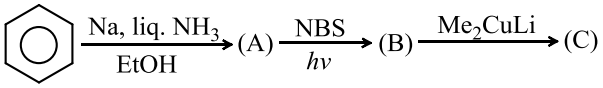
88. HBr reacts with $CH_2=CH-OCH_3$ under anhydrous conditions at room temperature to give:

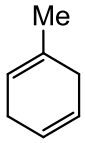
a) CH_3CHO and CH_3Br
b) $BrCH_2CHO$ and CH_3OH
c) $BrCH_2CH_2OCH_3$
d) $CH_3-CH(Br)-OCH_3$

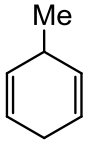
89. Which of the following is the most stable arenonium or benzenium ion?

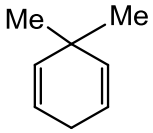
a) 
b) 
c) 
d) 

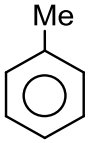
90. The final product (C) in the following reactions is:



a) 

b) 

c) 

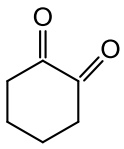
d) 

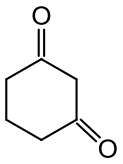
91. The decreasing order of the rate of nitration of the following compounds is
I. Benzene **II**. C_6D_6
III. Nitrobenzene**IV.**Chlorobenzene
a) (I) > (II) > (III) > (IV) b) (I) >(II) > (IV) > (III)
c) (I) = (II) > (IV) > (III) d) (I) = (II) > (III) > (IV)

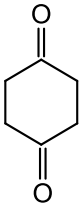
92. Which of the following halides is capable of exhibiting enantiomerism?
a) Ethyl chloride b) Isopropyl bromide c) *sec*-Butyl iodide d) *tert*-Butyl chloride

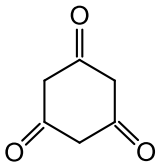
93. The reaction between chloral and chlorobenzene in H_2SO_4yields:
a) Chloretone b) p,p-Dichlorodiphenyl trichloroethane
c) o-Chlorobenzaldichloride d) Chloralphenylchloride

94. The compound that will react most readily with NaOH to form methanol is:
a) $(CH_3)_4\overset{\oplus}{N}I^{\ominus}$ b) CH_3OCH_3 c) $(CH_3)_3S^{\oplus}I^{\ominus}$ d) $(CH_3)_3CI$

95. Which of the following ketonic compound is the least stable?
a) 

b) 

c) 

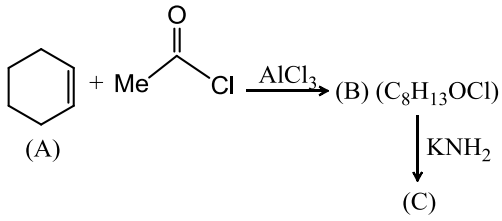
d) 

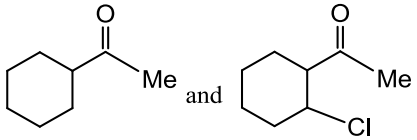
96. Bottles containing PhI and $PhCH_2I$ lost their original labels. They were labelled as (A) and (B) for testing. (A) and (B) were separately taken in test tubes and boiled with NaOH solutions. The end solution in each tube was made acidic with dilute HNO_3 and some $AgNO_3$ solution was added. Substance (B) gave a yellow precipitate. Which of the following statements is true for this experiment?
a) Addition of $HNO_3$was unnecessary b) (A)was PhI
c) (A)was $PhCH_2I$ d) (B) was PhI

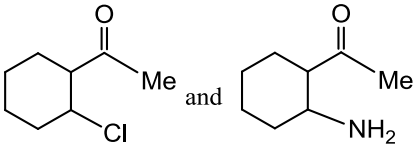
97. Which of the following reacting substances will not liberate ethyne gas?
a) CH_3Cl and Ag b) CaC_2andH_2O c) CHI_3 and Ag d) $CHCl_3$and Ag

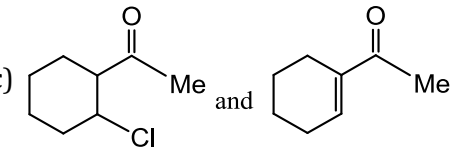
98. The decreasing basic order of the following is:
i. $\overset{\ominus}{C}H_3$ ii. $\overset{\ominus}{N}H_2$ iii. $\overset{\ominus}{O}H$ iv. $F^{\ominus}$
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)

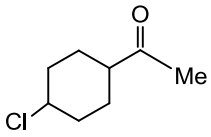
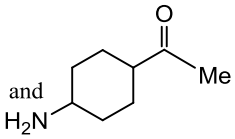
99. Ethanol $\xrightarrow{P_4/I_2}$ (X) $\xrightarrow[(ii)HBr]{(i)KOH(alc.)}$ (Y)In this sequence of reactions, (Y) is:
a) Ethene b) Bromoethane c) Ethanol d) None

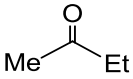
100. 

Compounds (B) and (C), respectively, are:
a) 

b) 

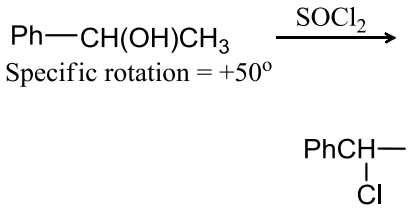
c)  and

d)  and 

101. Reactivity of  Et with the following G.R. in decreasing order is:

1. MeMgBr
2. EtMgBr
3. $Me_2CH - MeBr$
4. $Me_3C - MgBr$

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (i)>(ii)>(iv)>(iii) d) (iv)>(ii)>(iii)>(i)

102. 

the reaction is carried out in the presence of pyridine. Which of the following mechanisms does it follow?

a) SN^1 b) SN^2 c) SN^i d) E2

103. Nitration of xylene gives only one mono-nitro derivative. Which xylene is it?

a) *ortho* b) *meta* c) *para* d) Both *o*and *p*

104. Propane dithioic acid is prepared by the reaction of the following, followed by hydrolysis:

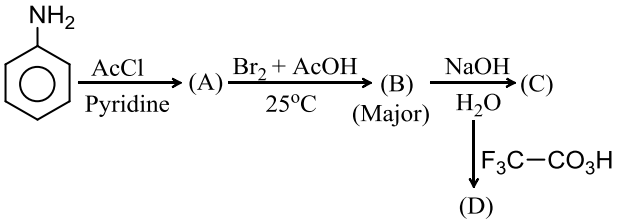
a) $C_3H_7MgBr + CS_2$ b) $C_2H_5MgBr + CS_2$ c) $C_3H_7MGBr + SO_2$ d) $C_2H_5MgBr + SO_2$

105. The decreasing basic order of the following is:

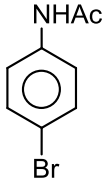
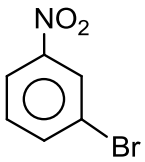
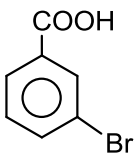
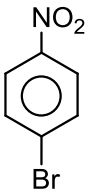
i. $\overset{\ominus}{C}N$ ii. $\overset{\ominus}{O}H$ iii. $\overset{\ominus}{O}Me$ iv. $\overset{\ominus}{C}H_3$ v.$H^{\ominus}$

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

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

106. 

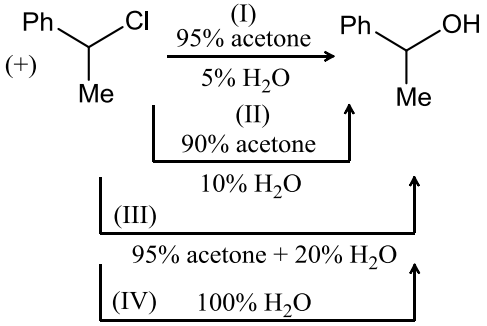
(D) would be:

a)  b)  c)  d) 

107. Acetoisonitrile on reaction with C_2H_5MgBr, followed by hydrolysis, gives compound (A), which on further hydrolysis gives (B) and (C).(B) and (C) are:

a) $MeNH_2$and EtCHO b) $EtNH_2$ and MeCHO c) $MeNH_2$and EtCOOH d) $EtNH_2$ and MeCOOH

108. Consider the following reactions:

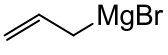
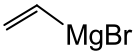


Arrange the following reactions in the decreasing order, of greater proportion of inverted product and select the correct answer

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

109. Reactivity of HCHO with the following G.R. in the decreasing order is:

1. PhMgBr
2. $PhCH_2MgBr$

iii.  iv. 

a) (iv)>(iii)>(ii)>(i) b) (i)>(ii)>(iii)>(iv) c) (iii)>(ii)>(i)>(iv) d) (ii)>(iii)>(i)>(iv)

110. $C_3H_7Cl \xrightarrow{KOH(alc.)} (A) \xrightarrow[770K]{Cl_2(g)} (X)$.(X) can be:

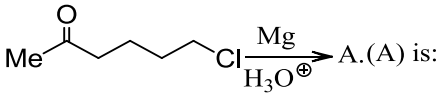
a) Vinyl chloride b) Allyl chloride c) Ethyl chloride d) Ethyl iodide

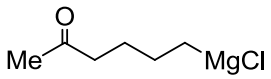
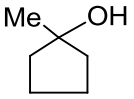
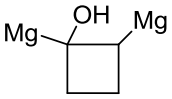
111. The formation of an optically active compound from a chiral molecule is called:

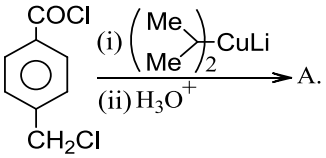
a) Asymmetric synthesis b) Resolution
c) Walden inversion d) Epimerisation

112. Which of the following is called Westron?

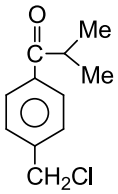
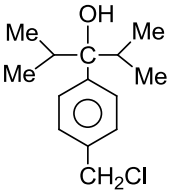
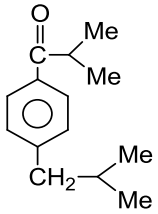
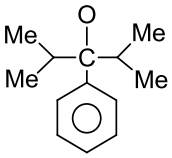
a) CH_3Cl b) $CHCl_3$ c) $CHCl_2CH_2Cl$ d) $CCl_2 = CHCl$

113.  A.(A) is:

a)  b)  c)  d) 

114. 

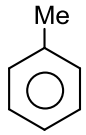
The Product A is:

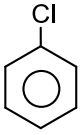
a)  b)  c)  d) 

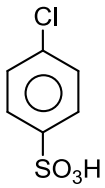
115. The most reactive compound for electrophilic nitration will be:

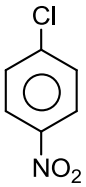
a) Toluene b) Benzoic acid c) Nitrobenzene d) Benzene

116. The decreasing order of ArSN reaction with $C_2H_5O^{\ominus}$/EtOH is:

I. 

II. 

III. 

IV. 

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

117. Give the decreasing order of K_a value of the following compounds

I. 

II. 

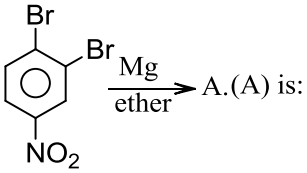
III. 

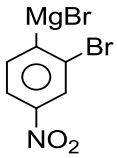
IV. 

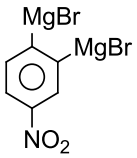
a) (I) > (IV) > (III) > (II)
b) (II) > (III) > (IV) > (I)
c) (I) > (III) > (II) > (IV)
d) (I) > (IV) > (II) > (III)

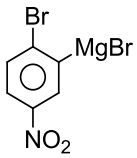
118. Alcohol is not formed when RMgX is treated with

a) Ethanoyl chloride
b) O_2
c) Oxirane
d) Methyl orthoformate

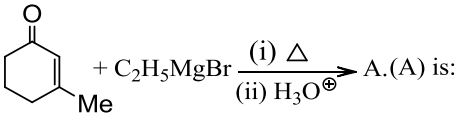
119. 

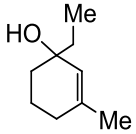
a) 

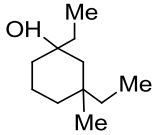
b) 

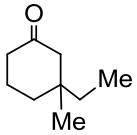
c) 

d) None of these

120. 

a) 

b) 

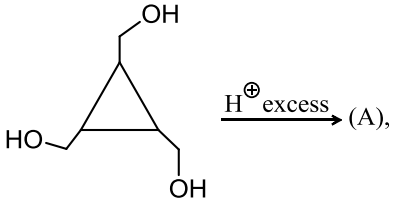
c) 

d) Both (a) and (b)

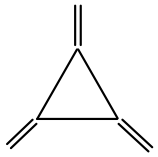
121. Among the following compounds, the strongest acid is:

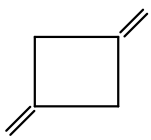
a) HC ≡ CH
b) C_6H_6
c) C_2H_6
d) CH_3OH

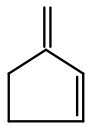
122. For the reaction:

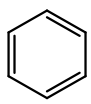


what is product (A)?

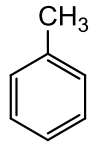
a) 

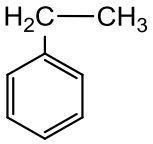
b) 

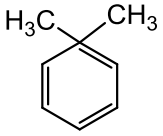
c) 

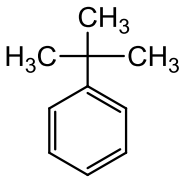
d) 

123. Which of the following compounds is the most reactive towards electrophilic substitution reaction?

a) 

b) 

c) 

d) 

124. Lindane can be obtained by the reaction of benzene with:
a) $CH_3Cl/Anhy.\ AlCl_3$ b) $Cl_2/Sunlight$ c) $C_2H_5I/Anhy.\ AlCl_3$ d) $CH_3COCl/AlCl_3$

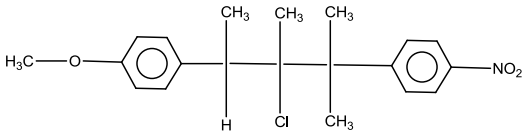
125. The experimentally determined rate equation for the alkaline hydrolysis of RBr is given by:

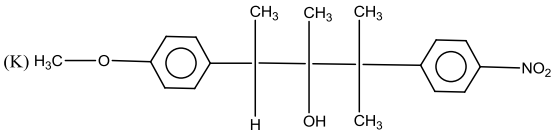
Rate $= K[\text{RBr}]\ [\overset{\ominus}{\text{OH}}]$

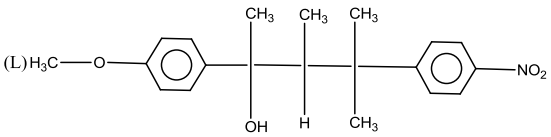
Which of the following statements is inconsistent with these observations?
a) The reaction is first order with respect to RBr b) The reaction is second order overall
c) The reaction process is false d) The rate-determining step is bimolecular

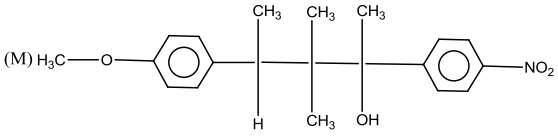
126. When phenol is treated with excess bromine water, it gives:
a) m-Bromophenol b) o- and p-bromophenol
c) 2,4-Dibromophenol d) 2,4,6-Tribromophenol

127. The following compound on hydrolysis in aqueous acetone will give





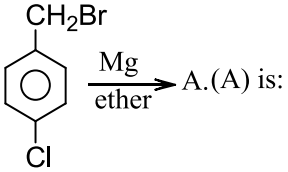




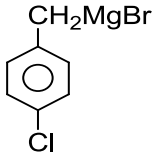
a) Mixture of (K) and (L) b) Mixture of (K) and (M)
c) Only (M) d) Only (K)

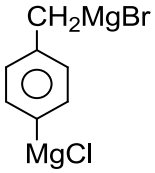
128. $CH_3 - CH(Cl) - C_2H_5 \xrightarrow{\text{Alc.KOH}} CH_3 - CH = CH - CH_3$. The above reaction proceeds viaE1cB mechanism. Which of the following statements is true about E1cB mechanism?
a) It is second order and bimolecular b) It is first order and unimolecular
c) It is first order and bimolecular d) It is second order and unimolecular

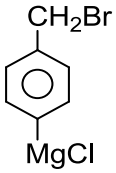
129. The reaction of toluene with chlorine in the presence of ferric chloride gives predominantly:
a) Benzoyl chloride b) m-Chlorotoluene
c) Benzyl chloride d) o- and p-Chlorotoluene

130. 

A.(A) is:

a) 

b) 

c) 

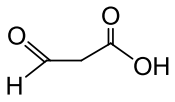
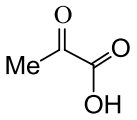
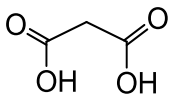
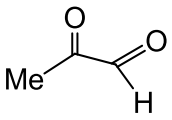
d) None of these

131. Which of the following is a geminaldihalide?
a) Ethylene dibromide b) Propylidene chloride c) Isopropyl bromide d) None of the above

132. Which of the following is the correct order of the rate of reaction of C_6H_6, C_6D_6, and C_6T_6, towards nitration?
a) $C_6H_6 > C_6D_6 > C_6T_6$ b) $C_6H_6 = C_6D_6 = C_6T_6$ c) $C_6H_6 > C_6D_6 = C_6T_6$ d) $C_6T_6 > C_6D_6 > C_6H_6$

133. The end product (C) of the following sequence of reaction is:

$$CH \equiv CH + MeMgBr\ (1\ mol) \longrightarrow (A) \xrightarrow[(ii)H_3O^{\oplus}]{(i)CO_2} (B) \xrightarrow{HgSo_4/H_2SO_4} (C)$$

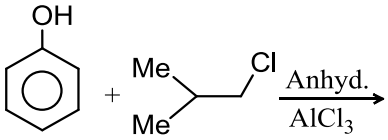
a) 
b) 
c) 
d) 

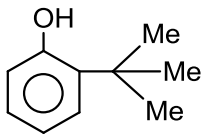
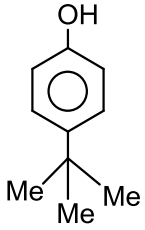
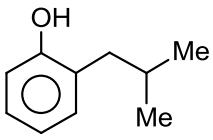
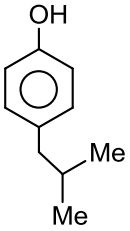
134. Iodoform can be prepared from:
a) Isoamyl alcohol b) α-Phenyl ethanol c) lsobutyl alcohol d) β-Phenyl ethanol

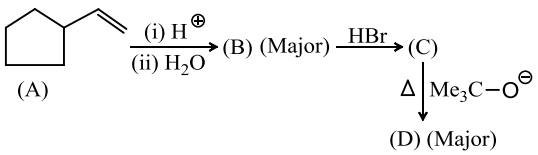
135. Chlorobenzene can be prepared by reacting aniline with:
a) Hydrochloric acid
b) Cuprous chloride
c) Chlorine in the presence of anhydrous aluminiumchloride
d) Nitrous acid followed by heating with cuprous chloride

136. The order of reactivities of the following alkyl halides for an SN^2 reaction is:
a) RF > $RCI > RBr > RI$ b) RF > $RBr > RCI > RI$
c) RCI > $RBr > RF > RI$ d) RI > $RBr > RCI > RF$

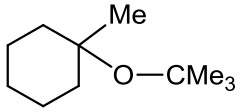
137. Give the major product of the following reaction

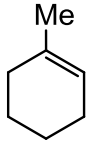


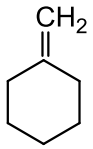
a) 
b) 
c) 
d) 

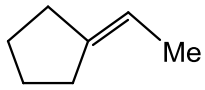
138. 

Compound(D) is:

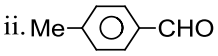
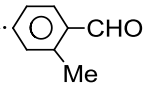
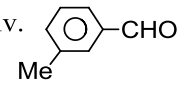
a) 

b) 

c) 

d) 

139. Reactivity of PhMgBr with the following in the decreasing order is:

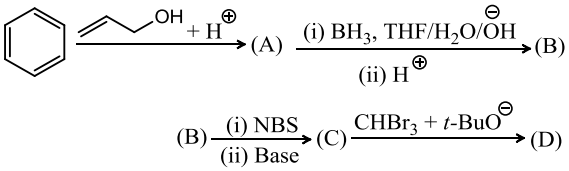
i. PhCHO ii.  iii.  iv. 

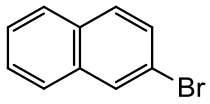
a) (i)>(iv)>(ii)>(iii) b) (iii)>(ii)>(iv)>(i) c) (i)>(iii)>(ii)>(iv) d) (i)>(ii)>(iii)>(iv)

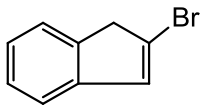
140. Which of the following alkyl halides undergoes SN^1 reaction the fastest?

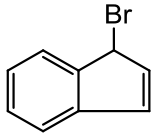
a) Methyl chloride b) Ethyl chloride c) Isobutyl chloride d) *tert*-Butyl chloride

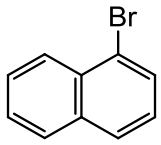
141. What is the end product (D) of the following reaction?



a) 

b) 

c) 

d) 

142. The decreasing nucleophilic order of the following compounds is:

i. $PhSO_3^{\ominus}$ ii. $C_2H_5SO_3^{\ominus}$ iii. $C_2H_5COO^{\ominus}$ iv. $\overset{\ominus}{C}N$ v. $\overset{\ominus}{O}H$

a) (v)>(iv)>(iii)>(ii)>(i)
b) (i)>(ii)>(iii)>(iv)>(v)
c) (iv)>(v)>(iii)>(ii)>(i)
d) (i)>(ii)>(iii)>(v)>(iv)

143. Choose the incorrect reaction

a) $2C_2H_5I + 2Na \xrightarrow{(C_2H_5)_2O} C_4H_{10} + 2NaI$ b) $2C_2H_5Br + Zn \xrightarrow{EtOH} (C_2H_5)_2\,Zn + Br_2$

c) $2C_2H_5I + Na_2S \rightarrow (C_2H_5)_2S + 2NaI$ d) $2C_2H_5Br + NaI \xrightarrow{(CH_3)_2C=O} C_2H_2I + NaBr$

144. Which of the following represents Freon?

a) Acetylene tetrachloride b) Trichloroethylene
c) Dichlorodifluoromethane d) Ethylene dichloride

145. What happens when CCl_4 is treated with $AgNO_3$ solution?

a) NO_2 in evolved b) A white precipitate of AgCl is formed
c) CCl_4 will dissolves in $AgNO_3$ solution d) NO reaction

146. A solution of (+)-2-chloro-2-phenylethane in toluene racemises slowly in the presence of a small amount of $SbCl_5$ due to the formation of:

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

147. Isopentane on monochlorination gives ..... isomers and out of them ..... are optically active

a) 3,1 b) 4,2 c) 3,2 d) 4,1

148. Which of the following has the highest boiling point?

a) C_3H_7Cl b) C_4H_9Cl c) $CH_3CH(CH)_3CH_2Cl$ d) $(CH_3)_3C-Cl$

149. The decreasing fugacity orderof the following compounds is:

i. $\overset{\ominus}{C}N$ ii. $\overset{\ominus}{O}H$ iii. $\overset{\ominus}{O}Me$ iv. $\overset{\ominus}{C}H_3$ v.$H^{\ominus}$

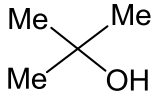
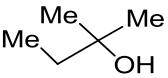
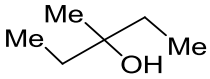
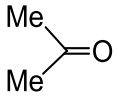
a) (v)>(iv)>(iii)>(ii)>(i)

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

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

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

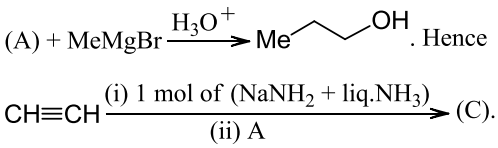
150. When ethyl ethanoate is treated with excess of MeMgBr, followed by hydrolysis, the product is:

a)  b)  c)  d) 

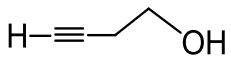
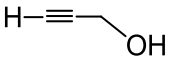
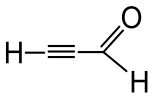
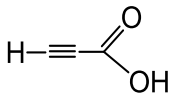
151. The decreasing basic order of the following is:

i.$F^{\ominus}$ii.$Cl^{\ominus}$iii.$Br^{\ominus}$iv.$I^{\ominus}$

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)

152. 

The product (C) is:

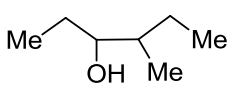
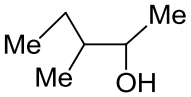
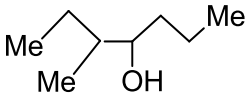
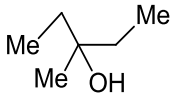
a)  b)  c)  d) 

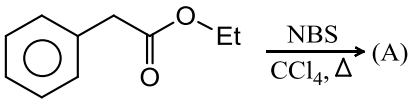
153. A halide with formula $C_6H_{13}Br$gave two isomeric alkenes (A) and (B) with formula C_6H_{12}. On reductive ozonolysis of a mixture of (A) and (B), the following compounds were obtained: CH_3COCH_3, CH_3CHO, CH_3CH_2CHO, and $(CH_3)_2CHCHO$. The halide is:

a) 2-Bromohexane b) 3-Bromo-2-methylpentane

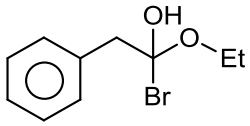
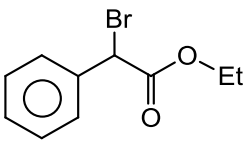
c) 2,2-Dimethyl-1-bromohexane d) Unpredictable

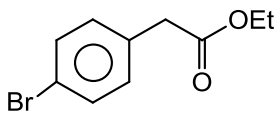
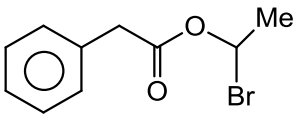
154. 1-Ethyl-2-methyl oxirane when treated with C_2H_5MgBr, followed by hydrolysis gives:

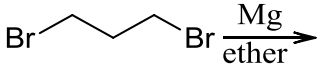
a)  b)  c)  d) 

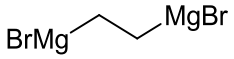
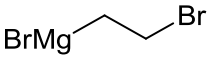
155. 

would be:

a)  b) 

c)  d) 

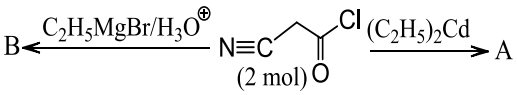
156. 

a)  b)  c)  d) All

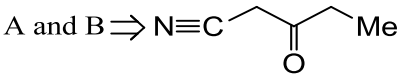
157. The decreasing basic order of the following is:

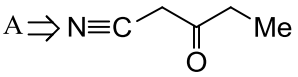
i. $\overset{\ominus}{C}H_3$ ii. $\overset{\ominus}{O}H$ iii. $CH_3COO^{\ominus}$ iv. H_2O

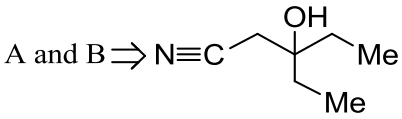
a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iii)>(ii)>(i)>(iv) d) (iii)>(ii)>(iv)>(i)

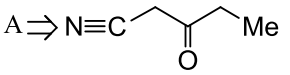
158. 

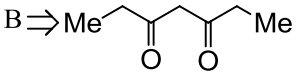
(A) and (B) are:

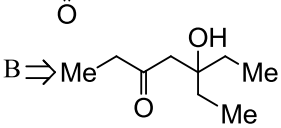
a) 



b) 



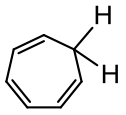
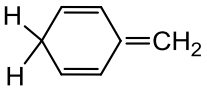
c) 

d) 

159. A solution of (+)-2-chloro-2-phenylethanein toluene racemises slowly in the presence of a small amount of $SbCl_5$, due to the formation of:

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

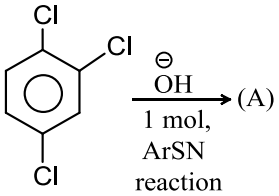
160. Give the increasing order of pK_a value of the following compounds?

I. C_9H_{10} II.  III. 

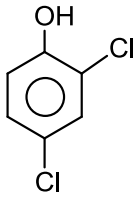
a) (I) <(III) < (II) b) (I)<(II)<(III) c) (II)<(III)<(I) d) (III) < (II) < (I)

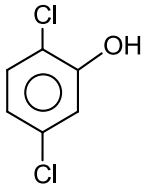
161. Which of the following undergoes nitration most readily?

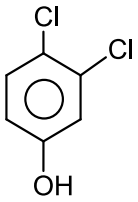
a) Toluene b) Styrene c) Chlorobenzene d) Phenol

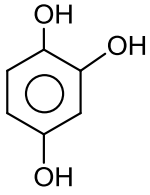
162. 

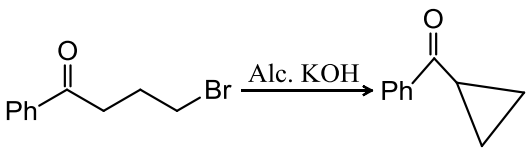
(A) would be

a) 

b) 

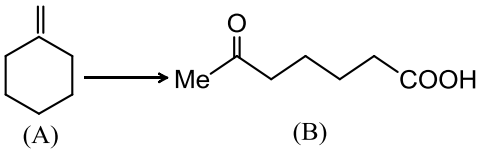
c) 

d) 

163. 

By which mechanism does the above reaction proceed?

a) α -Elimination b) β-Elimination c) γ-Elimination d) δ-Elimination

164. 

(A) (B)

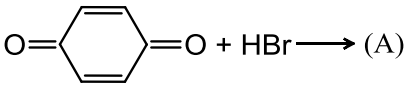
The above conversion can be carried out by which process

a) i.HBr+peroxide ii.$Me_3CO^{\ominus}$ Δ iii.O_3/H_2O

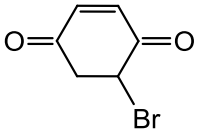
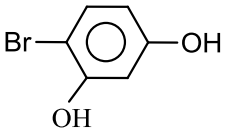
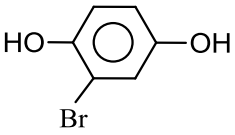
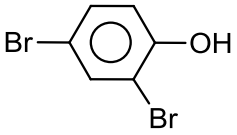
b) i.HBrii.$C_2H_5O^{\ominus}$,Δ iii.O_3/H_2O

c) i.HIii.$MeO^{\ominus}$,Δ iii.O_3/Zn-acid

d) HCl+peroxide

165. 

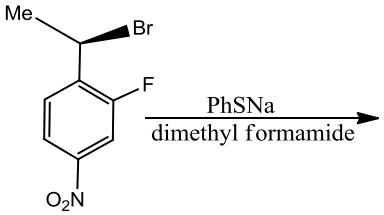
(A) would be:

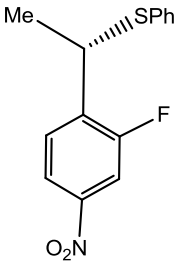
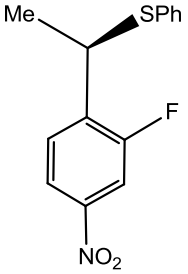
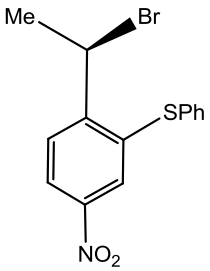
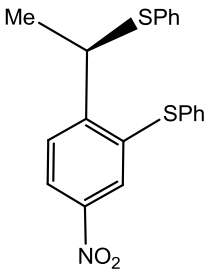
a)  b)  c)  d) 

166. Slow oxidation of chloroform in air leads to the formation of:

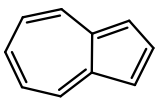
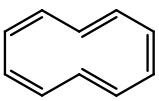
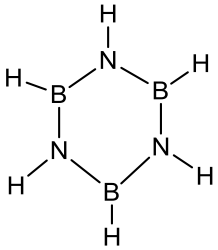
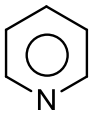
a) Formyl chloride b) Formic acid c) $COCl_2$ d) Trichloro acetic acid

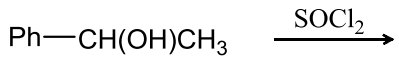
167. The major product of the following reaction is



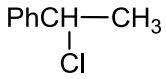
a)  b)  c)  d) 

168. Which of the following in not aromatic in nature?

a)  b)  c)  d) 

169. 

Specific rotation = $+50^{o}$

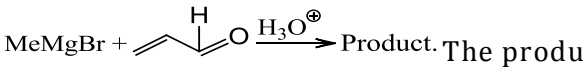


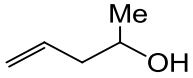
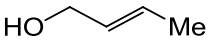
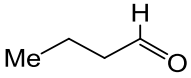
which of the following acts as a nucleophile?

a) $Cl^{\ominus}$ b) $\overset{\ominus}{OH}$ c) SO_2 d) None

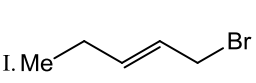
170. Propylsulphinic acid is prepared by the reaction of the following, followed by hydrolysis:

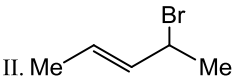
a) $C_3H_7MgBr + SO_2$ b) $C_2H_5MgBr + SO_2$ c) $C_3H_7MgBr + SO_3$ d) $C_2H_5MgBr + SO_3$

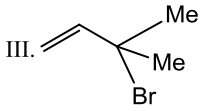
171. 

a)  b)  c)  d) None is correct

172. Which of the following halides will be most reactive in SN^2 reaction and SN^1 reaction, respectively?







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

173. The number of isomers for the compounds with molecular formula $C_2BrClFI$ is

a) 3 b) 4 c) 5 d) 6

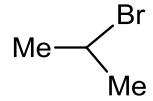
174. The decreasing basic order of the following is:

i. Me_2N-NMe_2 ii. $MeNH-NHMe$

iii. H_2N-NH_2 iv. NH_3

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iv)>(iii)>(i)>(ii) d) (iii)>(iv)>(ii)>(i)

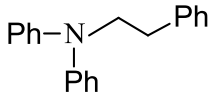
175. Which of the following is most reactive for SN^2 reaction?

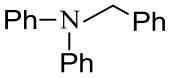
a) 

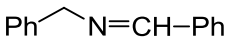
b) 
c) 

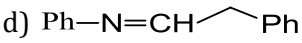
d) 

176. Phenyl isocyanide + Benzyl magnesium bromide $\xrightarrow[2.H_3O^{\oplus}]{1.\text{Ether }\Delta}$ (A). The compound (A) is:

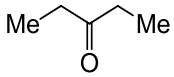
a) 

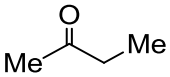
b) 

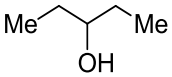
c) 

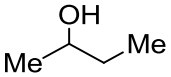
d) 

177. When ethanamide is treated with EtMgBr, followed by hydrolysis, the product is:

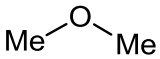
a) 

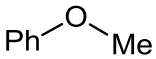
b) 

c) 

d) 

178. Which of the following ether will always give SN^2 mechanism in acidic as well as basic conditions?

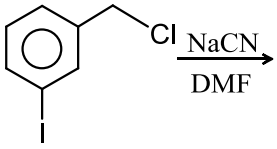
a) 

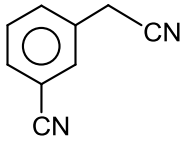
b) 

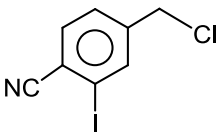
c) 

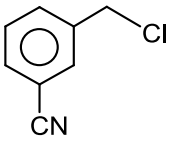
d) All

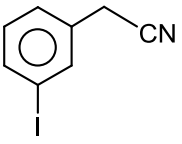
179. The structure of the major product formed in the following reaction is:



a) 

b) 

c) 

d) 

180. Out of monochloro, monobromo, and monoiododerivatives of ethane, the most reactive compound towards nucleophilic substitutions will be:

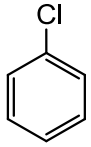
a) C_2H_5Br b) C_2H_5Cl

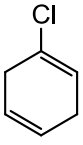
c) C_2H_5I d) All are equally reactive

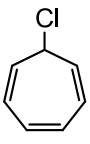
181. (X) on treatment with sodium hydroxide followed by the addition of silver nitrate gives white precipitate at room temperature which is soluble in NH_4OH. (X) can be:

a) Chlorobenzene b) Ethyl bromide c) Benzyl chloride d) Vinyl chloride

182. Which of the following compounds will give curdy precipitate with $AgNO_3$ solution?

a) 

b) $CH_2 = CH - Cl$
c) 

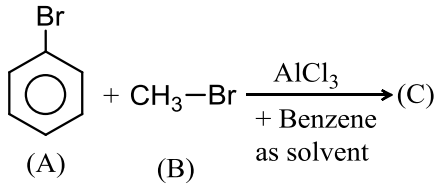
d) 

183. The correct decreasing order of SN^1 reactivity of the following is:

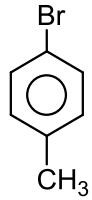
I. $PhCH_2X$ II. $CH_2 = CHCH_2X$

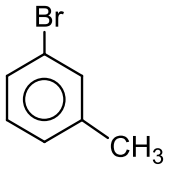
III. Me_2CHX IV. C_2H_5X

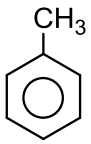
a) (I)>(II)>(III)>(IV) b) (IV)>(III)>(II)>(I) c) (II)>(I)>(III)>(IV) d) (IV)>(III)>(I)>(II)

184. 

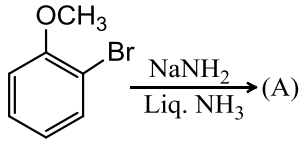
Product (C) is:

a) 

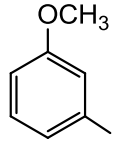
b) 

c) 

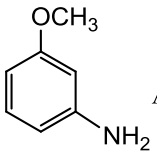
d) None

185. 

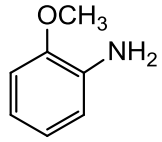
The major product (A)and reaction R are:

a) 

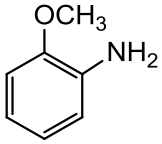
Cine substitution

b) 

Addition-elimination reaction

c) 

SN^1 reaction

d) 

SN^2 reaction

186. Of the following, four groups are *m*-directing when present on a benzene ring. The one which is not *meta*-directing is:

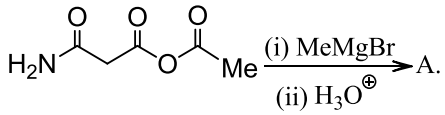
a) $-COOH$ b) $-NO_2$ c) $-CHO$ d) $-NH_2$

187. When iodoform is heated with silver powder, the gaseous product formed is:

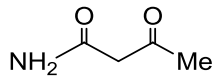
a) Ethene b) Ethyne c) Ethane d) Silver iodate

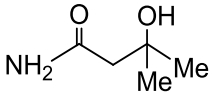
188. A reaction involving an aromatic nucleus is usually initiated by:

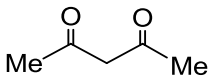
a) Free radicals b) Molecules possessing a lone pair of electrons
c) Nucleophiles d) Electrophiles

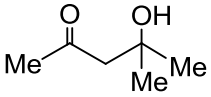
189. 

(A) is:

a) 

b) 

c) 

d) 

190. The compound that is most reactive towards electrophilic nitration is:

a) Toluene b) Benzene c) Benzoic acid d) Nitrobenzene

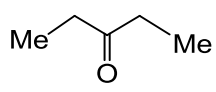
191. $(CH_3)_2CHI \xrightarrow[EtOH]{KOH} (A) \xrightarrow[475\ K]{SO_2Cl_2} (B)$Compound (B) in the sequence is:

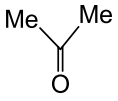
a) Dimethyl sulphate b) 1,2-Dichloro ethane
c) 3-Chloro propene d) 1-Chloro-2-iodopropane

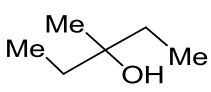
192. How many chiral carbon atoms are present in 2,3,4- trichloropentane?

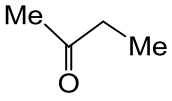
a) 3 b) 2 c) 1 d) 4

193. When ethane nitrile is treated with C_2H_5MgBr, followed by hydrolysis, the product is:

a) 

b) 

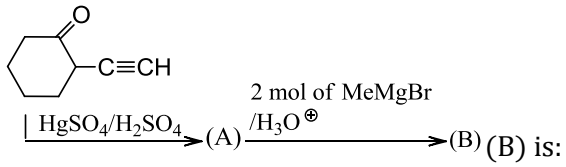
c) 

d) 

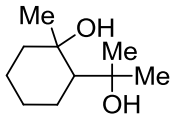
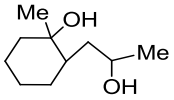
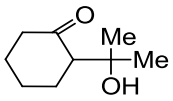
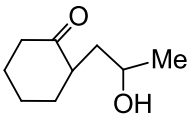
194. Alkyl halides can be obtained by all methods except:

a) $CH_3CH_2OH + HX/ZnCl_2$ b) $CH_2 = CH - CH_3 \xrightarrow[475K]{SO_2Cl_2}$

c) $C_2H_5OH + NaCl$ d) $CH_3COOAg + Br_2/CCl_4$

195. 

(B) is:

a)  b)  c)  d) 

196. The decreasing order of the rate of bromination of the following compounds is:

I. $Ph\overset{\oplus}{N}Me_3$ II. $Ph\,CH_2\overset{\oplus}{N}Me_3$

III.PhMe IV. $PhNMe_2$

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

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

197. Which of the following halides has the least dipole moment?

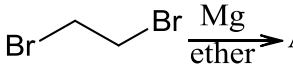
a) 1,2-Dichlorobenzene b) Dichloromethane c) Trichloromethane d) Ethyl chloride

198. Reactivity of PrMgBr with the following in the decreasing order is:

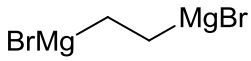
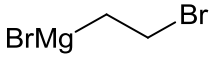
i. Alcoholii. Aldehyde

iii. Ketoneiv. Ester

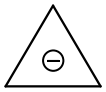
a) (iv)>(iii)>(ii)>(i) b) (i)>(ii)>(iii)>(iv) c) (ii)>(iii)>(i)>(iv) d) (iv)>(i)>(iii)>(ii)

199. 

A. (A) is:

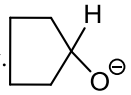
a)  b)  c) $CH_2 = CH_2$ d) All

200. Which of the following species will be least stable?

a)  b)  c)  d) 

201. The decreasing order of SN^2 reactivity of alkoxide nucleophiles:

i. $Me_3CO^{\ominus}$ ii. $MeO^{\ominus}$ iii. $MeCH_2O^{\ominus}$

iv. $Me_2CHO^{\ominus}$ v. 

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

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

202. Me_3C- MgCl on reaction with D_2O Porduces:

a) Me_3CD b) Me_3COD c) $(CD)_3CD$ d) $(CD)_3COD$

203. A compound *A* of formula $C_3H_6Cl_2$ on reaction with alkali can give *B* of formula C_3H_6O or *C* of formula C_3H_4. *B* on oxidation gave a compound of the formula $C_3H_6O_2$. *C* with dilute H_2SO_4 containing H_g^{2+} ion gave *D* of formula C_3H_6O, which with bromine and NaOH gave the sodium salt of $C_2H_4O_2$. Then *A* is:

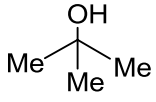
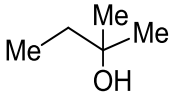
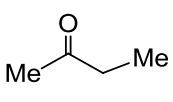
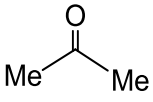
a) $CH_3CH_2CHCl_2$

b) $CH_3CCl_2CH_3$

c) $CH_2ClCH_2CH_2Cl$

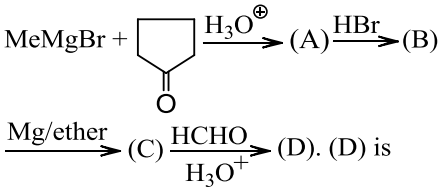
d) $CH_3CHClCH_2Cl$

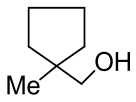
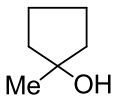
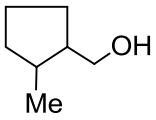
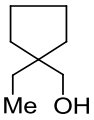
204. Ethanoicpropanoic anhydride on reaction with excess of MeMgBr gives the major product

a)  b)  c)  d) 

205. Vinyl chloride and ethyl chloride can be distinguished by:

a) Lucas reagent b) $KOH, AgNO_3$ c) $AgCl$ d) $HCl/AgCl$

206. 

a)  b)  c)  d) 

207. Which of the following sequence of reaction (reagents) can be used for the conversion of $PhCH_2CH_3$ into $PhCH = CH_2$?

a) $SOCl_2; H_2O$ b) SO_2Cl_2: alc. KOH c) $Cl_2/hv; H_2O$ d) $SOCl_2$; alc. KOH

208. Carbylamine test is performed in alcoholic KOH by heating a mixture of:

a) Chloroform and silver powder

b) Trihalogenated methane and a primary amine

c) An alkyl halide and a primary amine

d) An alkyl cyanide and a primary amine

209. Which of the following is the correct order of stability of the given compounds?

I.  II.  III. 

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

210. $CH_3{-}Br\ Nu^{\ominus} \longrightarrow CH_3{-}Nu + Br^{\ominus}$ The decreasing order of the rate of the above reaction with nucleophile ($Nu^{\ominus}$) (A) to (D) is:

$Nu^{\ominus} \Rightarrow$

$\left[(A)\ PhO^{\ominus}\ (B)\ ACO^{\ominus}\ (C)\ \overset{\ominus}{O}H\ (D)\ CH_3O^{\ominus}\right]$

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

211. Raschig's process is employed for the commercial preparation of:

a) Ethyl chloride b) Grignard's reagent c) Chlorobenzene d) Ethanol

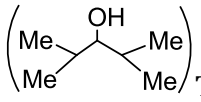
212. Which of the following on reaction with acetylene ($CH \equiv CH$) produce gas(es)?

I. K in liquid NH_3 II. $\overset{\ominus}{N}H_2$

III. $\overset{\ominus}{C}H_3$ IV. $\overset{\ominus}{O}H$

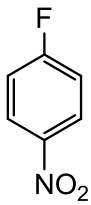
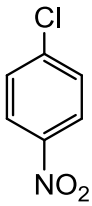
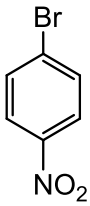
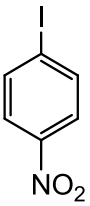
a) (I),(II),and(III) b) (I),(II),and(IV) c) (II),(III) and (IV) d) (I),(III), and (IV)

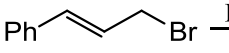
213. Propyl ester reacts with isopropyl magnesium bromide to give 2° alcohol

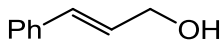
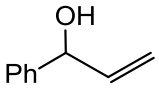
 The ester is:

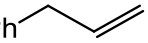
a) Propyl methanoate b) Isopropyl formate c) Propyl ethanoate d) Isopropyl ethanoate

214. Which of the following compounds will show faster $ArSN^2$ reaction?

a)  b)  c)  d) 

215. In the reaction  [X], [X] will be:

a)  b) 

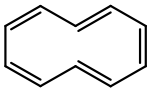
c) Equimolar mixture of (a) and (b) d) 

216. The decreasing basic order of the following compounds is:

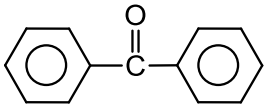
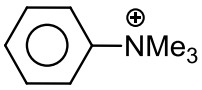
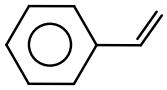
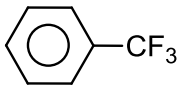
i.H_2Oii.H_2Siii.H_2Seiv.H_2Te

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iii)>(i)>(ii)>(iv) d) (iv)>(ii)>(i)>(iii)

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

a)  b)  c)  d) 

218. In which case will SE not be in m-position?

a)  b)  c)  d) 

219. Propane on dichlorination gives…….isomers and out of them …….are optically active

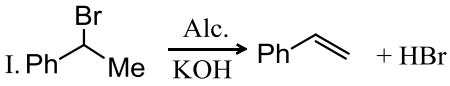
a) 4, 1 b) 3, 1 c) 4,2 d) 3,2

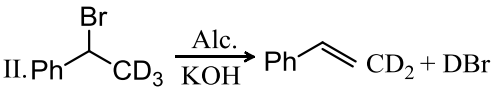
220. Which of the following is not an example of Sandmeyer's reaction?

a) $C_6H_5\overset{+}{N}_2\,Cl^- \xrightarrow{CuCl} C_6H_5Cl$ b) $C_6H_5\overset{+}{N}_2\,Cl^- \xrightarrow{CuBr} C_6H_5Br$

c) $C_6H_5\overset{+}{N}_2\,Cl^- \xrightarrow{CuCN} C_6H_5CN$ d) $C_6H_5\overset{+}{N}_2\,Cl^- \xrightarrow[KI]{KCN} C_6H_5I$

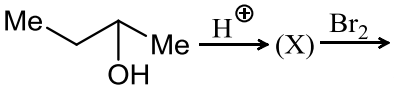
221. In the following reactions:





the rate of reaction of (I) is faster than that of (II). By which mechanism do both the reactions proceed?

a) E1 b) E2 c) E1cB d) α-Elimination

222.  five compounds with formula$C_4H_8Br_2$. How many structures of (X) are possible?

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

223. The decreasing nucleophilic order of the following compounds is:

i. $\overset{\ominus}{C}H_3$ ii. $\overset{\ominus}{N}H_2$ iii. $\overset{\ominus}{O}H$ iv. $F^{\ominus}$

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

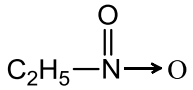
b) (iv)>(iii)>(ii)>(i)

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

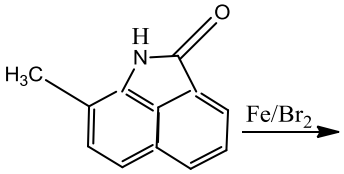
d) (ii)>(i)>(iv)>(iii)

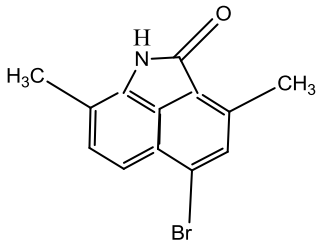
224. $C_2H_5I \xrightarrow{AgNO_2}$(X). Here (X) is:

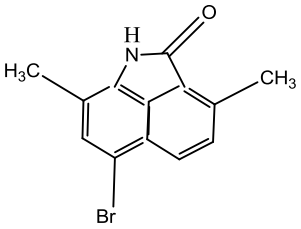
(Major product)

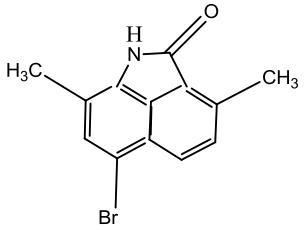
a)  b) $C_2H_5-O-N=O$ c) $C_2H_5-N=O$ d) All of the above

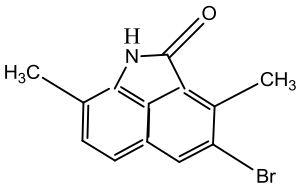
225. Product on monobromination of this compound is



a) 

b) 

c) 

d) 

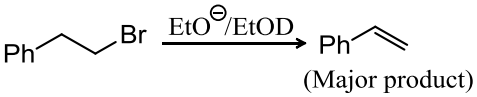
226. Methyl oxirane on reaction with CH_3MgBr, followed by hydrolysis, gives alcohol. By which of the following mechanisms does the reaction proceed?

a) SN^1 b) SN^2 c) SN^i d) SE

227. Which of the following is soluble in water?

a) CS_2 b) C_2H_5OH c) CCl_4 d) $CHCl_3$

228. In the following reaction:



By which mechanism does the reaction proceed?

a) E1 b) E2 c) E1cB d) α-Elimination

229. A suspension of $CaOCl_2$ in water is heated with ethanol. The product formed is:

a) Ethylene b) Ethanol c) Trichloromethane d) Chloroethane

230. Fluorobenzene (C_6H_5F) can be synthesised in the laboratory:

a) By heating phenol with HF and KF

b) From aniline by diazotization followed by heating the diazonium salt with HBF_4

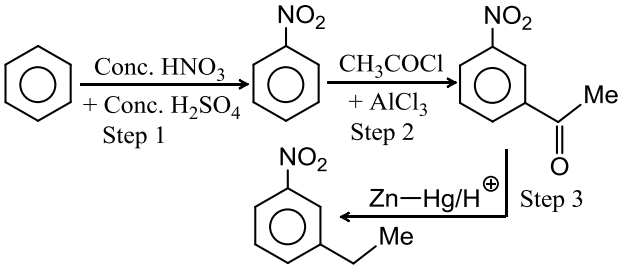
c) By Direct Fluorination of benzene with F_2gas

d) By reacting PhBr with NaF solution

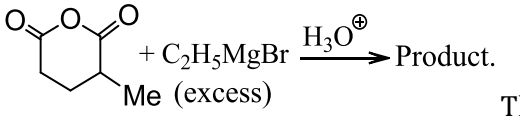
231. Which will react faster with NBS?

a) C_6H_6 b) CH_4 c) Toluene d) Cyclopropane

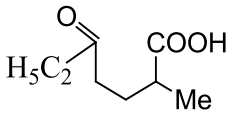
232. In the following reaction, which of the following steps is wrong?

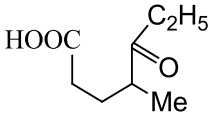


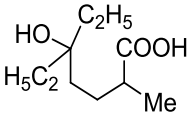
a) Step 1 b) Step 2 c) Step 3 d) None

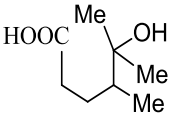
233. 

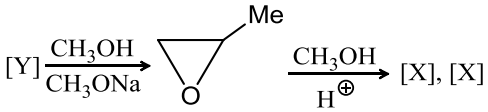
The major product is:

a) 

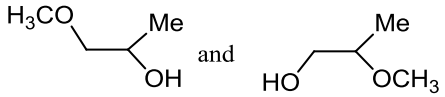
b) 

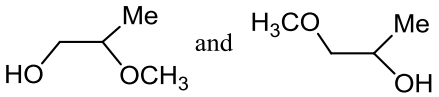
c) 

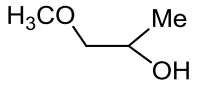
d) 

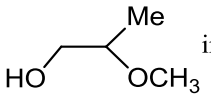
234. 

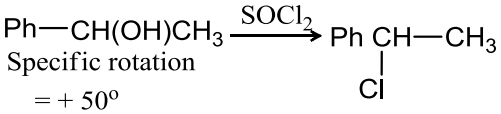
and [Y] are:

a)  and

b)  and

c)  in both cases

d)  in both cases

235. 

Specific rotation $= +50^{o}$

What is the specific rotation of the product?

a) $+50°$ b) $+60°$ c) $-60°$ d) Zero

236. The decreasing nucleophilic order of the following compounds is:

i.NH_3ii.PH_3iii.AsH_3iv.SbH_3

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (ii)>(i)>(iii)>(iv) d) (ii)>(i)>(iv)>(iii)

237. Which of the following is the correct order of the rate of reaction of C_6H_6, C_6D_6, and C_6T_6towards sulphonation?

a) Same rates of reaction of C_6D_6, C_6D_6 and C_6T_6 b) $C_6T_6 > C_6D_6 > C_6H_6$

c) $C_6H_6 > C_6D_6 > C_6T_6$ d) $C_6H_6 > C_6D_6 = C_6T_6$

238. A sample of chloroform which is used by doctors as an anaesthetic is generally tested by:

a) $AgNO_3$ (aq.) b) Fehling's solution

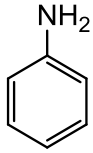
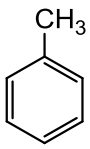
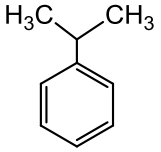
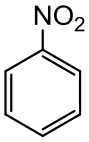
c) $AgNO_3$ (aq.)after boiling with KOH d) Any of the above

239. The energy of activation is lowest for which reaction?

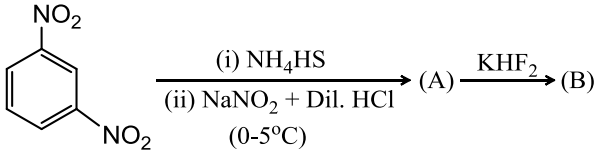
a) $RCH_2\overset{\oplus}{O}H_2 \longrightarrow R\overset{\oplus}{C}H_2$ b) $R_2CH\overset{\oplus}{O}H_2 \longrightarrow R_2\overset{\oplus}{C}H$

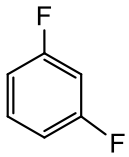
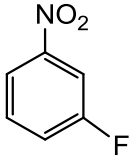
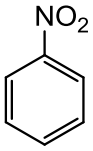
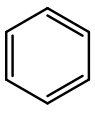
c) $R_3C-\overset{\oplus}{O}H_2 \longrightarrow R_3C^{\oplus}$ d) All have the same energy of activation

240. Which of the following compounds will undergo Friedel-Crafts alkylation with faster rate?

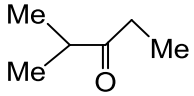
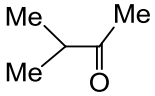
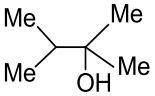
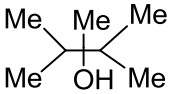
a)  b)  c)  d) 

241. What is the end product of the reaction?



a)  b)  c)  d) 

242. When di-isopropyl cadmium is treated with ethanoyl chloride, the product is:

a)  b)  c)  d) 

243. The decreasing fugacity order of the following compounds is:

i. $PhSO_3^{\ominus}$ ii. $C_2H_5SO_3^{\ominus}$ iii. $C_2H_5COO^{\ominus}$ iv. $\overset{\ominus}{C}N$

v. $\overset{\ominus}{O}H$

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

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

244. Phenol reacts with bromine in carbon disulphide at low temperature to give:

a) *m*-Bromophenol b) *o*- and *p*-Bromophenol

c) p-Bromophenol d) 2,4,6-Tribromophenol

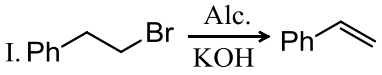
245. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to:
a) The formation of less stable carbonium ion b) Resonance stabilisation
c) Larger carbon-halogen bond d) Inductive effect

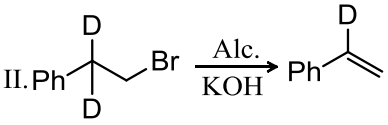
246. The chemical reaction
$(CH_3)_3CBr \xrightarrow[-H_2O,-KBr]{KOH(alc.)} (CH_3)_3C = CH_2$ is an example of:
a) Nucleophilic substitution b) Electrophilic substitution
c) Free radical substitution d) β-Elimination

247. In the reaction of p-chlorotoluene withKNH_2 in liquid NH_3, the major product is:
a) o-Toluidine b) m-Toluidine c) p-Toluidine d) p-Chloroaniline

248. The chemistry of benzene is characterised by which of the following types of reaction?
a) Addition b) Elimination c) Polymerisation d) Substitution

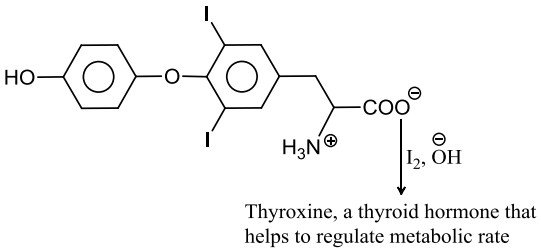
249. In the following reactions:



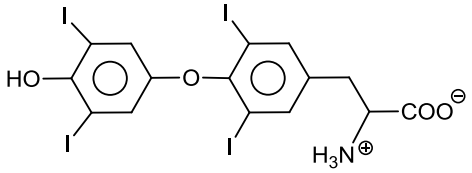


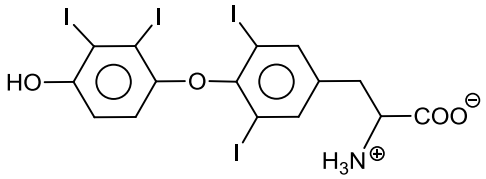
the rate of reaction of (I) and (II) are same. Bothreactionsproceed by which mechanism
a) E1 b) E2 c) E1cB d) Anti-elimination

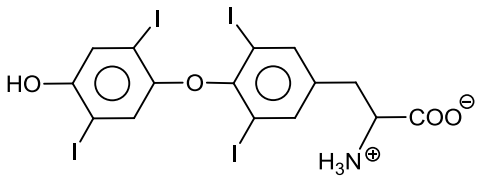
250. In the reaction

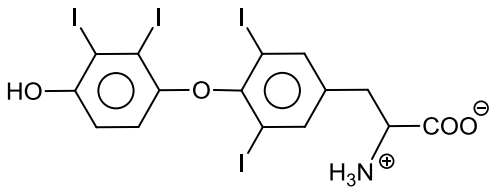


Thyroxine, a thyroid hormone thathelps to regulate metabolic rate
Thyroxine is:

a)


b)


c)


d)


251. 1, 2-Dibromopropane on treatment with$X$moles of $NaNH_2$ followed by treatment with C_2H_5Br gives a

pentyne. The value of $X$is:

a) 1 b) 2 c) 3 d) 4

252. $(CH_3)_2CHCl + NaI \rightarrow (CH_3)_2CHI + NaCl$ The above reaction is known as:

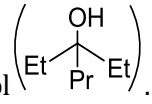
a) Perkin's reaction b) Finkelstein's reaction

c) Fitting reaction d) Sabatier and Senderan's reaction

253. Reactivity of EtMgBr with the following in the decreasing order is:

1. HCHO
2. MeCHO
3. MeCOMe
4. $CI_3C - CHO$

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iv)>(i)>(ii)>(iii) d) (iii)>(ii)>(i)>(iv)

254. 

Methyl ester reacts withEtMgBr to give 3°alcohol . The ester is:

a) Methyl propanoate b) Methyl butanoate c) Methyl ethanoate d) Methyl formate

255. Fire extinguisher pyrene is:

a) CO_2 b) CCl_4 c) $CHCl_3$ d) H_2CO_3

256. The decreasing nucleophilic order t the following compounds is:

i. $\overset{\ominus}{C}N$ ii. $\overset{\ominus}{O}H$ iii. $\overset{\ominus}{O}Me$ iv. $\overset{\ominus}{C}H_3$ v.$H^{\ominus}$

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

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

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

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

257. The optical isomers which are not mirror images of each other are called:

a) Enantiomers b) Mesomers c) Diastereomers d) Metamers

258. The decreasing fugacity order of the following compounds is:

i. $\overset{\ominus}{C}H_3$ ii.$\overset{\ominus}{O}H$ iii. $CH_3COO^{\ominus}$ iv. H_2O

a) (i)>(ii)>(iii)>(iv) b) (iv)>(iii)>(ii)>(i) c) (iii)>(ii)>(i)>(iv) d) (iii)>(ii)>(iv)>(i)

259. On mixing a certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane.

a) Propane b) Pentane c) *Iso*-pentane d) *Neo*-pentane

260. In order to convert aniline into chlorobenzene, the reagents needed are:

a) CuCl b) $NaNO_2/HCl$ and CuCl c) Cl_2/CCl_4 d) $Cl_2/AICl_3$

261. The distillation of bleaching powder and acetone gives:

a) $CHCl_3$ b) Chloral c) CH_3Cl d) CCl_4

262. Which of the following cannot be used for the preparation of iodoform?

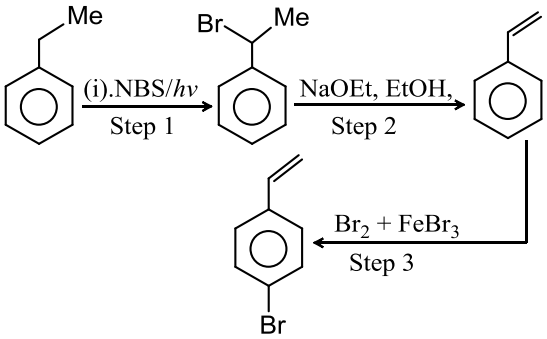
a) Acetone b) Methanol c) Ethanol d) Acetaldehyde

263. The compound (A) in the previous question is further hydrolysed in dilute acidic medium to give compounds (B) and (C). The compounds (B) and (C) are:

a) $phNH_2$and $PhCH = O$ b) $PhCH_2NH_2$and $PhCH = O$

c) $PhNH_2$and $PhCH_2CH = O$ d) $PhCH_2NH_2$and $PhCH_2CH = O$

264. In the following reaction, which of the following steps is wrong?



a) Step 1 b) Step 2 c) Step 3 d) None

265. The process of converting one enantiomer of an optically active compound into racemic mixture is called:
a) Resolution b) Inversion c) Epimerisation d) Racemisation

Multiple Correct Answers Type

266. Consider the following reactions:

I. $C_2H_5—I + NH_3 \longrightarrow C_2H_5\overset{\oplus}{N}H_3 + I^{\ominus}$

II. $C_2H_5—I + \ddot{P}H_3 \longrightarrow C_2H_5\overset{\oplus}{P}H_3 + I^{\ominus}$

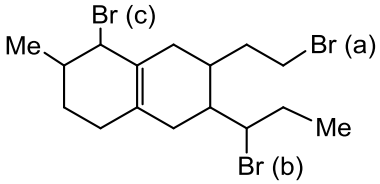
III. $C_2H_5—I + EtO^{\ominus} \longrightarrow C_2H_5—OEt + I^{\ominus}$

IV. $Me—\overset{\oplus}{S}—Me_2 + \overset{\ominus}{O}H \longrightarrow Me—OH + Me_2S$

In which of the above reactions does the rate of SN^2 reaction decrease with an increase in solvent polarity?
a) (I) b) (II) c) (III) d) (IV)

267. Toluene when treated with Br_2/Fe gives *p*-bromotoluene as the major product because the (CH_3) group:
a) is *para*-directing b) is *meta*-directing
c) activates the ring by hyperconjugation d) deactivates the ring

268. Consider the following compound



Which of the following statements are correct?
a) Loss of Br (a) atom in dehydrobromination reaction results in the formation of the most reactive double bond towards hydrogenation reaction
b) Removal of Br (c) atom results in the formation of the most stable carbocation
c) The above compound contains five asymmetric C atoms
d) The above compound does not show geometrical isomers

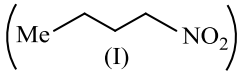
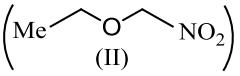
269. Among the following, which is/are correct?
a) Both cyclopentadienyl anion and benzene are aromatic and have the same stability
b) Benzene is aromatic and more stable than cyclopentadienyl anion and it is non-aromatic
c) Both cyclopentadienyl anion and benzene are aromatic but benzene is more stable than cyclopentadienyl anion
d) Cyclopentadienyl anion is more stable than benzene though both are aromatic

270. i. $Me\sim\sim Cl \xrightarrow[EtOH]{NaNO_2} (B)$
(A)

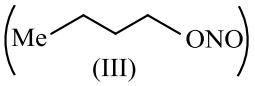
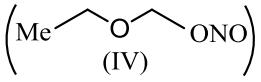
ii. $Me\sim O\sim\sim Cl \xrightarrow[EtOH]{NaNO_2} (D)$
(C)

Which of the following statements is/are correct for the above reactions?

(B) and (D) are respectively

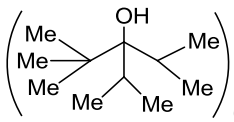
a)  and 

(B) and (D) are respectively

b)  and 

c) (B) is (I) and D is (IV)

d) (B) is (III) and D is (II)

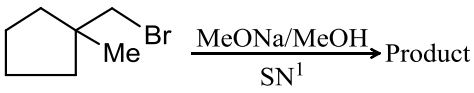
271. A 3°alcohol  can be obtained by the reaction of ketone (di-isopropyl ketone) and

a) Isopropyl magnesium bromide

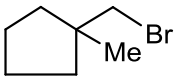
b) Isopropyl lithium

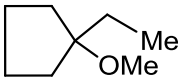
c) Di-isopropyl cadmium

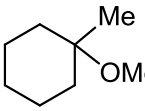
d) Di-isopropyl zinc

272. 

Which of the following statements are correct?

a) The product is  (I)

b) The product is  (II)

c) The product is a mixture of (II) +  (III)

d) Product (II) is formed by 1, 2-Me shift and product (III) is formed by 1,2-$H^{\ominus}$ shift with ring expansion

273. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to

a) The formation of less stable carbonium ion

b) Resonance stabilisation

c) Longer carbon–halogen bond

d) The inductive effect

274. Which of the following statements are correct about Friedel–Crafts reaction?

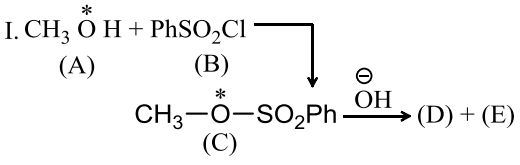
a) It is an aromatic electrophilic substitution reaction

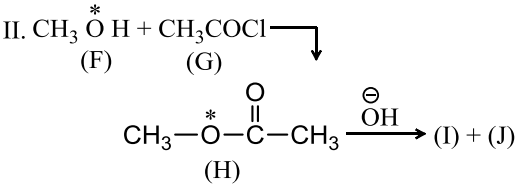
b) The reaction intermediate is an $\bar{e}$- deficient species

c) The reaction involves alkylation and acylation

d) A Lewis acid is used as a catalyst

275. Consider the following reactions





The products (D), (E), (I), and (J) are respectively

(D) (E) (I) (J)

a) CH_3OH $PhSO_2\overset{*}{O}Na$ $CH_3\overset{*}{O}H$ CH_3COONa

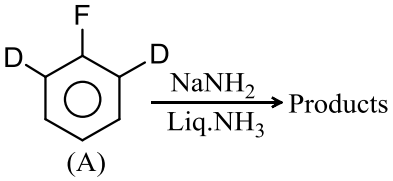
b) $CH_3\overset{*}{O}H$ $PhSO_2ONa$ CH_3OH $CH_3CO\overset{*}{O}Na$

c) $CH_3\overset{*}{O}H$ $PhSO_2ONa$ $CH_3\overset{*}{O}H$ CH_3COONa

d) CH_3OH $PhSO_2\overset{*}{O}Na$ CH_3OH $CH_3CO\overset{*}{O}Na$

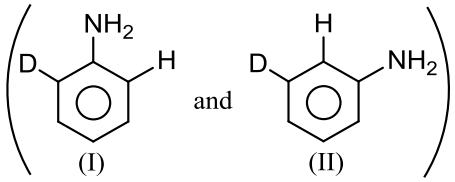
276. The compounds used as refrigerant are:

a) NH_3 b) CCl_4 c) CF_4 d) CF_2Cl_2

277. 

Which of the following statements are correct for the above reaction?

The product is a mixture of

a) 

b) The product (II) is a cine-substitution product

c) The reaction proceeds *via*benzene intermediate

d) The reaction is ArSN (addition-elimination)

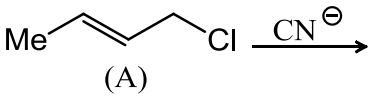
278. Hexan-3-one can be obtained by the reaction of EtMgBr and

a) Butanamide b) Propanamide c) Butane nitrile d) Propane nitrile

279. An aromatic molecule will:

a) Have $4n\pi$-electrons b) Have $(4n+2)\ \pi$-electrons

c) Be planar d) Be cyclic

280. 

Which of the following statements are correct?

a) Formation of (I) and (II) proceeds *via*SN^1 mechanism

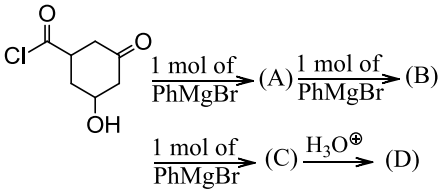
b) Formation of (I) and (II) proceeds *via* SN^2mechanism

c) Formation of (III) proceeds *via* SN^2 mechanism

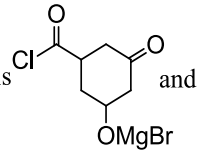
d) Formation of (IV) proceeds *via*SN^2 mechanism with allylic rearrangement and is called SN^2-prime (SN^2) mechanism

281. $EtNH_2 + MeMgI \xrightarrow[\text{in the prosence of pyridine}]{\text{Heated at high temp}}$ GAS (A) The volume of gas (A) obtained at S.T.P. when 0.45 gm of $EtNH_2$reacts with MeMgI is

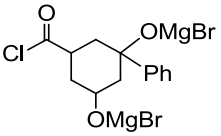
a) 224 ml b) 22.4 ml c) 448 ml d) 44.8 ml

282. 

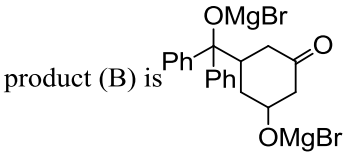
Which of the following statements is/are correct?

a) product (A) is  and phenol.

First mole of G.R. reacts at (— OH) group and the product (A) is andphenol

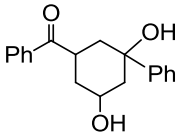
b) product (B) is 

Second mole of G.R. reacts with keto group and the product (B) is

c) product (B) is 

Second mole of G.R. reacts with acid chloride group and the product (B) is

d) Compound (D) is

Compound (D) is 

283. Which content(s) of middle oil separate on cooling?

a) Naphthalene b) Phenol c) Benzene d) Pyridine

284. In Dow's process for the manufacture of phenol, PhCl is fused with NaOH at elevated temperature under pressure

$$PhCl \xrightarrow[623\ K\ 300\ atm]{NaOH} [Intermediate] \xrightarrow{H_2O} Phenol + (B + C)$$

(A) Side product

Which of the following statements are correct:

a) Phenol is formed *via*the formation of benzyne intermediate

b) *p*-Phenyl phenol is also formed as a by-product

c) Diphenylether is also formed as a by-product

d) Biphenylene is also formed as a by-product

285. Which of the statements is/are correct?

a) In Reformatsky reaction, α-bromo ester reacts with aldehyde or ketone in the presence of Mg to give *β*-hydroxy ester

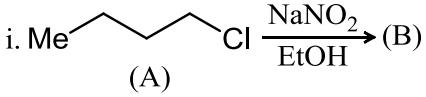
b) In Reformatsky reaction,α-bromo ester reacts with aldehyde or ketone in the presence of Zn to give β-hydroxy ester

c) Citric acid is prepared by the reaction of α-bromoethyl acetate and ethyl oxaloacetate in the presence of Zn followed by hydrolysis

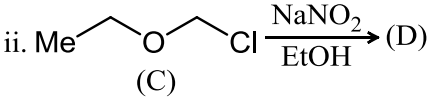
d) Citric acid is prepared by the fermentation of molasses in the presence of *Aspergilluswenti*enzymes

286. Which of the following side chain reaction/s can be used to reduce the activity of strongly activating groups such as $(-OH)$ or $(-NH_2)$

a) Benzoylation b) Acetylation c) Tosylation d) Sulphonation

287. i. 

(A)

ii. 

(C)

Which statement is/are correct?

a) Both reactions (i) and (ii) proceed *via* SN^2 mechanism

b) Both reactions (i) and (ii) proceed *via* SN^1 mechanism

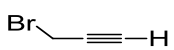
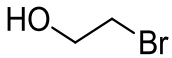
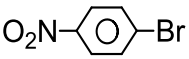
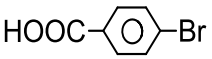
c) Reaction (i) proceeds *via*SN^1 and reaction (ii) *via* SN^2 mechanism

d) Reaction (i) proceeds *via* SN^2 and reaction (ii) *via*SN^1 mechanism

288. The products of reaction of alcoholic silver nitrite with ethyl bromide are:

a) Ethane b) Ethene c) Nitroethane d) Ethyl alcohol

289. Which of the following halides does not form G.R. when treated with magnesium in the presence of ether?

a)  b)  c)  d) 

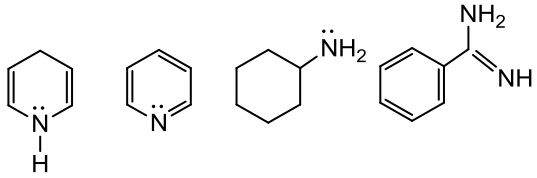
290. Acetophenone can be obtained by the reaction of PhMgBr and

a) Ethane nitrile b) Ethanamide c) Ethanoyl chloride d) Methanamide

291. Which of the following reaction(s) is/are neither stereospecific nor stereoselective?

a) SN^1 b) SN^2 c) E2 d) E1cB

292.



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

Which of the following statements are correct?

a) (I) and (II) are aromatic and have equal basic strength

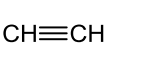
b) (I) is aromatic, (II) is anti-aromatic, but (II) is a stronger base than (I)

c) The basicity order of above compounds is (IV) > (III) > (II) > (I)

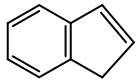
d) The conjugate acid of (IV) is more stabilised than the conjugate acid of (II)

293. The decreasing order of pK_a value of the following is:

(I) CH≡CH (II)



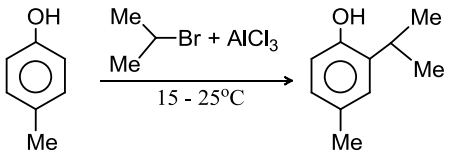
(III)



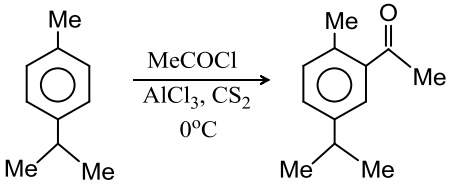
a) (III)>(I)>(II) b) (II)>(I)>(III) c) (I)>(III)>(II) d) (I)>(II)=(III)

294. In which of the following reactions is the correct major product formed?

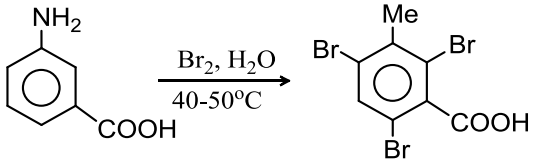
a)



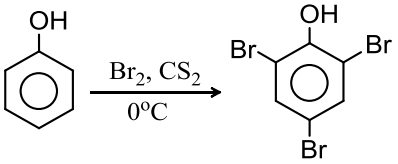
b)



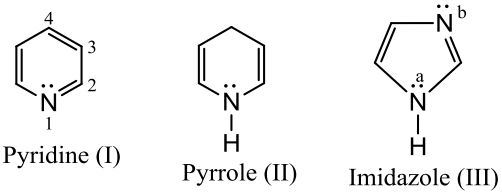
c)



d)



295.



Pyridine (I) Pyrrole (II) Imidazole (III)

Which of the following statements are true?

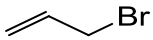
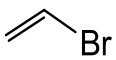
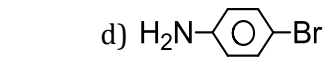
a) (I) and (III) are modest Bronsted bases, whereas (II) is not

b) In (III), N^a in more basic than N^b

c) When (II) is protonated in the presence of a strong acid, protonation occurs at C-2

d) All the nitrogen present in (I), (II), and (III) are sp^2- hybridised

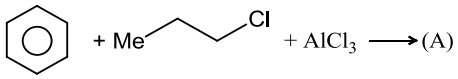
296. Which of the following halides forms G.R. when treated with magnesium in the presence of ether?

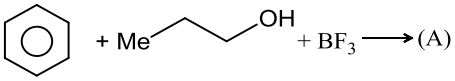
a) PhBr b)  c)  d) 

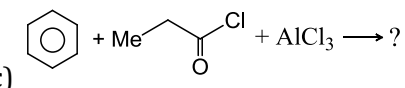
297. Which of the following reaction(s) is/are non-stereospecific but stereoselective?

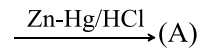
a) SN^1 b) E1 c) E2 d) E1cB

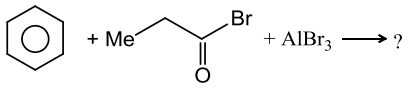
298. Which of the following are the best methods for the preparation of *n*-propyl benzene (A)?

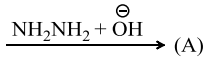
a) 

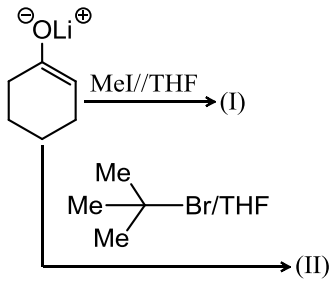
b) 

c) 



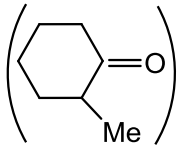
d) 

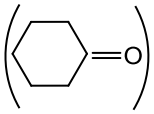


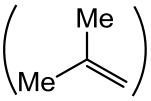
299. 

The products (I) and (II) are:

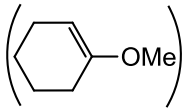
(I) is 2-methyl cyclohexanone

a) 

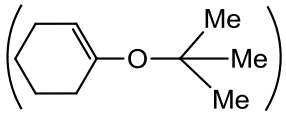
b) (II) is a mixture of cyclohexanone 

and 2-methyl propene 

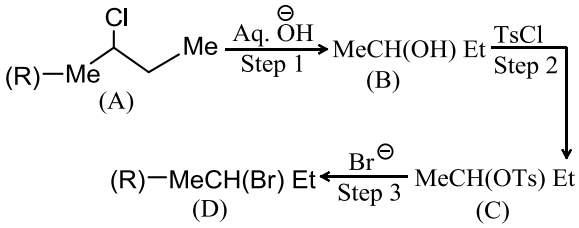
(I)In l-methoxy cyclohexene

c) 

(II)is *t*-butoxy cyclohexene

d) 

300. In the conversion of optically active (R) form of 2-chlorobutane to (R) form of 2-bromobutane, the following sequence of reactions is carried out

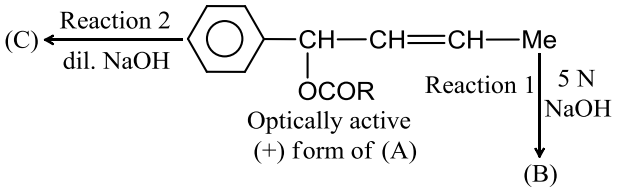


Direct conversion is not feasible since Cl cannot be replaced by Br in one step

In which of the following steps does the inversion occur?

a) Step 1 b) Step 2 c) Step 3 d) None

301. Which of the following statements are correct about the following reactions?



a) Reaction 1 proceeds by SN^2 and reaction 2 by SN^1mechanism

b) Reaction 1 proceeds by SN^1 and reaction 2 by SN^2mechanism

c) The products (B) and (C) are, respectively

(B) $\Rightarrow$ (-) Ph—CH(OH)—CH=CH—Me

(C) $\Rightarrow$ ($\pm$) Ph—CH=CH—CH(OH)—Me

d) The products (B) and (C) are, respectively

(B) $\Rightarrow$ (-) Ph—CH(OH)—CH=CH—Me

(C) $\Rightarrow$ ($\pm$) Ph—CH(OH)—CH=CH—Me

302. $CH_2=CH-CH(Me)-Cl \xrightarrow{H_2O}$ (A)

Which of the following statements are correct?

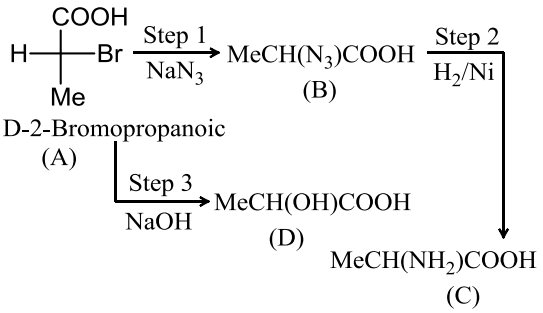
a) The product is $CH_2=CH-CH(Me)-OH$ (I) (major)

b) The product is a mixture of (I) and $HO-CH_2-CH=CH-Me$ (II) (major)

c) Allyl chloride is reactive both by SN^1 and SN^2 mechanism but more reactive by SN^1 mechanism

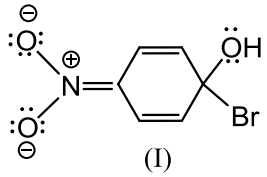
d) Formation of (II) takes place by an allylic rearrangement

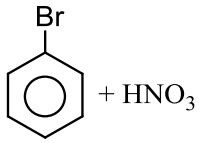
303. In which of the following steps does inversion occur?

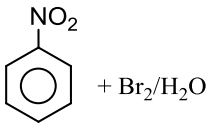


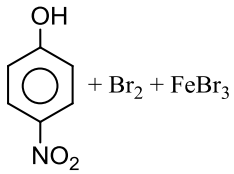
a) Step 1 b) Step 2 c) Step 3 d) None

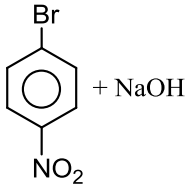
304. Which combination of reactants will not give species (I) shown as a reactive intermediate?


(I)

a) 

b) 

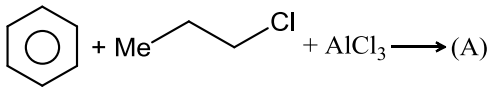
c) 

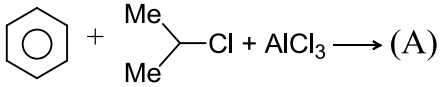
d) 

305. Which of the following reactions are both stereospecific and stereoselective?

a) SN^1 b) SN^2 c) E1 d) E2

306. Which of the following are the best methods for the preparation of cumene (A)?

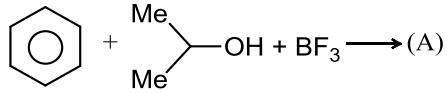
a) 

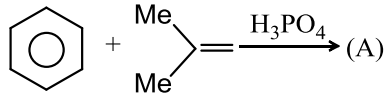
b) 

(D)

MeCH(NH2)COOH

(C)

c) 

d) 

307. Consider the following reactions:

1. $Me_3C - Br \xrightarrow[SN^1]{H_2O+NaBr} Product$
2. $Ph_3C - Br \xrightarrow[SN^1]{H_2O+NaBr} Products$

Which of the following statements are correct about the above reactions?

a) The products in reactions (I) and (II) are mixture of $(Me_3 - OH + Me_3Br)$ and $(Ph_3C - OH + Ph_3C - Br)$,respectively

b) The product in (I) is $(Me_3C - OH)$ and in (II) is $(Ph_3C - OH + Ph_3C - Br)$

c) The product in (I) is $(Me_3C - OH + Me_3C - Br)$ and in (II) is $(Ph_3C - OH)$

d) $Ph_3C^{\oplus}$ is more stable than $Me_3C^{\oplus}$

308. Which of the following statements are correct about the reactivities of (I) n-propyl chloride and (II) allyl chloride

a) Rate of SN^1 reaction of (I) > (II)

b) Rate of SN^1 reaction of (II) >(I)

c) Rate of SN^2 reaction of (I) > (II)

d) Rate of SN^2 reaction of (II) > (I)

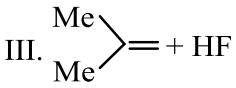
309. Both t-butyl and $(-SO_3H)$ groups are used as a blocking group in certain synthesis of organic compounds. Which of the following statements are correct?

a) t-Butyl group is easily introduced by any of the variations of the Friedel–Crafts alkylation reaction

b) t-Butyl group can be introduced by using:

I. $Me_3C - Cl + AlCl_3$

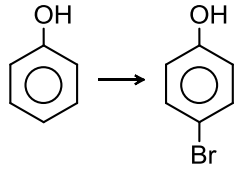
II. $Me_3C - OH + BF_3$

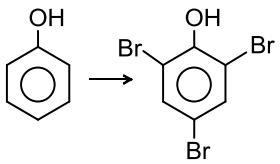
III. 

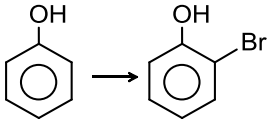
c) t-Butyl group can be easily removed under acidic conditions because of the stability of $tert$-butyl cations

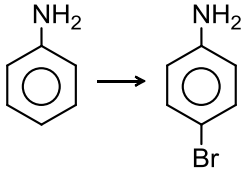
d) t-Butyl group has advantage over a $(-SO_3H)$ group as a blocking group, because t-butyl group activates the ring to further SE reaction

310. Which of the following syntheses could not be done without involving blocking position on the ring?

a) 

b) 

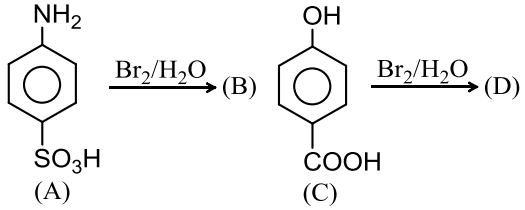
c) 

d) 

311. When benzene sulphonic acid and p-nitrophenol are treated with $NaHCO_3$, the gases released, respectively, are:

a) SO_2, NO_2 b) SO_2, NO c) SO_2, CO_2 d) CO_2, CO_2

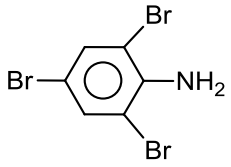
312. In the following reactions:

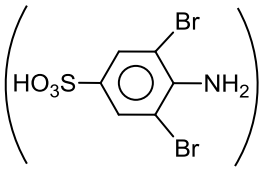


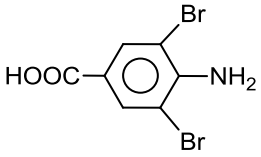
(A) (C)

Which of the following statements are correct about the above reactions?

(B) and (D) are the same product

a) 

b) (B) is 

c) 

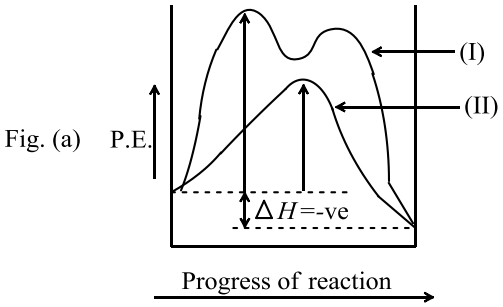
(D) is

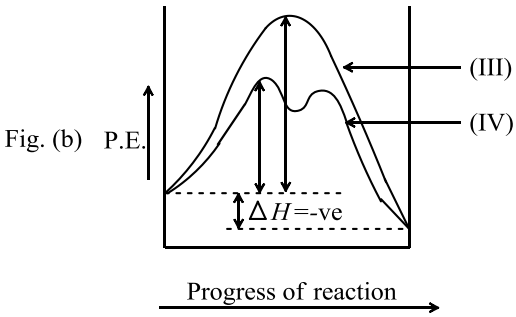
d) The above reaction is called ipso substitution

313. Which of the following reaction(s) is/are stereospecific but non-stereoselective?

a) SN^2 b) E1 c) E2 d) E1cB

314. Energy diagram of SN^1 and SN^2 reactions. The order of hydrolysis of RX by SN^1 is $3° > 2° 1°$ RX and by SN^2 path is $1° > 2° > 3°$ RX





Which of the following statements are correct for the above energy diagrams of SN^1 and SN^2 reactions?

a) (I) is Fig. (a) and (IV) in Fig. (b) represent SN^1 reaction

b) (II) in Fig. (a) and (III) in Fig. (b) represent SN^2 reaction

c) Fig. (a) and Fig. (b) are the energy diagrams for $1°$ RX and $3°$ RX, respectively

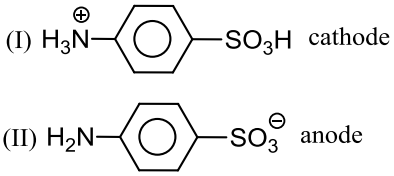
d) Fig. (a) and Fig (b) are the energy diagram for $3°$RX and $1°$ RX, respectively

315. Which are the sources of phenol?

a) Cumene b) Hydrolysis of benzene diazonium salt

c) Middle oil of coal tar distillation d) Reaction of diazonium salt with H_3PO_2

316. Sulphanilic acid at pH = 2 and 12 exists as…… and migrates towards, ……. respectively

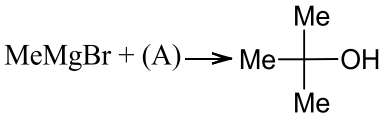
a) 

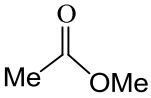
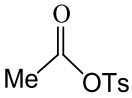
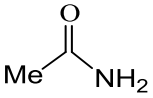
b) (II) anode and (I) cathode

c) At both pH, only (I) and migrates towards the cathode

d) At both pH, only (II) and migrates towards the anode

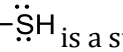
317. Which of the reagents is the most suitable for the following reaction?



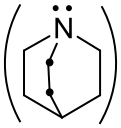
a) $Me-C\equiv N$ b)  c)  d) 

318. Which of the following statements are correct

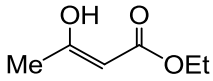
a)  is weaker nucleophile than H_2O

b)  is a stronger nucleophile than  in polar protic solvent such as ethanol

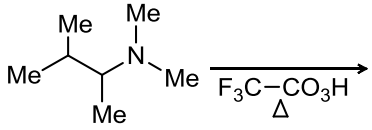
c)  is a weaker nucleophile than

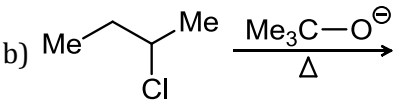
d)  (I) is a stronger nucleophile than (II)

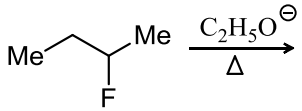
319. Which of the following would give benzene when reacted withPhMgBr?

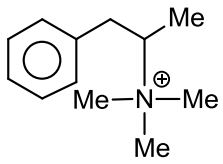
a)  b) H_2 c) Methyl amine d) NH_3

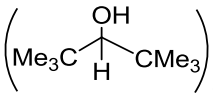
320. Which of the following will give Hofmann alkene?

a) 

b) 

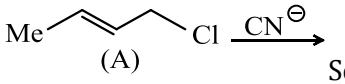
c) 

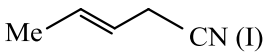
d) 

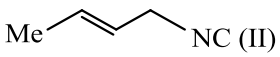
321. A2°alcohol  can be obtained by the reaction of di-*t*-butyl ketone and

a) Isopropyl magnesium bromide b) *t*-Butyl magnesium bromide

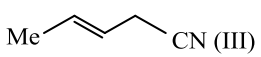
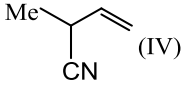
c) EtMgBr d) MeMgBr

322.  Select the correct statement

a) The product is  (I)

b) The product is  (II)

The product is Mixture of me

c)  (III)  (IV)

d) The product is a mixture of (I) and (II)

323. Which of the following statements are correct about E1cB reaction?

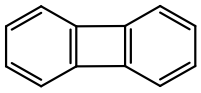
a) It proceeds *via*the formation of a carbanion intermediate

b) Strong EWG and poor leaving groups favour the reaction

c) It is a unimolecular reaction with second order kinetics

d) When D is incorporated in the starting material by the solvent EtOD and the reaction is interrupted before completion, no D is found either in the substrate or in the product

324. The name of the compound

 is :

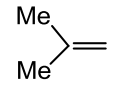
a) Dibenzocyclobutadiene
b) Dibenzcyclobutane
c) Biphenylene
d) Dibenzocyclobutene

325. Consider the following reactions:

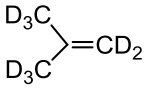
I. $CH_3CH_2I \xrightarrow[E2]{EtO^{\ominus}} CH_2{=}CH_2 + EtOH + I^{\ominus}$

II. $D_3C{-}CH_2I \xrightarrow[E2]{EtO^{\ominus}} D_2C{=}CH_2 + EtOD + I^{\ominus}$

III. $Me_3C{-}I \xrightarrow[SN^1 \text{ and } E1]{EtO^{\ominus}} Me_3C{-}OEt$ + Substitution

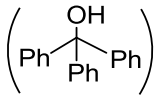
 Elimination

IV. $(CD_3)_3C{-}I \xrightarrow[SN^1 \text{ and } E1]{EtO^{\ominus}} (CD_3)_3C{-}OEt$ +

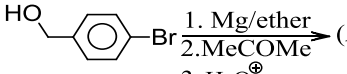


Which of the following statement(s) is/are correct?

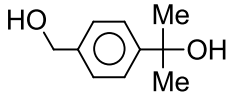
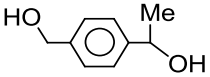
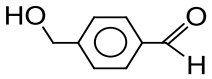
a) Reactions (I) and (II) show primary kinetic isotope effect, whereas reactions (III) and (IV) show 2°kinetic isotope effect
b) Reactions (I) and (II) show 2° kinetic isotope effect, whereas reactions (III) and (IV) show 1° kinetic isotope effect
c) All reactions show 1° kinetic isotope effect
d) All reactions show 2°kinetic isotope effect

326. A 3°alcohol  can be obtained by the reaction of PhMgBr and

a) Ethyl carbonate
b) Benzophenone
c) Ethyl benzoate
d) Benzamide

327.  (A).

(A).The compound (A) is:

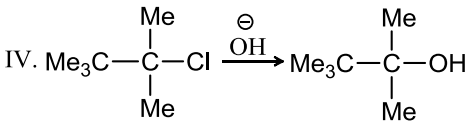
a) 
b) 
c) 
d) None of these

328. Consider the following reactions:

I. $Me_3C{-}F \xrightarrow{H_2O/H^{\oplus}} Me_3C{-}OH$

II. $Me_3C{-}F \xrightarrow{OH^{\ominus}} Me_3C{-}OH$

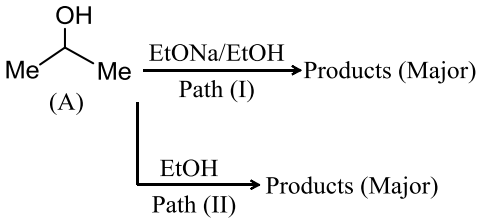
III. $Me_3C{-}Cl \xrightarrow{OH^{\ominus}} Me_3C{-}OH$

IV. 

Which of the following statements are correct?

a) Reaction (I) is faster than (II)
b) Reaction (II) is faster than (I)
c) Reaction (III) is faster than (IV)
d) Reaction (IV) is faster than (III)

329. Consider the following reactions.



Which statement(s) is/are wrong.

a) The product by path (I) is $Me-CH=CH_2$ (I)

b) The product by path (II) is $Me-CH(OEt)Me$ (II)

c) The products are mixture of (I) and (II) by both paths

d) Path I proceeds *via* E2 mechanism, while path II proceeds *via* SN^1 mechanism

330. The coupling between C_2H_5MgBr and MeBr gives propane in the presence of:

a) MeOTs b) EtOTs c) AgBr d) $CuCl_2$

331. Which of the following reactions would give caproic acid?

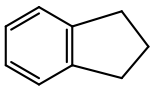
a) $n-C_5H_{11}Br \xrightarrow[(ii)CO_2]{(i)Mg/ether}$

b) $n-C_5H_{11}Li \xrightarrow[(ii)H_3O]{(i)CO_2}$

c) $n\text{-}C_4H_9Br \xrightarrow[(ii)\ CO_2]{(i)\ Mg/ether} \xrightarrow[(iii)\ H_3O^{\oplus}]{}$

d) $n-C_5H_{11}MgBr + (CN)_2 \xrightarrow[(ii)H_3O^{\oplus}]{(i)\ \Delta}$

332. The name of the compound



is

a) Indane b) Benzocyclopentene c) Benzcyclopentane d) Benzocyclopentane

333. The first steps of SN^1 and SN^2 reactions are, respectively

a) Both exothermic

b) Both endothermic

c) Endothermic and exothermic

d) Exothermic and endothermic

334. Consider the following reactions:

I. $C_2H_5-I + NH_3 \longrightarrow C_2H_5\overset{\oplus}{N}H_3 + I^{\ominus}$

II. $C_2H_5-I + \ddot{P}H_3 \longrightarrow C_2H_5\overset{\oplus}{P}H_3 + I^{\ominus}$

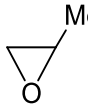
III. $C_2H_5-I + EtO^{\ominus} \longrightarrow C_2H_5-OEt + I^{\ominus}$

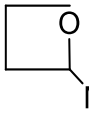
IV. $Me-\overset{\oplus}{S}-Me_2 + \overset{\ominus}{O}H \longrightarrow Me-OH + Me_2S$

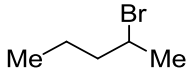
In which of the above reactions does the rate of SN^2 reaction increase with an increase in solvent polarity?

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

335. Which of the following reactions would give pentan-2-ol?

a)  $\xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ EtMgBr} \xrightarrow[(ii)H_3O^{\oplus}]{(i)EtMgBr}$

b)  $\xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ MeMgBr}$

c)  $\xrightarrow[(ii)\ O_2]{(i)\ Mg/ether} \xrightarrow[(iii)\ H_3O^{\oplus}]{}$

d) $MeCHO \xrightarrow[H_3O^{\oplus}]{PrMgBr/ether}$

336. Consider the following reactions:

I. $Me_3C-Cl \xrightarrow{\overset{\ominus}{O}H} Me_3C-OH$

II. $F_3C-\underset{Me}{CH}-Cl \xrightarrow{\overset{\ominus}{O}H} F_3C-\underset{Me}{CH}-OH$

III. $Me_3C-Cl \xrightarrow{90\%D_2O+10\%\ ether} Me_3C-OD$

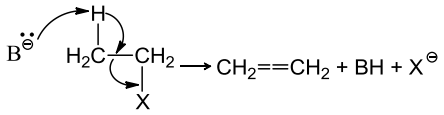
IV. $Me_3C - Cl \xrightarrow{90\%H_2O+10\%\ ether} Me_3C - OH$

Which of the following statements are correct?

a) Reaction (I) is faster than (II)
b) Reaction (II) is faster than (I)
c) Reaction (III) is faster than (IV)
d) Reaction (IV) is faster than (III)

337.

β -Elimination or anti-elimination reaction is carried out with base $(B^{\ddot{\ominus}})$ as shown below:



The following bases are used

I. $\overset{\ominus}{O}H$ II. $RO^{\ominus}$
III. $RCOO^{\ominus}$ IV. $\overset{\ominus}{C}N$
V. $NO_3^{\ominus}$

The decreasing order of reactivity for the above elimination is:

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

Assertion - Reasoning Type

This section contain(s) 0 questions numbered 338 to 337. 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

338

Statement 1: 2-Bromobutane on reaction with sodium ethoxide in ethanol gives 1-butene as a major product

Statement 2: 1-Butene is more stable than 2-butene

339

Statement 1: Hydroxy ketones are not directly used in Grignard reaction

Statement 2: Grignard reagents react with hydroxyl group

340

Statement 1: Benzyl bromide when kept in acetone and H_2Oproduces benzyl alcohol

Statement 2: The reaction follows SN^2mechanism

341

Statement 1: Benzonitrileis prepared by the reaction of chlorobenzene with potassium cyanide

Statement 2: Cyanide $(\overset{\ominus}{C}N)$ is a strong nucleophile

342

Statement 1: PhBr is less reactive than C_2H_5Br towards SN reactions

Statement 2: The forces of attraction between RX and H_2O molecules are weaker than those present between the molecules of RX and water molecules separately

343

Statement 1: In comparision to C_2H_5Br, it is difficult to carry out SN reaction on vinyl bromide

Statement 2: Vinyl group is electron donating

344

Statement 1: SN^1 reaction is carried out in the presence of a polar protic solvent

Statement 2: A polar protic solvent increases the stability of carbocation due to solvation

345

Statement 1: Reaction between (Me_3CONa) (sodium *tert*-butoxide) and ethyliodide (C_2H_5I) does not produce an ether

Statement 2: Sodium *tert*-butoxide is a very strong base but is not a nucleophile

346

Statement 1: *tert*-Butyl bromide (Me_3C-Br) and sodium ethoxide (NaOEt) will react to form only ether

Statement 2: Ethers are prepared from sodium alkoxide and alkyl halide

347

Statement 1: SN^2 reaction is carried out in the presence of polar aprotic solvent

Statement 2: Polar aprotic solvents do not contain acidic hydrogen

348

Statement 1: Aryl halides undergo nucleophilic substitution with ease

Statement 2: The carbon-halogen bond in aryl halides has partial double bond character

349

Statement 1: MeMgBr should be prepared under perfectly anhydrous conditions

Statement 2: Grignard reagent reacts with water

350

Statement 1: The presence of nitro group facilitates nucleophilic substitution reaction in aryl halide

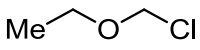
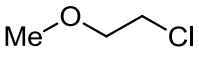
Statement 2: The intermediate carbanion is stabilised due to the presence of the nitro group

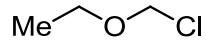
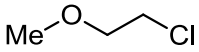
351

Statement 1: *t*-Butyl bromide on reaction with sodium metal in dry ether gives 2,2,3,3-tetramethyl butane

Statement 2: *t*-Alkyl halides readily undergo Wurtz reaction

352

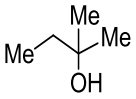
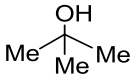
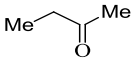
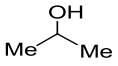
Statement 1:  reacts faster with H_2O than 

Statement 2: The carbocation of  is more stable than the carbocation of 

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**.

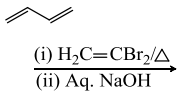
353.

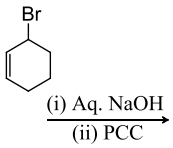
Column-I	Column- II
(A) Propane nitrile + $MeMgBr \xrightarrow[2.H_2O]{1.THF,\Delta}$	(p) 
(B) Propanoyl chloride + $Me_2Cd \xrightarrow{\Delta}$	(q) 
(C) Propanoyl chloride + $2MeMgBr \xrightarrow[2.H_3O^{\oplus}]{1.THF,\Delta}$	(r) 
(D) Ethyl ethanoate + $2MeMgBr \xrightarrow[2.H_3O^{\oplus}]{1.THF,\Delta}$	(s) 
(E) Propyl methanoate+ $2MeMgBr \xrightarrow[2.H_2O^{+}]{1.THF,\Delta}$	(t)

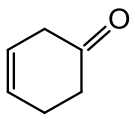
CODES :

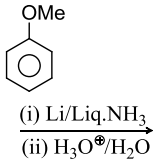
	A	B	C	D	E
a)	R	r	p	q	s
b)	s	r	t	p	s
c)	p	q	r	s	s
d)	t	p	q	s	s

354.

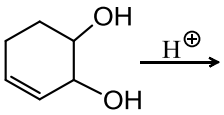
Column-I	Column- II
(A) 	(p) Birch reduction

(B) 

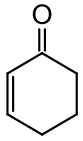
(q) 

(C) 

(r) (4+2) Addition reaction

(D) 

(s) MeOH

(t) 

CODES :

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

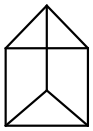
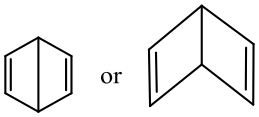
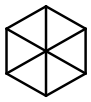
355.

Column-I	**Column- II**
(A) $C_6H_4Cl_2$	(p) 10
(B) C_6H_4ClBr	(q) 6
(C) $C_6H_3Cl_3$	(r) 3
(D) $C_6H_3Cl_2Br$	(s)
(E) C_6H_3ClBrI	(t)

CODES :

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

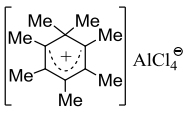
356.

Column-I	Column- II
(A) 	(p) Dewar's Parallel formula
(B) 	(q) Ladenburg's prism formula
(C) 	(r) Armstrong and Baeyer's centric formula
(D) 	(s) Clauss diagonal formula

CODES :

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

357.

Column-I	Column- II
(A) $C_6H_6 + MeCl \xrightarrow[(Excess)]{AlCl_3}$ 	(p) Proves the existence of π- complex (charge- transfer complex)
(B) $C_6H_6 + I_2 \longrightarrow$ Brown $\xrightarrow{\Delta} C_6H_6 + I_2$ (Purple)coloured Compound	(q) Proves the existence of σ-complex in SE reaction
(C) $C_6H_6 \xrightarrow{Sulphonation} C_6H_5SO_3H$ $C_6D_6 \xrightarrow{Sulphonation} C_6D_5SO_3H$	(r) Does not show 1° kinetic isotope effect
(D) $C_6H_6 \xrightarrow{Nitration} C_6H_5NO_2$ $C_6D_6 \xrightarrow{Nitration} C_6D_5{-}NO_2$	(s) Shows 1° kinetic isotope effect
	(t) Shows slightly2° kinetic isotope

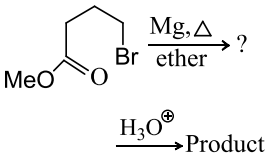
effect

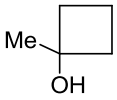
CODES :

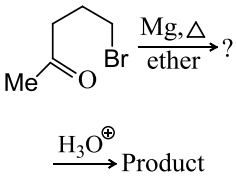
	A	B	C	D
a)	q	p	s,t	r,t
b)	p	r,t	q	s,t
c)	s,t	q	r,t	p
d)	r,t	s,t	p	q

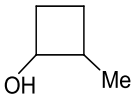
358.

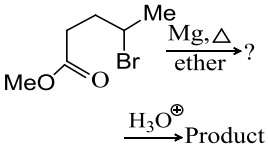
Column-I **Column- II**

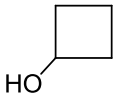
(A) 

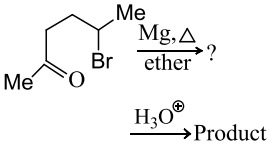
(p) 

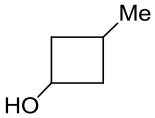
(B) 

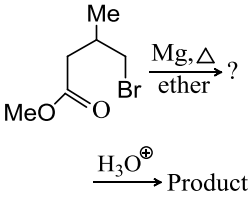
(q) 

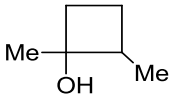
(C) 

(r) 

(D) 

(s) 

(E) 

(t) 

CODES :

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

359. Match the following. The correct match is

Column-I **Column- II**

(A) C_2H_5Cl, moist Ag_2O

(B) C_2H_5Cl, aqueous ethanolic AgCN

(C) C_2H_5Cl, aqueous ethanolic $AgNO_2$

(D) C_2H_5Cl, ethanolic KOH

(1) CH_3CH_2ONO

(2) C_2H_4

(3) CH_3CH_2OH

(4) CH_3CH_2NC

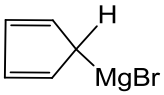
(5) C_2H_6

CODES :

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

360.

Column-I **Column- II**

(A) 

$\xrightarrow[\Delta]{\text{Reagent A}}$ Ferrocene

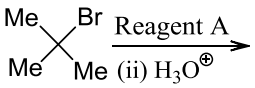
(p) O_2

(B) $2PhMgBr \xrightarrow[(ii)H_3O^+]{(i)\text{Reagent A}} 2PhOH$

(q) $FeCl_2$

(C) $PhMgBr \xrightarrow[(ii)H_3O\oplus]{(i)\text{Reagent A at}-70^\circ C} PhCOOH$

(r) Me_2Zn

(D) 

Neopentane

(s) $CoCl_2$

(E) $C_2H_5MgBr \xrightarrow[\Delta]{\text{Reagent A}}$ Butane

(t) $Et - OTs$

CODES :

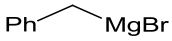
	A	**B**	**C**	**D**	**E**
a)	Q	p	p	r	s,t
b)	p	q	r	s	s,t
c)	t	p	q	s	s,t
d)	q	s	r	p	s,t

361.

Column-I **Column- II**

(A) Reactant+ $CS_2 \xrightarrow[\Delta]{\text{Ether}}$ Propane dithioic acid

(p) EtOH

(B) Reactant + $SO_3 \xrightarrow[\Delta]{Ether}$ Propyl sulphonic acid (q) 

(C) Reactant+S$\xrightarrow[\Delta]{Ether}$Ethyl mercaptan (r) PrMgBr

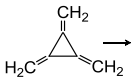
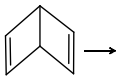
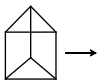
(D) Reactant + $CH_2 = O + HCl \rightarrow ?$ $\xrightarrow[\Delta]{MeMgBr}$Ethyl ethane (s) EtMgBr

(E) Enol Form of EAA + GR ⟶ Toluene (t)

CODES :

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

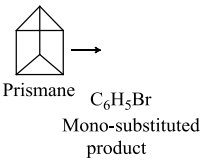
362.

Column-I	**Column- II**
(A)  C_6H_5Br Mono-substituted product	(p) 2
(B)  C_6H_5Br Mono-substituted product	(q) 3
(C)  C_6H_5Br Mono-substituted product	(r) 1
(D)  C_6H_5Br Mono-substituted product	(s)

CODES :

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

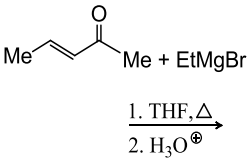
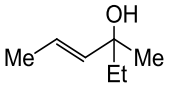
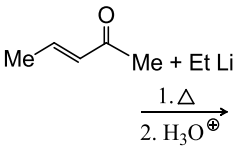
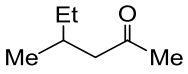
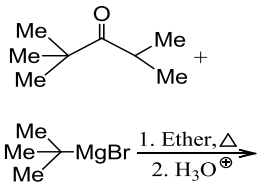
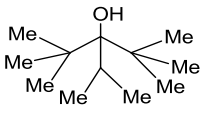
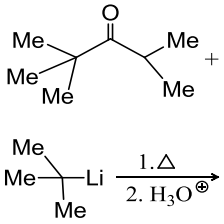
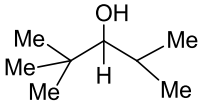
363.

Column-I		Column- II
(A)		(p) Three isomers, one isomer is chiral
(B)	Prismane→ $C_6H_4Br_2$ Disubstituted products	(q) Three isomers, two isomers are chiral
(C)	Prismane→ C_6H_4BrCl Disubstituted products	(r) Three isomers, all are chiral
(D)	Benzene → $C_6H_4Br_2$ Disubstituted products	(s) One isomer
(E)	Benzene → C_6H_4BrCl Disubstituted products	(t)

CODES :

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

364.

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

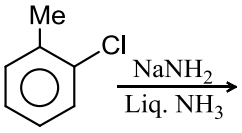
CODES :

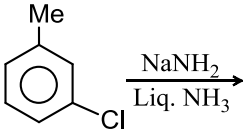
	A	B	C	D	E

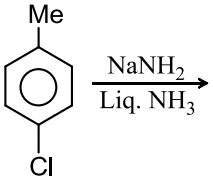
a)	S	t	q	p	r
b)	q	p	s	r	r
c)	p	q	r	s	r
d)	t	p	q	s	r

365.

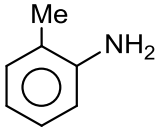
Column-I

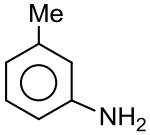
(A) 

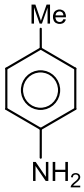
(B) 

(C) 

Column- II

(p) 

(q) 

(r) 

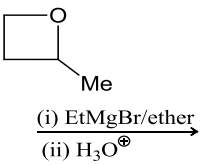
(s) ArSN (elimination- addition) reaction

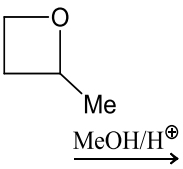
CODES :

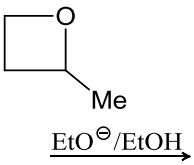
	A	**B**	**C**	**D**
a)	P,q,s	p,q,r,s	q,r,s	
b)	q,r,s	p,q,s	p,q,r,s	
c)	p,q,r,s	q,rs	p,q,s	
d)	r,s	p,r	q,s	

366.

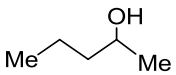
Column-I

(A) 

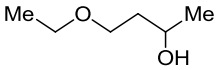
(B) 

(C) 

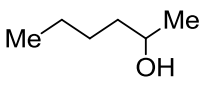
Column- II

(p) 

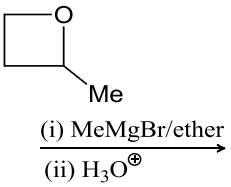
and SN^2

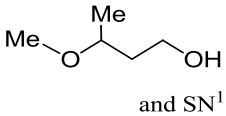
(q) 

and SN^2

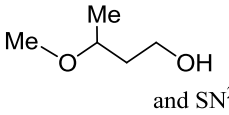
(r) 

and SN^2

(D) 

(s) 

and SN^1

(t) 

and SN^2

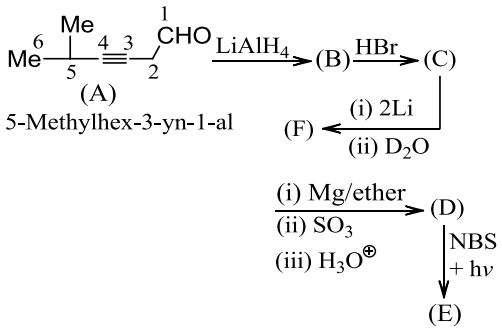
CODES :

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

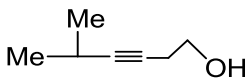
Linked Comprehension Type

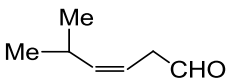
This section contain(s) 32 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

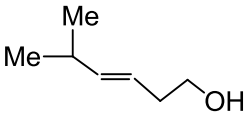
Paragraph for Question Nos. 367 to -367

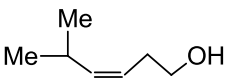


367. The structure of product (B) is:

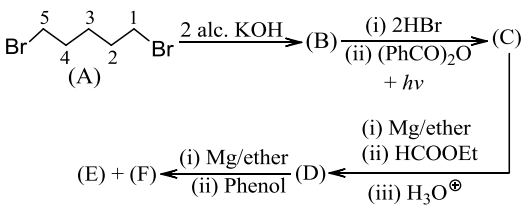
a) 

b) 

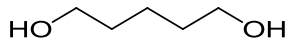
c) 

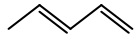
d) 

Paragraph for Question Nos. 368 to - 368

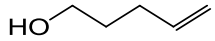


368. The structure of product (B) is:

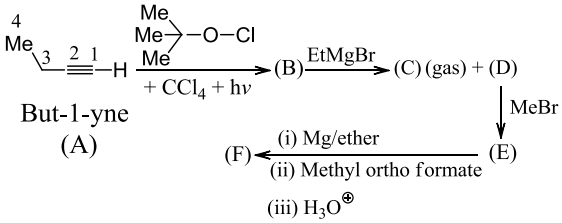
a) 

b) 

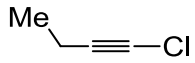
c) 

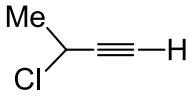
d) 

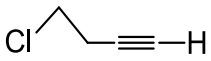
Paragraph for Question Nos. 369 to - 369

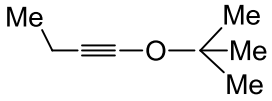


369. The structure of product (B) is:

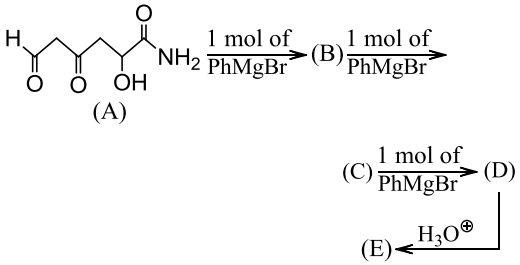
a) 

b) 

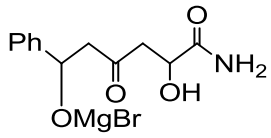
c) 

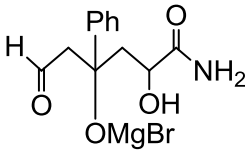
d) 

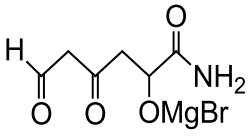
Paragraph for Question Nos. 370 to - 370

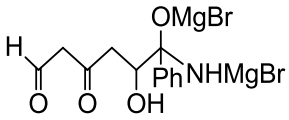


370. The structure of product (B) is:

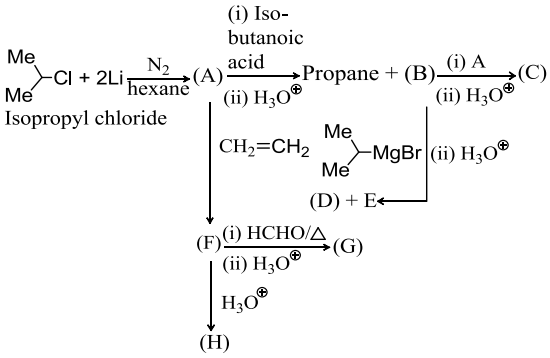
a) 

b) 

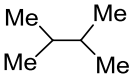
c) 

d) 

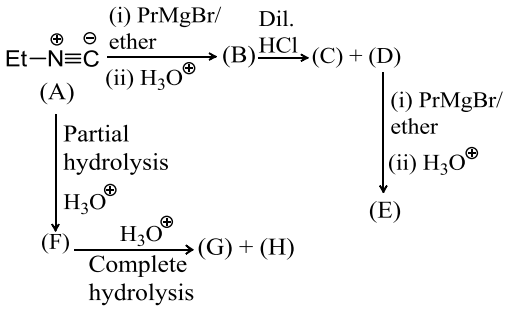
Paragraph for Question Nos. 371 to - 371



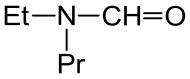
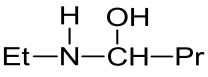
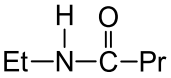
371. The structure of product (A) is:

a) Isopropyl lithium b) Propyl lithium c)  d) Hexane

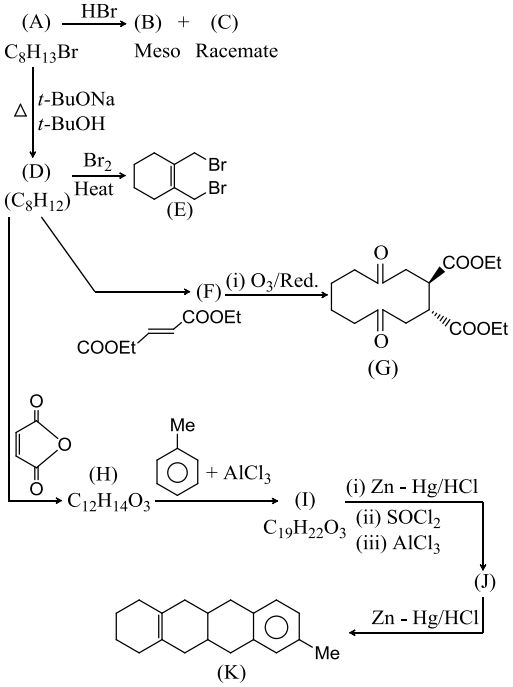
Paragraph for Question Nos. 372 to - 372



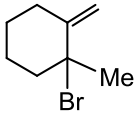
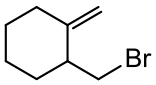
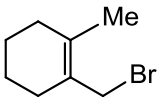
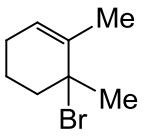
372. The compound (B) is:

a)  b) $Et - N = CH - Br$ c)  d) 

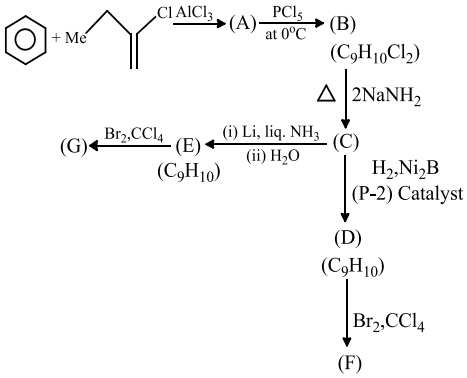
Paragraph for Question Nos. 373 to - 373



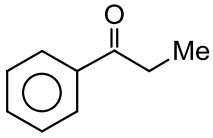
373. Compound (A) is:

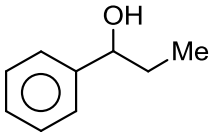
a)  b)  c)  d) 

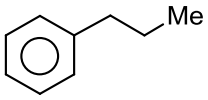
Paragraph for Question Nos. 374 to - 374

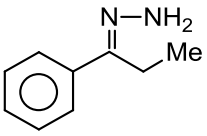


374. Compound (A)on reaction with $NH_2NH_2 + \overset{\ominus}{O}H$ is:

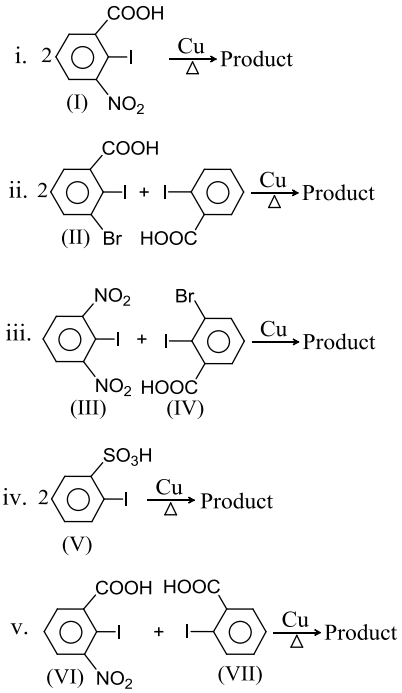
a) 

b) 

c) 

d) 

Paragraph for Question Nos. 375 to - 375



375. All the reactions (i) to (v) are examples of:

a) Wurtz reaction
b) Wurtz- Fittig reaction
c) Ullmann reaction
d) Frankland reaction

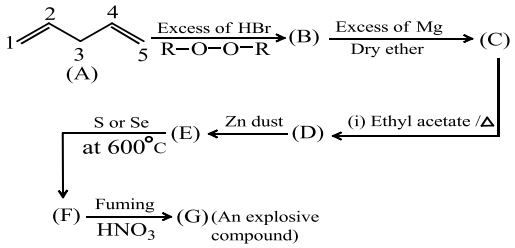
Paragraph for Question Nos. 376 to - 376

Compound (A), an alkane with molecular formula (C_5H_{10}), exists in various structures and stereoisomers. On monochlorination and dichlorination, it again shows various structures and stereoisomers

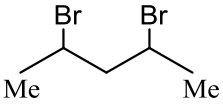
376. The number of cyclic structures including stereoisomers for (A) is:

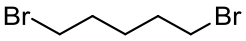
a) 5 b) 6 c) 7 d) 8

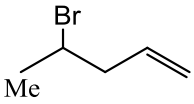
Paragraph for Question Nos. 377 to - 377

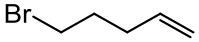


377. Compound (B) is:

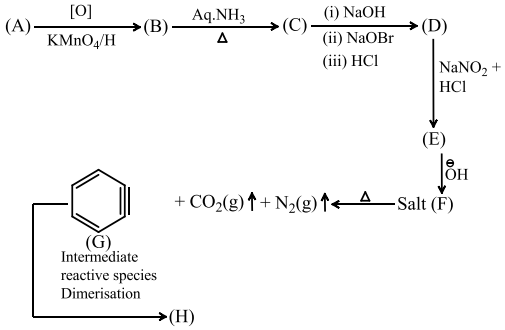
a) 

b) 

c) 

d) 

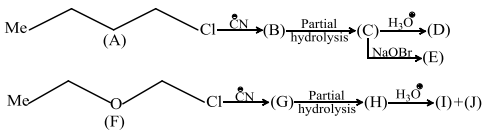
Paragraph for Question Nos. 378 to - 378



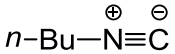
378. Compound (A) is:

a) Ethylbenzene b) *p*-Xylene c) *m*-Xylene d) *o*-Xylene

Paragraph for Question Nos. 379 to - 379



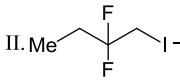
379. Compound (B) is:

a) $n - \text{Bu} - \text{C} \equiv \text{N}$ b) 

c) Both d) None

Paragraph for Question Nos. 380 to - 380

I. BuI $\xrightarrow{AgNO_2}$ (B) $\xrightarrow{NaNO_2 + HCl}$ (C) $\xrightarrow{\ominus OH}$ Blood red colouration

II.  $\xrightarrow{KNO_2}$ (E) $\xrightarrow{NaNO_2 + HCl}$ (F)

(D)

380. Compound (B) is:

a) $Bu - NO_2$ b) $Bu - O - N = O$ c) Both d) None

Paragraph for Question Nos. 381 to - 381

SN reaction is given by these compounds, which have a nucleophilic group and a good leaving EWG. It should be stable after leaving with bonding pair of $\bar{e}$'s and it should have high polarisability
Nucleophilic aliphatic substitution reaction is mainly of two types SN^1 and SN^2. SN_1 mechanism is a two-step process. Reaction velocity of SN^1 depends only on the concentration of the substrate. It proceeds *via* the formation of carbocation, optically active substrate gives $\oplus$ and $\ominus$ forms of the product
In most of the cases, the product usually consists of $5 - 20\%$ inverted and $(95 - 80\%)$ racemised species. The more stable is the carbocation, the greater is the proportion of racemisation. In solvolysis reaction, the more nucleophilic is the solvent, the greater is the proportion of inversion

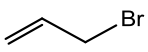
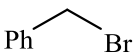
381. Which of the following will give SN reaction?

a) $R - Br$ b) $R - N_3$ c) $R-\overset{\oplus}{O}H_2$ d) All

Paragraph for Question Nos. 382 to - 382

SN reaction is given by these compounds, which have a nucleophilic group and a good leaving EWG. It should be stable after leaving with bonding pair of $\bar{e}$'s and it should have high polarisability
Nucleophilic aliphatic substitution reaction is mainly of two types SN^1 and SN^2. SN_1 mechanism is a two-step process. Reaction velocity of SN^1 depends only on the concentration of the substrate. It proceeds *via* the formation of carbocation, optically active substrate gives $\oplus$ and $\ominus$ forms of the product
In most of the cases, the product usually consists of $5 - 20\%$ inverted and $(95 - 80\%)$ racemised species. The more stable is the carbocation, the greater is the proportion of racemisation. In solvolysis reaction, the more nucleophilic is the solvent, the greater is the proportion of inversion

382. Which of the following will give SN^2 mechanism?

a) MeBr b)  c)  d) All

Paragraph for Question Nos. 383 to - 383

Isopropyl bromide was treated separately with sodium *t*-butoxide and sodium ethoxide under two different conditions

Reaction I:

Treatment of isopropyl bromide with (Me_3CONa) at 40°Cgave almost exclusively compound (A) (C_3H_6)

Reaction II:

Treatment of (*i*-PrBr) with $NaOC_2H_5$ at 30°C yielded compound (A) (C_3H_6). Along with a small amount of an ether (B) $(C_5H_{12}O)$

Compound (A) was readily oxidised by a neutral solution of cold dil. $KMnO_4$ to give a brown precipitate

383. The formations of (A) and (B) are best explained by:

a) SN^2 reaction and E2 reaction, respectively
b) E2 reaction and SN^2 reaction, respectively
c) E1 reaction and SN^1 reaction, respectively
d) E2 reaction and SN^1 reaction, respectively

: ANSWER KEY :

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

189)	d	190)	a	191)	c	192)	b
193)	d	194)	c	195)	b	196)	b
197)	c	198)	b	199)	c	200)	d
201)	b	202)	a	203)	a	204)	a
205)	b	206)	a	207)	b	208)	b
209)	a	210)	c	211)	c	212)	a
213)	a	214)	a	215)	c	216)	a
217)	b	218)	c	219)	a	220)	d
221)	b	222)	b	223)	a	224)	a
225)	b	226)	b	227)	b	228)	b
229)	c	230)	b	231)	c	232)	b
233)	c	234)	b	235)	b	236)	b
237)	c	238)	a	239)	c	240)	b
241)	b	242)	b	243)	b	244)	b
245)	b	246)	d	247)	b	248)	d
249)	a	250)	b	251)	c	252)	b
253)	c	254)	b	255)	b	256)	c
257)	c	258)	b	259)	d	260)	b
261)	a	262)	b	263)	c	264)	c
265)	d	1)	c,d	2)	a,c	3)	a,b,c
4)	c						
5)	c	6)	b	7)	b,c,d	8)	b,e
9)	a,c,d	10)	a	11)	a,d	12)	a,b,c
13)	a,c	14)	b,c,d	15)	c,d	16)	c
17)	b	18)	a	19)	a,b,c	20)	b,c,d
21)	a,b,c	22)	d	23)	c,e	24)	a,b,c,d
25)	a,b	26)	a	27)	c,d	28)	b
29)	a,b,c	30)	a,c,d	31)	a,b,c	32)	b
33)	c,d	34)	a,b	35)	a,c	36)	a,c
37)	b,c,d	38)	a,c	39)	a,b,c	40)	b,d
41)	b,c,d	42)	b,d	43)	b,d	44)	a,b,c,d
45)	c	46)	d	47)	a,b	48)	d
49)	a,b,c	50)	a,b,c	51)	a	52)	c
53)	b,c,d	54)	a,b,c,d	55)	a,b,c	56)	a,b,c
57)	c	58)	a,b,c	59)	a,b,c	60)	a
61)	a,b,c	62)	d	63)	a,d	64)	c
65)	a,c,d	66)	a,d	67)	a,b,c	68)	c
69)	a,b	70)	a,b,c,d	71)	b,d	72)	a
1)	d	2)	a	3)	b	4)	d

5)	**b**	**6)**	**c**	**7)**	**d**	**8)**	**a**
9)	**b**	**10)**	**b**	**11)**	**d**	**12)**	**a**
13)	**a**	**14)**	**d**	**15)**	**d**	**1)**	**a**
	2)	**c**	**3)**	**b**	**4)**	**a**	
5)	**a**	**6)**	**a**	**7)**	**c**	**8)**	**a**
9)	**b**	**10)**	**d**	**11)**	**b**	**12)**	**b**
13)	**a**	**14)**	**c**	**1)**	**c**	**2)**	**c**
	3)	**b**	**4)**	**c**			
5)	**a**	**6)**	**b**	**7)**	**a**	**8)**	**c**
9)	**c**	**10)**	**c**	**11)**	**b**	**12)**	**d**
13)	**a**	**14)**	**a**	**15)**	**d**	**16)**	**d**
17)	**b**						

: HINTS AND SOLUTIONS :

2 **(b)**
Weaker the base, stronger is the leaving group
Fugacity: $H_2Te > H_2Se > H_2S > H_2O$

3 **(c)**
Aryl halides are least reactive due to resonance

4 **(b)**
EWG in benzyl halides favours SN^2, but EDG favours SN^1

6 **(c)**
Stronger the acid, weaker the C_B

1. Sulphonic acids are stronger than carboxylic acids
2. Aromatic sulphonic acids are stronger than aliphatic sulphonic acids
3. More the number of EWG, stronger is the acid

Acidic:

$F_3CSO_3H > PhSO_3H > MeSO_3H > Cl_3CCOOH$

Basic:

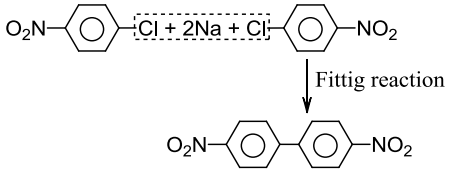
$F_3CSO_3^{\ominus} < PhSO_3^{\ominus} < MeSO_3^{\ominus} < Cl_3CCO\overset{\ominus}{O}$

7 **(b)**
Weaker the base or stronger the acid, stronger is the leaving group
$I^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$

8 **(b)**
Since nucleophilic centre is different and they belong to the same group, so basic character and nucleophilicity are reversed
$I^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$

14 **(b)**
$C_2H_5MgBr + S \xrightarrow[H_3O^{\oplus}]{} C_2H_5 - SH$

16 **(b)**



Strongly EWG $(-NO_2)$ group facilitates the reaction

17 **(a)**
More the nucleophilic character, more is the SN^2 reaction. Basicity and nucleophilicity are same when the nucleophilic centres are same

Acidic order: $HNO_3 > CH_3COOH > C_6H_5OH > H_2O > C_2H_5OH$

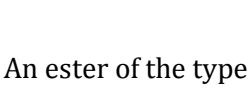
Basic and nucleophilic order:

$NO_3^{\ominus} < CH_3COO^{\ominus} < C_6H_5O^{\ominus} < \overset{\ominus}{O}H < C_2H_5\overset{\ominus}{O}$

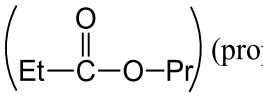
Therefore, $C_2H_5O^{\ominus}$ is the most effective nucleophile among the given nucleophiles

18 **(a)**
The basic character of hydride of 15 group decreases down the periodic table because size increases down the group and LP$\bar{e}$ density decreases
$NH_3 > PH_3 > AsH_3 > SbH_3$

19 **(a)**

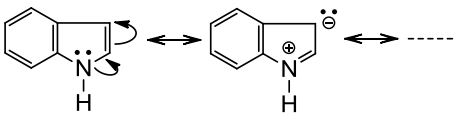


An ester of the type $(R-\overset{\overset{O}{\|}}{C}-O\ Pr)$ reacts with G.R. to give 3° alcohol, with two R' groups obtained from G.R. (EtMgBr)(R = Et−). The 3° alcohol must contain at least two (Et−) groups. (a) contains three (Et−) groups, two (Et −) groups are obtained from G.R. and one (Et −) group is obtained from ester
So, the alcohol is (a) and the ester is


(propyl propanoate).

20 **(c)**
Self-explanatory

23 **(a)**
Due to resonance, C − 3 acquires a negative charge and SE reaction at C − 3 takes place



25 **(a)**
Allyl halides undergo SN^1, SN^2 and $SN^{2'}$

27 **(c)**
SN^2 is stereospecific and stereoselective

Addition of Br_2 is stereospecific, i.e., anti-addition of two Br atoms

SE reaction is not stereospecific

Hydroxylation is stereospecific, syn-addition of two (−OH) groups

29 **(d)**

$H-\ddot{H}$, $PhO\ddot{H}$, and $Me-COO\ddot{H}$ contain active H atom. C_3H_7MgBrreacts with them to give propane gas. Butyne-2 (Me−≡ −Me) does not have active H atom and hence does not react with G.R

30 **(b)**

$$CH_3CH_2CH_2Br \xrightarrow{\text{Ethanolic KOH}} CH_3CH = CH_2 + KBr + H_2O$$

n-Propyl bromide Propene

34 **(a)**

R.E. of benzene, naphthalene, and anthracene,respectively, are 151, 255, and 351 kJ mol^{-1}

R.E./ring of naphthalene (two rings) = 255/2

= 127.5 kJ mol^{-1}

R.E./ring of anthracene (three rings) = 351/3

= 117 kJ mol^{-1}

On the basis of R.E./ring, R.E. of benzene > of napthalene> of anthracene

Hence, more stable the ring (more R.E./ring), more is the aromatic character

35 **(a)**

(a) ⇒ Aromatic (most stable)

(b) ⇒ Non-aromatic

(c) ⇒Non-aromatic

(d) ⇒ Anti-aromatic

36 **(b)**

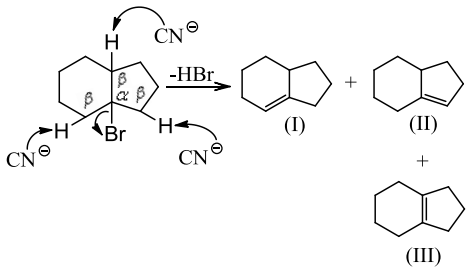
Weaker the base or stronger the acid, stronger is the leaving group

$$F^{\ominus} > \overset{\ominus}{O}H > \overset{\ominus}{N}H_2 > \overset{\ominus}{C}H_3$$

37 **(a)**

Since the reactant is a 3°alkyl halide, so in the presence of NaCN, it will follow E2 path rather thanSN^2, so path (II) is not feasible

The possible product by path (II) is:



38 **(b)**

$$C_2H_5OH \xrightarrow{SOCl_2} C_2H_5Cl + SO_2 + HCl$$

a. HCl bond is strong, no reaction

c. HCl bond is strong, no reaction

39 **(d)**

All the statements are self-explanatory

40 **(a)**

More the EDG, more reactive is the SE

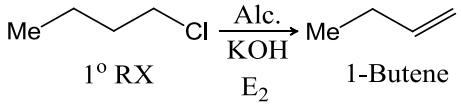
In anisole, $\left(-\ddot{O}CH_3\right)$ is $\overline{e}$ donating by resonance

SE order: (a) > (b) > (c) > (d)

41 **(b)**

Halogens are called deactivating group due to −Ieffect, but *o*- and *p*-directing by +R effect

42 **(a)**



1°RX undergoes E2 elimination with alc. KOH in which no rearrangement takes place.

43 **(a)**

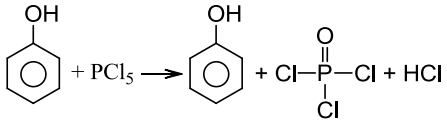
SE reaction takes place in central ring because it is attached to $\overline{e}$- donating (by resonance) (activating) two Ph-rings

Moreover, in $NO_2^{\oplus}ClO_4^{\ominus}$, $NO_2^{\oplus}$is an electrophile

44 **(d)**

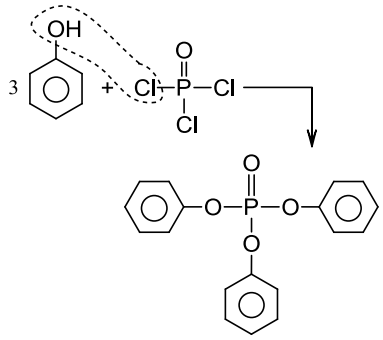
The (−OH) group of phenol, unlike that of alcohol, is difficult to replace by ahalogen,e.g., halogen acids have no action, and PX_3yields only phosphorous esters. Phenol reacts with PCl_5or PBr_5, when the (−OH) group of phenol is replaced by a halogen atom. The yield of chloro or bromo benzene is small, the main product is triphenyl phosphate

$(PhO)_3P = O$ or Ph_3PO_4



Small yield

Phenol further reacts with $POCl_3$ to give Ph_3PO_4



45 **(c)**

Statement (c)is Ullmann reaction

$2ArI + Cu \rightarrow Ar - Ar + CuI_2$

46 **(b)**

Basicity and fugacuty are reversed

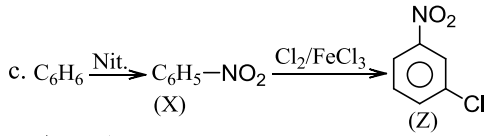
More N atom and more alky group (+I effect), more basic:(i) $>$ (ii) $>$ (iii) $>$ (iv)

48 **(b)**

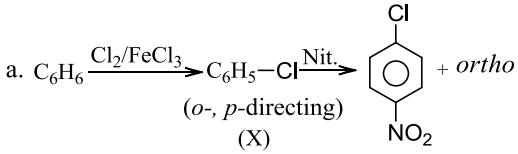
Basicity and nucleophilicity orders are reversed. Have different nucleophilic centre and belong to the same group

Nucleophilicity: $H_2Te > H_2Se > H_2S > H_2O$

49 **(c)**



$(-NO_2)$ group is *m*-directing



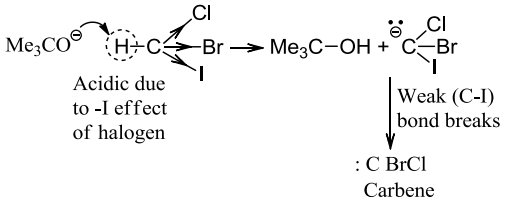
b. (Z)$\Rightarrow C_6H_5SO_3H$

54 **(a)**

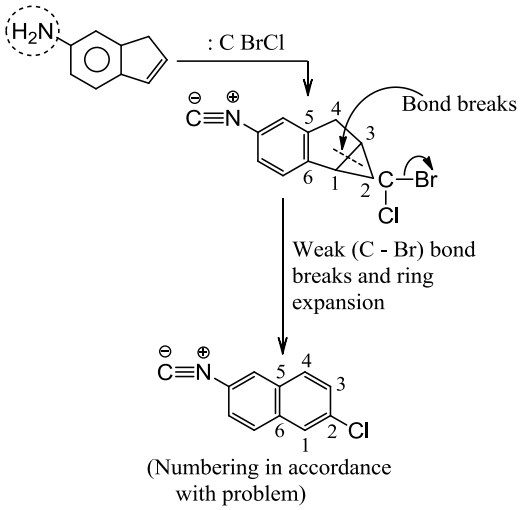
$C_2H_6(\text{Excess}) + Cl_2 \xrightarrow{\text{U.V.light}} C_2H_5Cl + HCl$

55 **(d)**

Reaction takes place by carbene mechanism followed by ring expansion



Carbene adds to (=) bond of five membered ring and simultaneously changes $(-NH_2)$ group in six-membered ring to $(-N\equiv C)$ (isocyanide group) (carbylamine reaction)



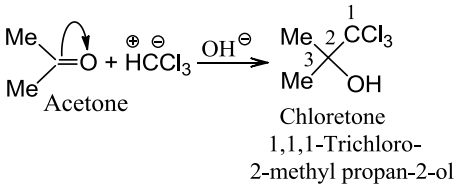
(Numbering in accordance with problem)

58 **(d)**

$C_6H_5Cl \xrightarrow{[H]} C_6H_6$

59 **(b)**

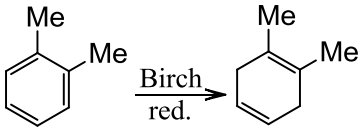
Chloretone is used as a hypnotic



Chloretone
1,1,1-Trichloro-
2-methyl propan-2-ol

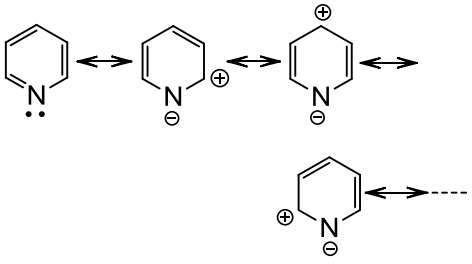
60 **(a)**

It is Birch reduction to give isolated double bond attached to the (Me) group



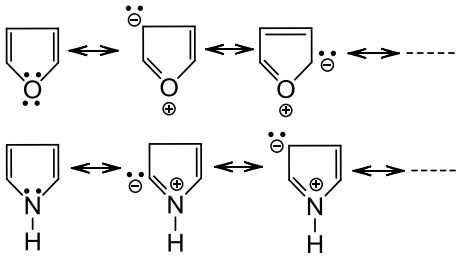
61 **(a)**

Pyridine is least reactive towards SE because pyridine is resonance stabilised as shown

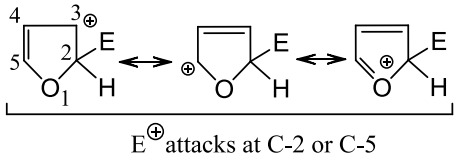


Because of withdrawal of $\bar{e}$'s from the ring by N atom the ring is deactivated, thereby resembling the benzene ring in nitrobenzene. So, it is least reactive towarde SE reaction

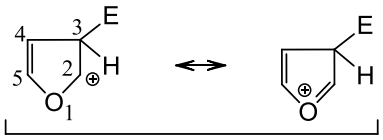
(b) and (d) are resonance structures so SE reaction takes place easily



SE reaction in pyrrole,thiophene and furan takes place at C-2 or C-5 positions because there are three resonating structures when $E^{\oplus}$ attacks at C-2 or C-5 and two resonating structures when $E^{\oplus}$ attacks at C-3



$E^{\oplus}$attacks at C-2 or C-5



$E^{\oplus}$attacks at C-3

63 **(d)**

When westronvapours are passed over heat $BaCl_2$or lime westrosol (trichloro ethylene) is obtained

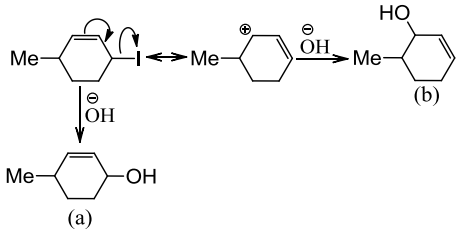
$Cl_2CH - CHCl_2 \xrightarrow[BaCl_2]{} Cl_2C = CHCl$ (Westrosol)

64 **(b)**

The Statement is self-explanatory

65 **(c)**

Both (a) and (b)



66 **(d)**

Nucleophilicityand leaving group are reversed

Fugacity:(i) $>$ (iii) $>$ (iv) $>$ (ii)

68 **(c)**

Same nucleophilic centre, basicity and nucleophilicity are same

Nucleophilicity:

$Cl_3CCOO^{\ominus} > MeSO_3^{\ominus} > PhSO_3^{\ominus} > F_3CSO_3^{\ominus}$

69 **(b)**

Weaker the base or stronger the acid, stronger is the leaving group

$SbH_3 > AsH_3 > PH_3 > NH_3$

71 **(d)**

(d) is allyl chloride, so most reactive, others are vinyl and aryl chloride

74 **(a)**

In (II) and (IV), the dipole vectors are cancelled, so there is zero dipole moment

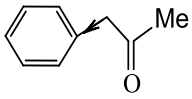
75 **(d)**

The statement is self-explanatory

77 **(b)**

The order of reactivity of G.R. with different functional groups is aliphatic aldehyde $>$ aromatic $>$ aldehyde $>$aliphatic ketone $>$ aromatic ketone. Also, EWG favours NA reaction

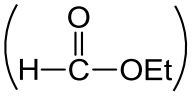
iv.is aliphatic ketone with−I effect of Ph group.



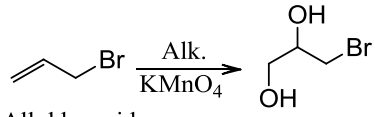
(+R effect is not possible since the double bond of benzene ring is not in conjugation with (C=O) group. So, (iv) is the most reactive ketone

Hence, the order is iv $> i >$ $ii > iii$

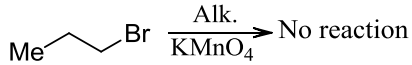
78 **(b)**

Ester of the type  reacts with G.R. to give 2° alcohol with two R' groups obtained from the G.R. (PrMgBr)(R = Pr−). The 2° alcohol must contain two propyl groups. Hence, the 2° alcohol is (b)

79 **(c)**



Allyl bromide



Propyl bromide

a.Aq.$AgNO_3$ will give test for $Br^{\ominus}$ by both

b. G.R will react with both

d.Tollens reagent will not react with both

80 **(a)**

More strained the ring, more easily it is cleaved. Three-membered ring is highly strained

81 **(a)**

Basic and nucleophilic orders are same

More N atom and more alky group (+I effect), more basic:(i) $>$ (ii) $>$ (iii) $>$ (iv)

82 **(a)**

Acidic: $PhSO_3H > C_2H_5SO_3H > C_2H_5COOH >$ $HCN > H_2O$

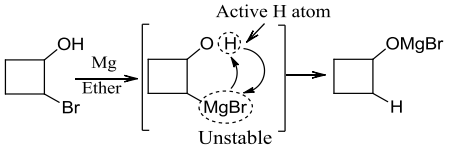
Basic: $PhSO_3^{\ominus} < C_2H_5SO_3^{\ominus} < C_2H_5COO^{\ominus} < \overset{\ominus}{C}N < \overset{\ominus}{O}H$

84 **(a)**

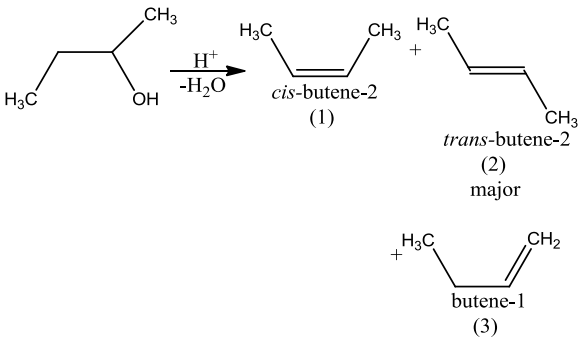
(a) is only an optically active product which will give racemic products. Others are not optically active

85 **(c)**

Reactant contains active H atom; therefore, it would not produce G.R.



86 **(d)**



In [F] order of quantity of alkene 2 > 1> 3

These on addition with Br_2/CCl_4 to give their addition products which have $C_4H_6\ Br_2$ as molecular formula.

(1) $CH_3 - \underset{\underset{Br}{|}}{CH} - \underset{\underset{Br}{|}}{CH} - CH_3$

(2) $CH_3 - \underset{\underset{Br}{|}}{CH} - CH - CH_3$

(3) $BrH_2C - \underset{\underset{Br}{|}}{CH} - CH_2 - CH_3$

(4) $BrH_2C - CH_2 - CHBr - CH_2$

(5) $CH_2Br - CH_2 - CH_2 - CH_2Br$

87 **(a)**

Compared to the others, $\overset{\ominus}{C}H_3$ has different nucleophilic centre; however, it belongs to the same period. Basicity and nucleophilicity order are same

$\overset{\ominus}{C}H_3 > \overset{\ominus}{O}H > CH_3COO^{\ominus} > H_2O$

89 **(b)**

In (b), positive charge is more stabilised due to+Ieffect of (Me) group

91 **(c)**

Rate is faster when the substituent activates the ring $(+\text{I or/and} + \text{R}, o/p)$and the rate is slower when the substituent deactivates the ring $(-\text{I}, -\text{R};\ m)$. Halogen deactivates the ring $(-\text{I}, +\text{R}, -\text{I} > +\text{R})$ but the orientation is o/p

Rate of $C_6H_6 = C_6D_6$, since no kinetic isotope effect is observed when H is replaced by D

Hence, the order is as given in (c). (I) = (II) > (IV) > (III)

92 **(c)**

$CH_3CH_2\overset{\otimes}{C}HCH_3$ (I)

sec-Butyl iodide

Contains asymmetric C atom while others do not have

94 **(a)**

EN of N > S

Positive charge on N will make (Me) group more $\bar{e}$deficient than positive charge on S. Therefore, (a) will undergo SN^2 reaction more rapidly than (c).

$Na^{\oplus}\ OH^{\ominus} + Me - \overset{\oplus}{N}Me_3\ I^{\ominus} \longrightarrow$

$MeOH + Me_3N + NaI$

96 **(b)**

Aryl halide due to resonance does not give test for halide ion, whereas benzyl halides give due to the formation of benzyl $C^{\oplus}$ which gives benzyl alcohol and $I^{\ominus}$

Ph I + Aq. NOH → No reaction

$PhCH_2I + \text{Aq. NaOH} \longrightarrow PhCH_2OH + I^{\ominus} \xrightarrow{AgNO_3} AgI$ (Yellow ppt.)

97 **(a)**

No reaction

$CaC_2 + 2H_2O \rightarrow HC \equiv CH + Ca(OH)_2$

c. $HC\boxed{I_3 + 6Ag + I_3}CH \longrightarrow HC{\equiv}CH + 6AgI$

d. $HC\boxed{Cl_3 + 6Ag + Cl_3}CH \longrightarrow HC{\equiv}CH + 6AgCl$

98 **(a)**

Stronger the acid weaker is its C_B

Acidic : $HF > H_2O > NH_3 > CH_4$

Basic: $F^{\ominus} < \overset{\ominus}{O}H < \overset{\ominus}{N}H_2 < \overset{\ominus}{C}H_3$

101 **(a)**

Since the G.R. reacts by SN^2 mechanism, the reactivity order of SN^2 reaction is 1° RMgX > 2° RMgX > 3° RMgX. Hence, the answer is (a)

103 **(c)**

p-Isomer gives only one product on SE reaction (OMP = 231)

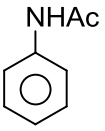
105 **(c)**

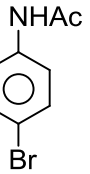
Acidic : $HCN > MeOH > H_2O > H_2 > CH_4$

Basic : $\overset{\ominus}{C}N < MeO^{\ominus} < OH^{\ominus} < H^{\ominus} < \overset{\ominus}{C}H_3$

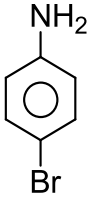
***Note*: MeOHis a stronger acid than H_2O, whereas otheralcoholsare weakerthanH_2O**

106 **(d)**

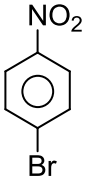
(A) ⇒ 

(B) ⇒ 

(C) ⇒ Alkaline hydrolysis of B,



(D) ⇒ Peracid oxidises($-NH_2$) to ($-NO_2$) group



108 **(d)**

Inverted product means SN^2

SN^2 reaction is faster in more polar protic solvent with neutral nucleophile (H_2O)

109 **(d)**

The reactivity order of G.R. with HCHO is:

Benzyl > Allyl > Ph−> Vinyl

Hence, the answer is (d)

110 **(b)**

(A) ⇒ $CH_3 - CH = CH_2$

(X) ⇒ Allylic chlorination

$Cl - CH_2 - CH = CH_2$

Allyl chloride

111 **(a)**

Self-explanatory

112 **(c)**

$$CH{\equiv}CH + 2Cl_2 \xrightarrow{CCl_4} Cl_2CH{-}CHCl_2$$

Westron or
1,1,2,2-Tetrachloro
ethane or
Acetylene tetrachloride

Westron is used as an industrial solvent for rubber,fats and varnished. It has some insecticidal action

115 **(a)**

More the EDG, more reactive is the SE reaction.

Order of SE = (a) > (*d*) > (*b*) > (*c*)

116 **(c)**

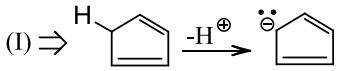
More the EWG, more is the reactivity for ArSNreaction

$-SO_3H$ (more resonance structure)

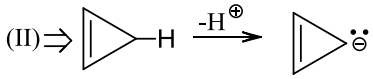
> $-NO_2$ > Cl > Me (EDG)

Therefore, (III) > (IV) > (II) > (I)

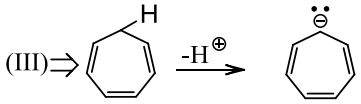
117 **(a)**

(I) ⇒ 

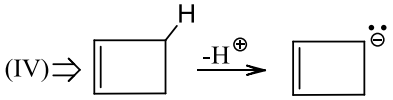
Aromatic
(6 $\bar{e}$'s system
in conjugation)

(II) ⇒ 

Anti-aromatic
(4 $\bar{e}$'s system
in conjugation)

(III) ⇒ 

Anti-aromatic
(8 $\bar{e}$'s system
in conjugation)

(IV) ⇒ 

Non-aromatic
(4 $\bar{e}$'s system but
not in conjugation)

Therefore, the order of acidic character:

Aromatic > Non-aromatic > Anti-aromatic

But anti-aromaticity of (III) is more than (II) since(III) is more resonance stabilised than (II)

Therefore, the order of decreasing acidic character or $K_a$value is (I) > (IV) >(III) > (II)

118 **(d)**

Here ,(a),(b) and (c) would produce alcohol, but

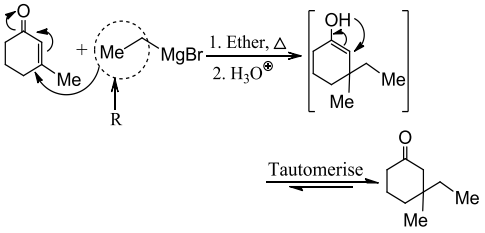
(d) would produce aldehyde with G.R

119 **(d)**

Aryl halide with EWG does not form G.R.

120 **(c)**

α, β-unsaturated ketone with G.R. gives predominantly 1, 4-addition product



121 **(d)**

Order of acidic strength is:

$CH_3OH > HC \equiv CH > C_6H_6 > C_2H_6$

Although all are neutral towards litmus paper

123 **(a)**

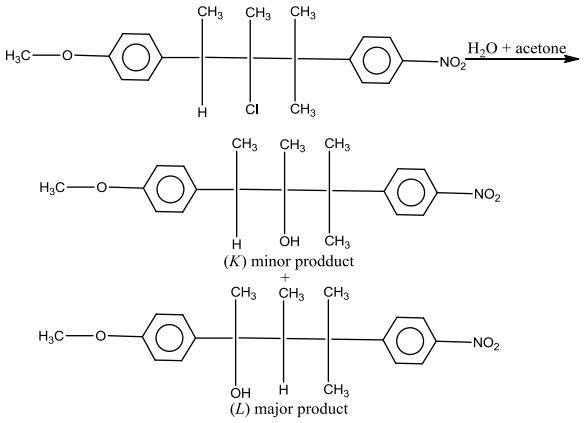
It is more reactive towards SE reactions, due to hyperconjugation

125 **(c)**

The reaction is wrong because alkaline hydrolysis of RX does not take place

127 **(a)**

The product (K) is formed through simple substitution while major product (L) is formed through H^- shift *via* S_N1 reaction and methoxy group stabilizes the carbocation intermediate of product (L).



130 **(a)**

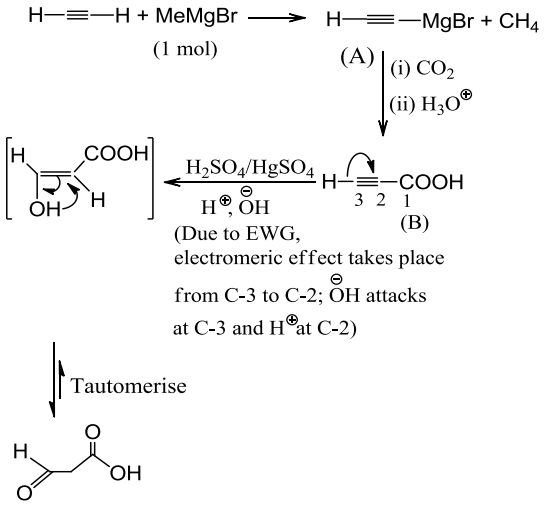
RBris more reactive than ArCl. So, the answer is (a)

132 **(b)**

Sulphonation is reversible process and shows 1° kinetic isotope effect, whereas other SE reactions (i.e., nitration halogenations, etc) do not show 1°kinetic isotope effect

133 **(a)**

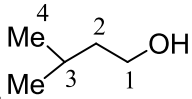
$H{-}\equiv{-}H + MeMgBr \rightarrow H{-}\equiv{-}MgBr + CH_4$



134 **(b)**

Alcohol containing $\left(CH_3{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}\right)$ aldehyde containing three α-H atoms ($CH_3 - CHO$); and ketone containing three α-H atoms

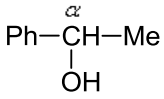
$\left(CH_3{-}\overset{\displaystyle O}{\overset{\|}{C}}{-}\right)$ gives iodoform test

a. 

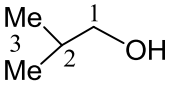
(Iso-amyl alcohol) does not contain $\left(CH_3{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}\right)$ group

So does not give iodoform

(Amyl⇒Five C atoms)

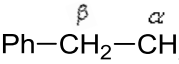
b. 

(It contains $\left(Me{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}\right)$ Group so gives iodoform)

c. 

(isobutyl alcohol)

(It also does not contain $\left(CH_3{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}\right)$, so does not gives iodoform)

d. 

(It does not contain $\left(Me{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}\right)$ group, so does not give iodoform)

136 **(d)**

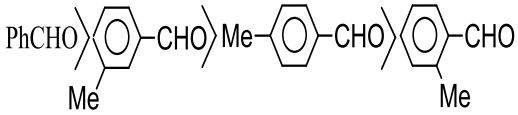
The order of reactivity of alkyl halides in SN^1 or SN^2 reaction is:

$(R - I) > (R - Br) > (R - Cl) > (R - F)$

$I^{\ominus}$is a better nucleophile and a better leaving group. Leaving group order:$I^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$

139 **(a)**

EDG (Me group) at $o-, m-$ and $p-$positions: At $ortho$- position, ED power of (Me−) group is more than p and m (due to +I effect and hyperconjugation effect). ED power of (Me−) group at p-position is slightly less than the Me group at $ortho$-position (due to less +I effect, but equal hyperconjugative effect). So the order of ED power of (Me−) group is $o > p > m$-. NA is favoured by less-substituted EDG or more-substituted EWG. So, the order of reactivity of PhMgBr with aromatic aldehyde is



or (i > iv > ii > iii)

140 **(d)**

Forms $(Me_3C^{\oplus})3°\ C^{\oplus}$. So SN^1 is fastest

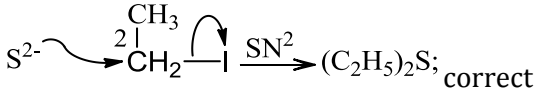
142 **(a)**

Nucleophilic centre on $\overset{\ominus}{C}N$ is different from others, but belongs to the same period. Basic and nucleophilic orders are same

Acidic: $PhSO_3H > C_2H_5SO_3H > C_2H_5COOH > HCN > H_2O$

Basic: $PhSO_3^{\ominus} < C_2H_5SO_3^{\ominus} < C_2H_5COO^{\ominus} < \overset{\ominus}{C}N < \overset{\ominus}{O}H$

143 **(b)**

1. Wurtz reaction; product is butane, correct
2. Frankland reaction, product would be butane, so wrong
3. 

correct
4. Finkelstein reaction, correct

$RBr + NaI \longrightarrow RI + NaBr$

144 **(c)**

Chlorofluoro carbons are called Freon.CCl_2F_2(Freon -12)

145 **(d)**

$CCl_4$is a covalent compound, so it does not react with $AgNO_3$

148 **(b)**

More the number of C atoms (high molecular mass) and straight chain (large surface are), higher the boiling points

149 **(d)**

Basicity and fugacity reversed.

Acidic :$HCN > MeOH > H_2O > H_2 > CH_4$

Basic : $\overset{\ominus}{C}N < MeO^{\ominus} < OH^{\ominus} < H^{\ominus} < \overset{\ominus}{C}H_3$

Note: MeOHis a stronger acid than H_2O, whereas otheralcoholsare weakerthanH_2O

151 **(a)**

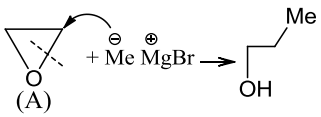
Stronger the acid, weaker is its C_B

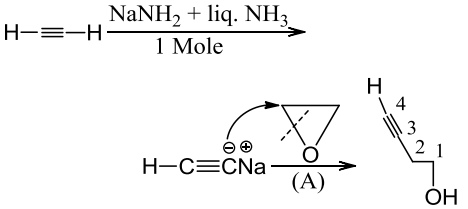
Acidic: HI > $HBr > HCl > HF$

Basic: $I^{\ominus} < Br^{\ominus} < Cl^{\ominus} < F^{\ominus}$

152 **(a)**

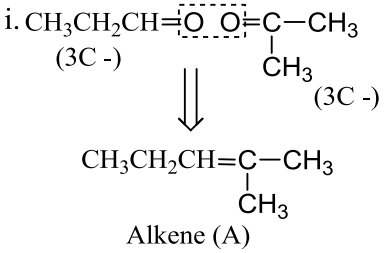
(B) is a 1° alcohol with three C atoms. HCHOwithMeMgBr would give 1° alcohol with two C atoms. Therefore, (A) may be oxirane



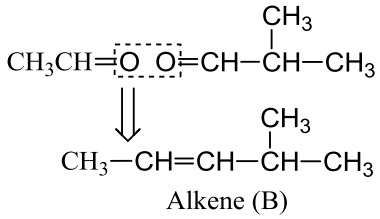


153 **(b)**

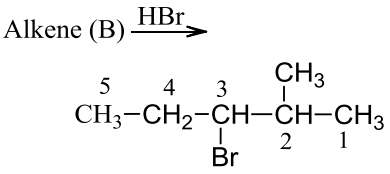
Alkene has six C atoms. Combine two products of ozonolysis containing three C atoms each



ii. Combine two products of ozonolysis containing four C and two C atoms to get another alkene



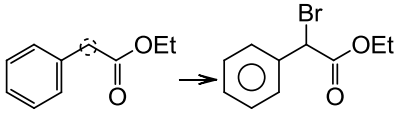
Alkene (B)



Alkene (A) and (B) $\xleftarrow[KOH]{Alc.}$ 3-Bromo -2- methyl pentane

155 **(b)**

Allylicbromination

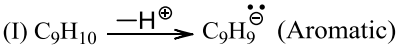


156 **(c)**

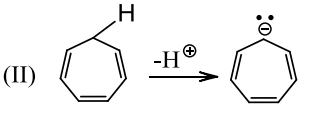
It would give cyclopropane

160 **(a)**

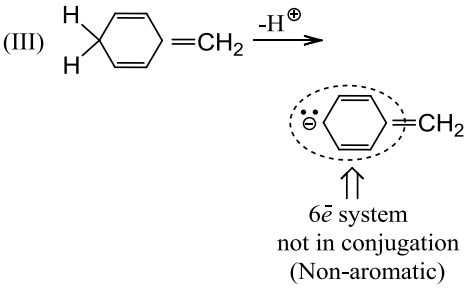
(I)$C_9H_{10} \xrightarrow{-H^{\oplus}} C_9H_9^{\ominus}$ (Aromatic)



[See Illustration 11.6 (27).]



(Anti-aromatic)



Acidic character: (I)>(III)>(II)

pK_a order: (I)<(III)<(II)

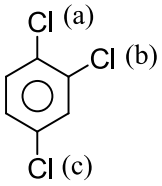
161 **(d)**

More the EDG, more is the SE reaction

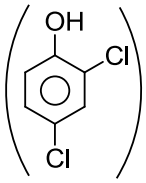
(−OH) group is more ED than other groups.

SE order is: (d) > (a) > (b) > (c)

162 **(a)**

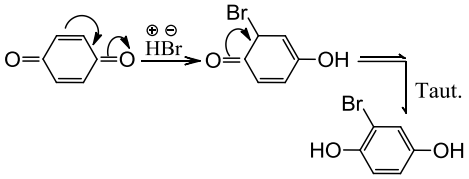


Cl (a) is more reactive towards ArSN reaction becausetwo EWGs are at *o*- and *p*-positions w.r.t. Cl (a). Hence,

the product is 

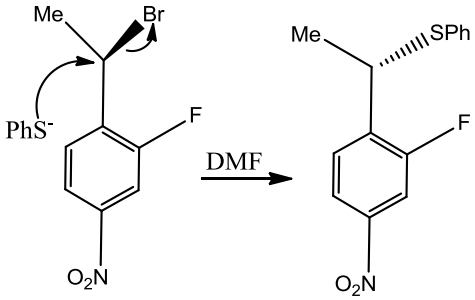
165 **(c)**

1, 4-Addition, followed by tautomerism



167 **(a)**

PhS^- is a strong nucleophile and dimethyl formamide (DMF) is a highly polar aprotic solvent. Condition indicates that nucleophilic substitution (S_N2) takes place at 2° benzylic place, stereochemically, it involves inversion of configuration.



168 **(b)**

(a) ⇒ Aromatic

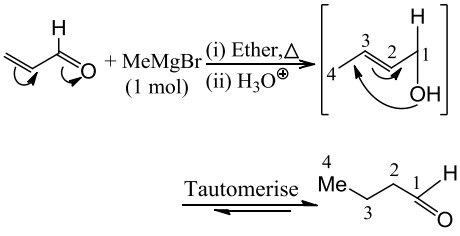
(b) ⇒ Non-aromatic, although $10\pi\bar{e}$'s system

(c) ⇒Aromatic

(d) ⇒Aromatic

171 **(c)**

α, β- Unsaturated aldehyde gives 1, 4-addition product with G.R.



172 **(c)**

(I) ⇒ 1°allylic halide and less steric hindrance, hence SN^2

(III) ⇒ 3°allylic halide, most stable carbonium ionand hence SN^1

174 **(a)**

More N atom and more alky group (+I effect), more basic:(i) $>$ (ii) $>$ (iii) $>$ (iv)

175 **(d)**

S is less EN and, therefore, more reactive towards SN^2

178 **(d)**

All

179 **(d)**

RCl (alkyl halide) is more reactive than (Ar − I) (arylhalide)

180 **(c)**

(C−I) is a weak bond and $I^{\ominus}$ is a better leaving group

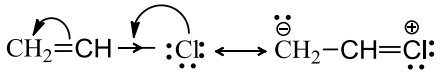
181 **(c)**

$PhCH_2Cl$ formsstable$PhCH_2^{\oplus}$(benzyl $C^{\oplus}$)ion. So the reaction is feasible

182 **(d)**

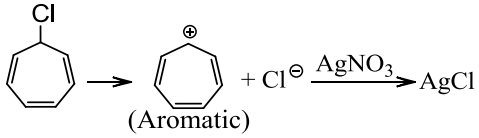
a. It is aryl halide, stabilised by resonance

b. Vinyl chloride is also stabilised by resonance



c.Vinyl system as in (B)

d.



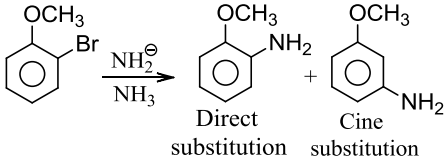
183 **(d)**

SN^1reactivity order is:

Benzyl >Allyl>2° > 1°halide

185 **(a)**

It is an example of ArSN (elimination-addition) reaction *via*benzyne intermediate



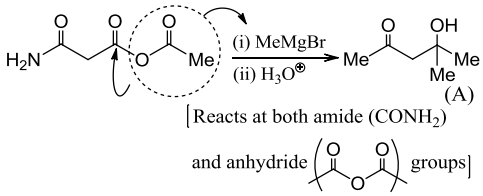
186 **(d)**

$(-NH_2)$group (EDG) is o, p-directing, while others (EWG) are m-directing

188 **(d)**

Self -explanatory

189 **(d)**

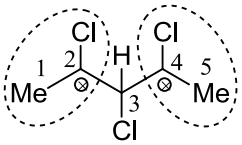


Amide with G.R. gives ketone, with one R(i.e., Me group) from G.R., and anhydride with G.R. gives 3° alcohol, with two R(i.e., Me group) from G.R.

190 **(a)**

+I effect of $(-CH_3)$ group increases the electron density on the benzene ring, hence it is most reactive towards electrophilic nitration

192 **(b)**



2,3,4-Trichloropentane

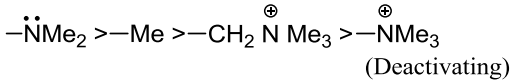
C-2 and C-4 are asymmetric C atoms, but C-3 is not, because two groups on C-3 marked $(\cdots)$are same

194 **(c)**

The statement is self-explanatory

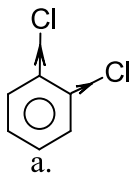
196 **(b)**

Stronger the activating substituent (i.e., EDG), faster is the rate of SE (bromination) reaction.Order of $\bar{e}$-donating substituent:



Hence, the rate of bromination: (IV) $>$ (III) $>$ (II) $>$ (I)

197 **(c)**



a.

$(\theta = 60°), CH_2Cl_2, CHCl_3, C_2H_5Cl$

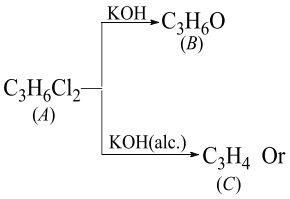
μorder is: (a) > (d) > (b) > (c)

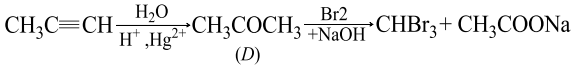
199 **(c)**

Two-C-atom dihalide with Mg gives alkene, while three-C-atoms dihalide with Mg gives cyclopropane

$$Br - CH_2 - CH_2 - Br \xrightarrow[Ether]{Mg} CH_2 = CH_2 + MgBr$$

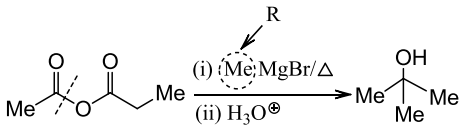
203 **(a)**





Since, B and D are different thus, B is CH_3CH_2CHO and so A is $CH_3CH_2CHCl_2$.

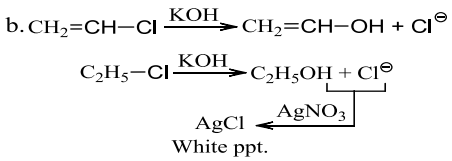
204 **(a)**



Nucleophile $(Me^{\ominus})$ attacks the $(C = O)$ group attached to the less-substituted EDG (Me group) because nucleophilic addition (NA) is favoured by EWG or less-substituted EDG

205 **(b)**

Lucas reagent will not react both, since it is a test to distinguish between 1°, 2° and 3° alcohols



c.AgCl will not react with both

HCl/AgCl will not react with both

208 **(b)**

Carbylamine test is given by 1°amine with $CHCl_3$ + KOH

$$RNH_2 + CHCl_3 + KOH \longrightarrow \underset{\text{Isocyanide}}{R\overset{\oplus}{N}{\equiv}\overset{\ominus}{C}}$$

It gives an offensive smell of isocyanide

Mechanism proceeds *via*carbene

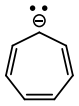
$(:CCl_2)$ or $(:CX_2)$ or $(:CXX^1)$

$(XX^1 \Rightarrow$Two different halogens)

209 **(a)**

(I)⇒Aromatic $6\pi\bar{e}$'s system in conjugation

(II)⇒Non-aromatic, $8\pi\bar{e}$'s system but ring is not planar, so not anti-aromatic but non-aromatic

(III) ⇒Anti-aromatic $8\pi\bar{e}$'s in conjugation 

Stability order: Aromatic > Non-aromatic > Anti-aromatic

(I)>(II)>(III)

210 **(c)**

Acidic character:

$ACOH > PhOH > MeOH > H_2O$

pK_4 value: 4.75 9.9 15.5 15.74

Basic and nucleophilic characters are same because of same nucleophilic centre

Nucleophilic order:

$AcO^{\ominus} < PhO^{\ominus} < MeO^{\ominus} < \overset{\ominus}{O}H$

(B)<(A)<(D)<(C)

212 **(a)**

1. $HC \equiv CH \xrightarrow[\text{Birch red}]{K \text{ in liq.} NH_3} H_2C = CH_2(Gas)$

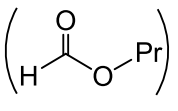
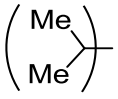
$[C \equiv C \Rightarrow (C = C)]$

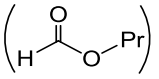
II. $HC{\equiv}CH + \overset{\ominus}{N}H_2 \longrightarrow HC{\equiv}C^{\ominus} + NH_3$ (Gas)

III. $HC{\equiv}CH + \overset{\ominus}{C}H_3 \longrightarrow HC{\equiv}C^{\ominus} + CH_4$ (Gas)

IV. $HC{\equiv}CH + \overset{\ominus}{O}H \longrightarrow HC{\equiv}C^{\ominus} + H_2O$ (liquid)

213 **(a)**

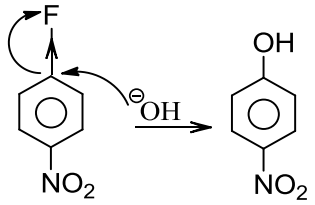
2°alcohol is obtained from the ester of the type  with two R groups, i.e., isopropyl group  obtained from the G.R.

So, the ester is  (Propyl methanoate)

214 **(a)**

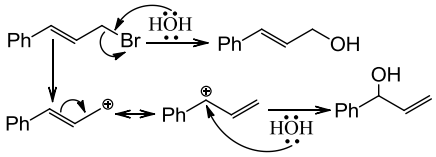
$ArSN^2$reactions are favoured by strong EWG,−I

effect of F is highest (more EN of F)



215 **(c)**

[Both (a) and (b)]



216 **(a)**

The basic character of hydrides of 16 group decreases down the group. Size increases down the group and LP $\bar{e}$ density decreases

Basic: $H_2O > H_2S > H_2Se > H_2Te$

217 **(b)**

(a) ⇒ Non-aromatic,

(b) ⇒Anti-aromatic ($4\pi\bar{e}$'s, conjugation)

(c) ⇒ Non-aromatic ($4\pi\bar{e}$'s not in resonance)

(d) ⇒ [10]-Annulene, non-aromatic.

So (b) is anti-aromatic

218 **(c)**

a. $\left(\begin{matrix}O\\ \|\\ -C-\end{matrix}\right)$ group, b. $\left(-\overset{\oplus}{N}Me_3\right)$

c.It is weakly deactivation but o, p-director

d.$(-CF_3)$ group; (a) (b) and (d) are m-director

220 **(d)**

(d) is not Sandmeyer's reaction

223 **(a)**

Since the nucleophilic centre is different but they belong to the same period, so the basic and nucleophilic characters are same. Basicity and nucleophilicity :

Stronger the acid weaker is its C_B

Acidic : $HF > H_2O > NH_3 > CH_4$

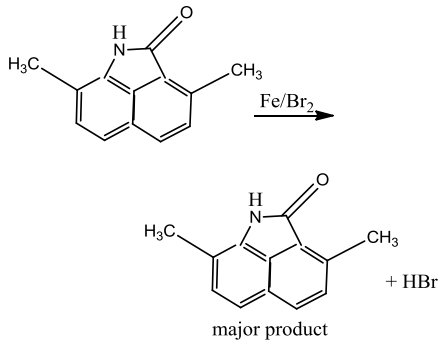
$$\text{Basic: } F^{\ominus} < \overset{\ominus}{O}H < \overset{\ominus}{N}H_2 < \overset{\ominus}{C}H_3$$

$$\overset{\ominus}{C}H_3 > \overset{\ominus}{N}H_2 > \overset{\ominus}{O}H > F^{\ominus}$$

224 **(a)**

RX with $AgNO_2$ gives nitroalkane

225 **(b)**



It is electrophilic substitution, so electrophile must be attacked on o/p-position due to higher electron density on this position. In this ring, the attached –NH- group will have high electron density due to resonance and $ortho$ position is blocked, so electrophile is attached on $para$ position.

226 **(b)**

SN^2 mechanism

227 **(b)**

Ethanol (C_2H_5OH) forms hydrogen bonding with water.Hence, it is soluble in water

230 **(b)**

The statement is self-explanatory

231 **(c)**

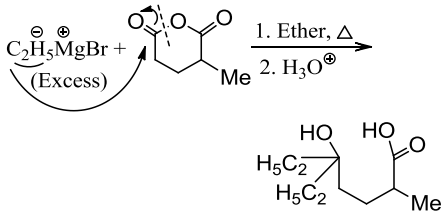
Toluene has an allylic group

232 **(b)**

Step 2 is wrong because Friedel-Crafts reaction will not take place in the presence of $\bar{e}$-withdrawing, m-directing $(-NO_2)$ group

233 **(c)**

NA reaction takes place from the side contaning less-substituted EDG or more-substituted EWG



234 **(b)**

In basic medium, SN^2 and in acidic medium, SN^1.

235 **(b)**

It is an example of SN^1 reaction in which retention takes place. So, if reactant-specific rotation is positive, it should be positive for the product also, but of different value since the reactant and product are different

236 **(b)**
Since nucleophilic centre is different and belongs to the same group, so basic character and nucleophilicity are reversed
$SbH_3 > AsH_3 > PH_3 > NH_3$

237 **(c)**
Sulphonation is reversible process and shows 1° kinetic isotope effect, whereas other SE reactions (i.e., nitration halogenations, etc) do not show 1°kinetic isotope effect

239 **(c)**
3° $C^{\oplus}$is more stable and hence has less$E_{\text{activation}}$

240 **(b)**
More the EDG, faster is the SE reaction or F.C. reaction

But ED power of $(-NH_2)$ (by resonance) is greater than $(-CH_3)$ (by hyperconjugation). But aniline does not undergo F.C. reaction

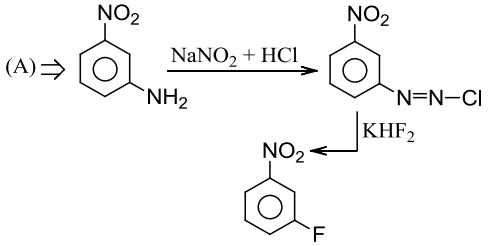
Therefore, in (a), three H.C. structures.

In (c), one H.C. structure

In (d), $(-NO_2)$, EWG, F.C. reaction does not take place

So in (b), F.C. reaction is fastest

241 **(b)**
Selective reduction by NH_4HS [only one $(-NO_2)$ is reduced to (NH_2)]



243 **(b)**
Fugacity and basic orders are reversed
(i)>(ii)>(iii)>(iv)>(v)

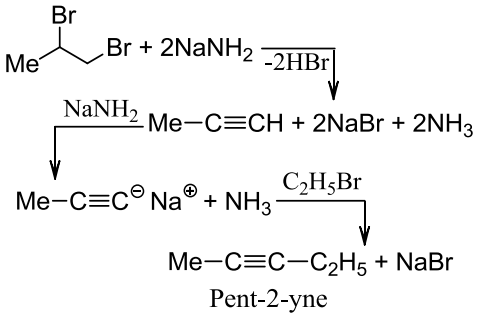
245 **(b)**
Self-explanatory

246 **(d)**
E1 and E2 are both called β-elimination becauseβ-H (most acidic) is removed by base.But E2 is also called anti-or *trans*-elimination

248 **(d)**
SE reaction is a characteristic of an aromatic compound

250 **(b)**
SE reaction takes place *ortho*to $(-OH)$ group, not *ortho*to $(-\ddot{O}-)$group. Since it is deactivated by the strong $\bar{e}$-withdrawing group $(-COO^{\ominus}$ and $\overset{\oplus}{N}H_3)$in another ring

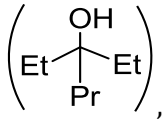
251 **(c)**

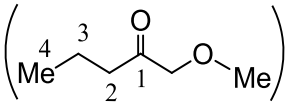


Hence 3 mol$NaNH_2$is used

252 **(b)**
Finkelstein reaction
$RCl \text{ or } R-Br \xrightarrow{NaI} R-I$

253 **(c)**
EWG favours NA reaction and aldehyde is more reactive than ketone in (iv). More reactive due to the −I effect of three Cl atoms
So, the order is: $Cl_3C-CHO > HCHO > MeCHO >$ MeCOMe

254 **(b)**
3°alcohol is 

, with two (Et) group obtained from G.R. Therefore, (Pr−) group has come from the user
So, the ester is 

(methyl butanoate). Hence, the answer is (b)

255 **(b)**
Self explanatory

256 **(c)**
Different nucleohiliccentres in $\overset{\ominus}{C}N,\ H^{\ominus},\ \overset{\ominus}{C}H_3,$ butall belong to the same period.
Basic and uncleophilic orders are same.
Acidic :$HCN > MeOH > H_2O > H_2 > CH_4$
Basic : $\overset{\ominus}{C}N < MeO^{\ominus} < OH^{\ominus} < H^{\ominus} < \overset{\ominus}{C}H_3$
Note: MeOHis a stronger acid than H_2O, whereas otheralcoholsare weakerthanH_2O

257 **(c)**
Self-explanatory

258 **(b)**

Fugacity and basicity orders are reversed

$$H_2O > CH_3COO^{\ominus} > \overset{\ominus}{O}H > \overset{\ominus}{C}H_3$$

259 **(d)**

Neo-pentane gives only one monochloro derivative.

$$CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3 + Cl_2 \xrightarrow{UV} CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2Cl$$

260 **(b)**

Diazotisation, followed by Sandmeyer reaction

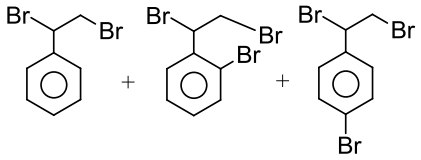
$$PhNH_2 \xrightarrow{NaNO_2/HCl} Ph-N{=}N-Cl \xrightarrow{CuCl/HCl} Ph-Cl$$

262 **(b)**

The statement is self-explanatory

264 **(c)**

Step 3 is wrong. The last step will first brominate the double bond. The product will be:



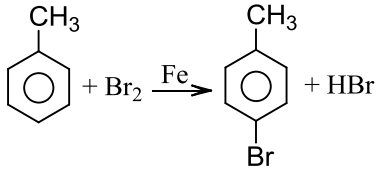
265 **(d)**

Self-explanatory

266 **(c,d)**

If the reactant and/or nucleophile are charged, increasing the polarity of the solvent stabilises any charged ground state species and decreases the rate of SN^2 reaction with an increase in the polarity of the solvent

267 **(a,c)**



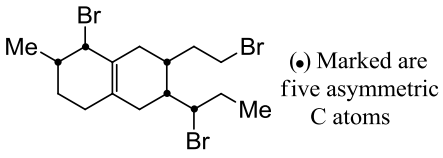
The $(-CH_3)$ group is able to activate the benzene ring by hyperconjugation. So, $(-CH_3)$ group shows *o/p*-directing influence on the benzene ring

268 **(a,b,c)**

a.Loss of Br (a) would give less-substituted alkene (more reactive, less stable)

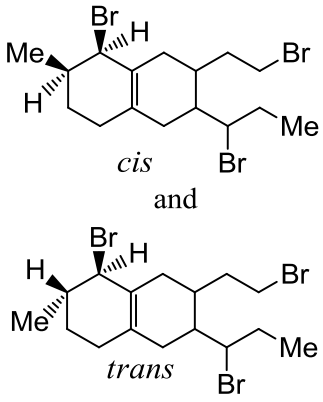
b.Removal of Br (c) would give more stable 2° allylic$C^{\oplus}$

c.



$C^{\oplus}$ Statements (a), (b), and (c) are correct

d.Statement (d) is wrong, since the compound shows G.I.



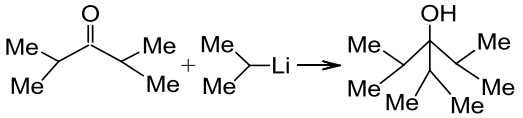
269 **(c)**


is stable (aromatic) but only in comparison with the rest of the family of anions. But this is not as stable as benzene (as it is neutral molecule in which all of carbon''s valencies are satisfied)

Rule: Uncharged state is more stable than charged state

271 **(b)**

$R^{\ominus}$ in RLi is more nucleophilic than in R′MgX, or R'_2Cd, or $R_2'Zn$ and, therefore, is sufficiently reactive to overcome the steric hindrance

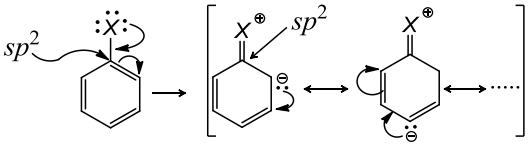


273 **(b,e)**

Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to the following reasons:

i. Resonance stabilisation

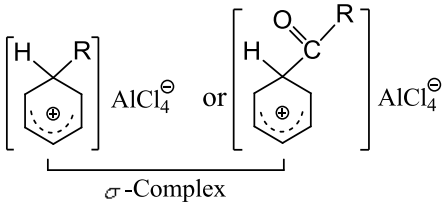
ii.sp^2-hybridised carbon attached to the halogen



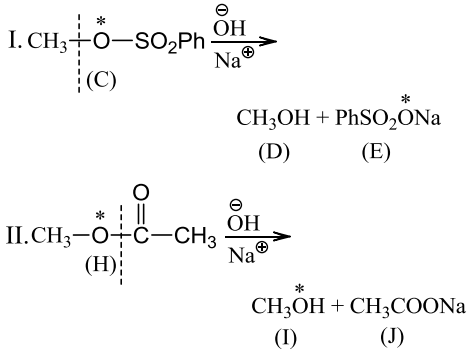
274 **(a,c,d)**

Statement (b) is wrong because the intermediate is σ-complex which is a positive -charge complex,

not $\bar{e}$-deficient species



275 **(a)**



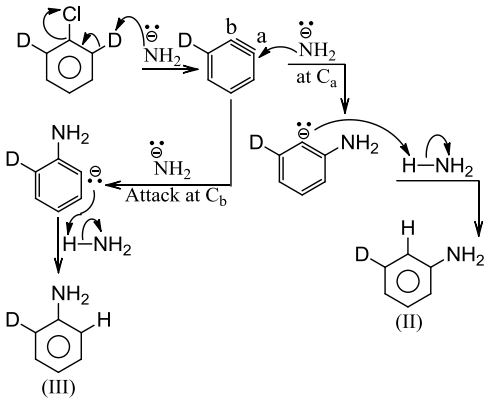
In (I), (C − O)bond breaks to give (D) and (E)

In (II), (O − C) bond breaks to give (I) and (J)

276 **(a,d)**

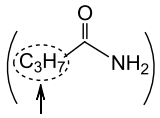
$NH_3$and dichlorodifluoro methane are used as refrigerants

277 **(a,b,c)**

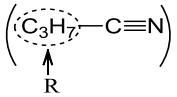


Product (II) is cine substitution and product (III) is direct substitution.Reaction is ArSN (elimination-addition) reaction

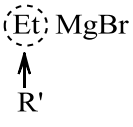
278 **(a,c)**



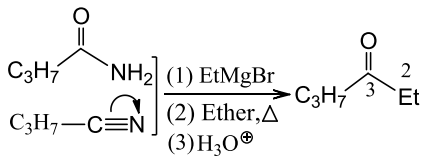
Both butanamide and butane nitrile



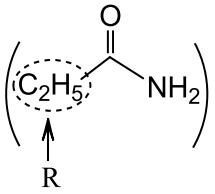
would give hexan-3-one with



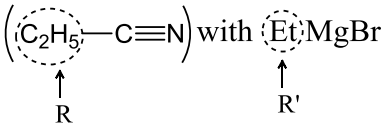
with



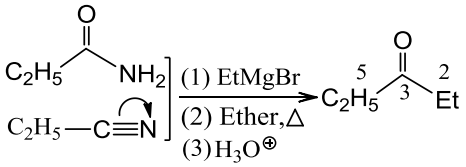
whilepropanamide



andpropanenitrile



would give petan-3-one



279 **(b,c,d)**

An aromatic molecule will have:

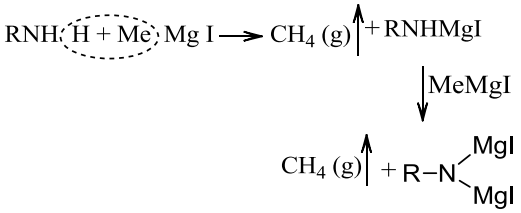
b. $(4n + 2)\pi$-electrons (by Huckel's rule),

c. Planar structure (due to resonance), and

d. Cyclic structure (due to the presence of sp^2-hybrid carbon atoms)

281 **(c)**

Only one hydrogen atom in 1° RNH_2reactes at room temperature. In the presence of pyridine, both H atoms in 1° RNH_2 react



One mole of $EtNH_2$ reacts with 2 mol of MeMgI to give 2 mol of CH_4(g). Molecular mass of$EtNH_2$ is 45 gm

Therefore, 45 gm of $EtNH_2$ gives2×22.4 litres of CH_4at S. T. P.

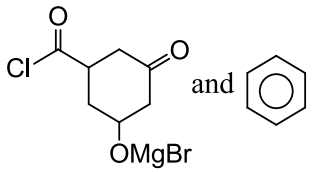
0.45 gm of $EtNH_2$gives$\frac{2\times22.4\times0.45}{45} = 0.448$ litres $= 448$ ml

282 **(b)**

The order of reactivity of functional group with G.R. is Alcohol>Aldehyde>

O
||
Ketone
>R − C − X>Ester>Anhydride>Amide>$-CH_2X$

a. First mole of PhMgBr reacts at the active H atom of alcohol to give

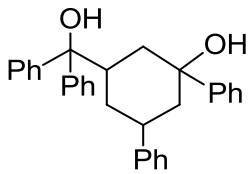


(benzene), not phenol. Hence, wrong statement

b. Second mole of PhMgBr reacts at ketone group and gives the required product. Hence, correct statement

c. It is a wrong statement

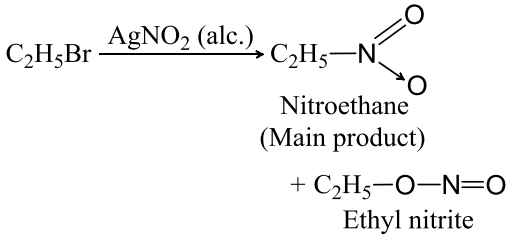
d. Compound (D) is wrong, because acid halide with G.R. gives 3° alcohol. Hence, compound D would be



286 **(a,b,c)**

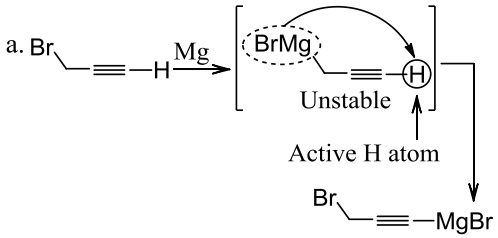
Statements are self-explanatory

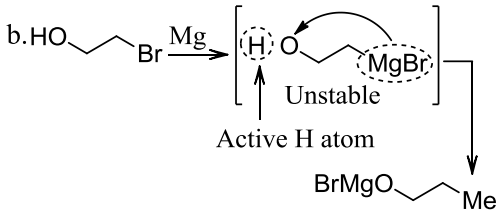
288 **(c,e)**



The main product of this reaction is nitroethane but ethyl nitrite is also formed as a side product along with silver bromide

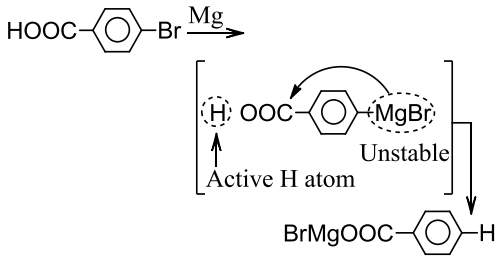
289 **(a,b,c,d)**



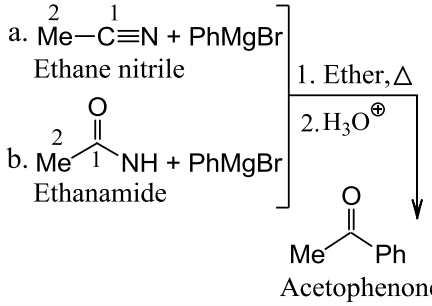


c. EWG ($-NO_2$ group) in the benzene ring oxidizes the G.R.

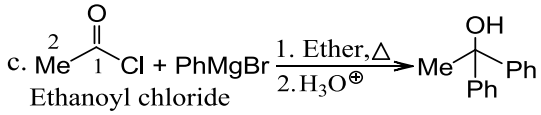
d.



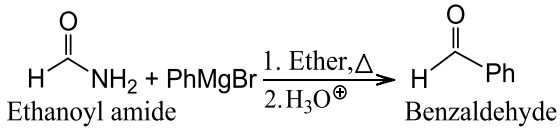
290 **(a,b)**



c. Acid chloride with G.R. would give 3° alcohol



d. Methanamide would give benzaldehyde with G.R.



291 **(a)**

In SN^1, the attack by the $Nu^{\ominus}$ is not specific (attack on the carbonium ion from front as well as back) and the products are mixtures of enantiomers thus neither stereospecific nor stereoselective

292 **(c,d)**

In (IV), the lone pair $\bar{e}$'s of two N makes it more basic and does not delocalise in the benzene ring

In (III), no delocalisation of $\ddot{N}H_2$, L.P. of $\bar{e}$'s

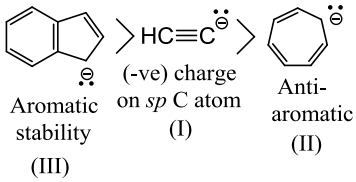
In (II), no delocalisation of LP of $\bar{e}$'s

In (I), delocalisation of LP of $\bar{e}$'s on N, *via* resonance

Hence, the order of basic character is: (IV) > (III)

>(II) > (I)

293 **(b)**



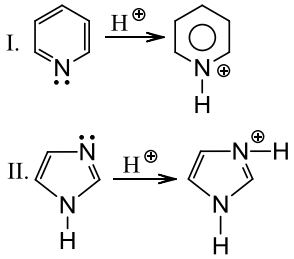
Stabler the C_B, stronger is the acidic strength (lower pK_a)

Therefore, the decreasing p$K_a$value: (II) > (I) >(III)

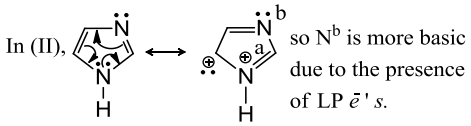
294 **(a,b,c)**

Product (d) is wrong, Br_2in non-polar solvent and gives *o*- and *p*-products

295 **(a,c,d)**



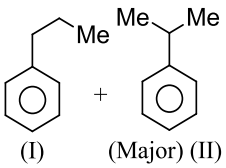
But (II) in not protonated. Hence statement (a) is true



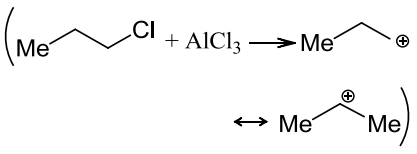
Hence, Statement (b) is wrong

298 **(c,d)**

(a) Products would be:

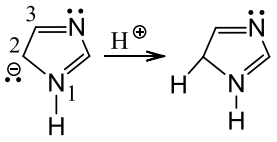


Due to stabilization of carbonium ion



b. Same explanation as in (a), the product would be a mixture of (I) and (II)

Statement (*c*):

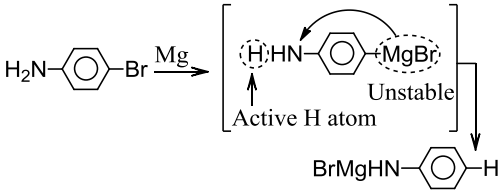


Statement (c) is true

Statement (d): Due to resonance, all N in (I), (II), and (III) are sp^2-hybridised and hence true

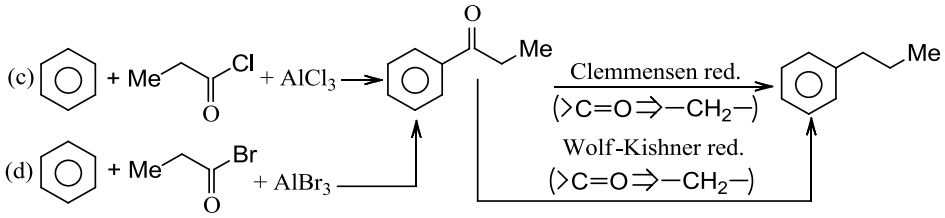
296 **(a,b,c)**

Since the $(-NH_2)$ group present in the benzene ring has active H atom, (d) does not form G.R.



297 **(b)**

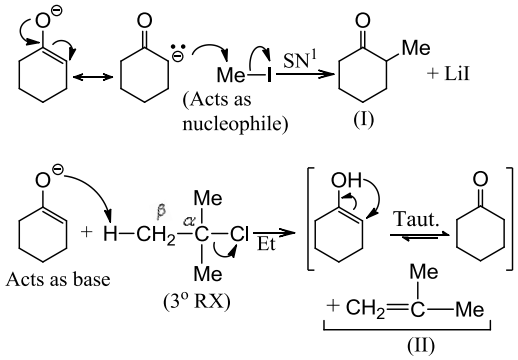
In E1, first ionisation of RX takes place and then abstraction of β-H atom by base takes place. The carbonium can rearrange and abstraction of H atom by base can be different. So the reaction is not stereospecific but stereoselective because of the formation of only one product



So, statements (c) and (d) are correct

299 **(a,b)**

The lithium enolate bases from cyclohexanone react with alkyl halides in different ways



300 **(a,c)**

If a bond at the asymmetric C atom is broken, SN^2 reaction occurs and inversion takes place

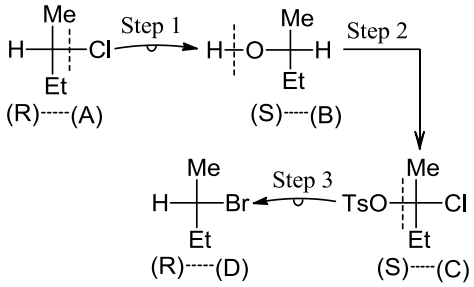
In step 1, (C − Cl) bond is broken to (C − OH), hence inversion occurs (↷)

In step 2, (C − O)bond is not broken but (O − H) bond is broken to give(−O − Ts). Hence, no inversion occurs

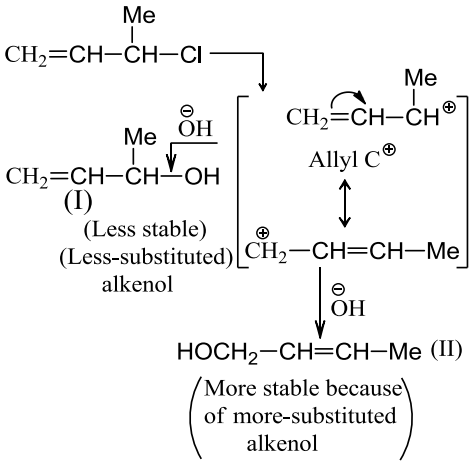
In step 3, (C − O) bond is broken, i.e.,

C−OTs → C−Br and hence inversion Occurs

Reaction:



302 **(b,c,d)**



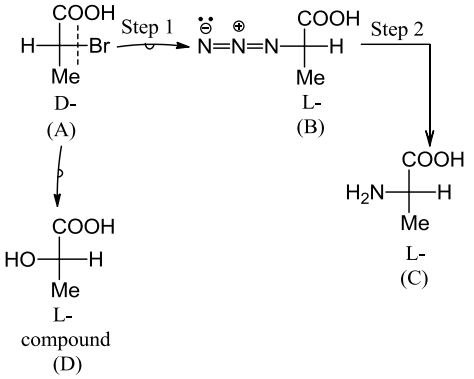
Statements (b), (c) and (d) are correct

303 **(a,c)**

In step 1, (C − Br) bond is broken to ($C - N_3$). Hence, inversion occurs (↷)

In step2, $(C-N=\overset{\oplus}{N}=\overset{\ominus}{\overset{\cdot\cdot}{N}})$ bond is not broken. So no inversion

In step3,(C − Br)bhjond is broken to (C − OH) bond hence, inversion occurs



304 **(a,b,c)**

1. SE reaction by $(\overset{\oplus}{NO_2})$ species (I) is not formed. So(a) is a correct statement

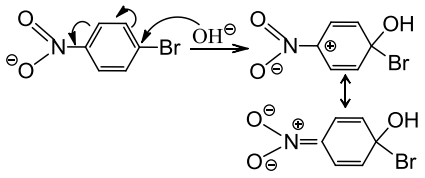
2. SE reaction by $Br^{\oplus}$, $(-NO_2)$ is *m*-directing, $Br^{\oplus}$ will attack at *m*-position.Species (I) is not formed.So (b) is a correct statement

3. SE reaction by $Br^{\oplus}$, (−OH) group is *o*- and *p*-directing (class−OHdecides orientation)*p*-position is blocked.Species

(I) in not formed. So (c) is a correct statement

4. ArSNreaction (addition –elimination) reaction by $\overset{\ominus}{OH}$ nucleophile.Species (I) is formed

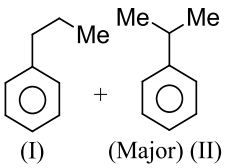
5. So (d) is an incorrect statements



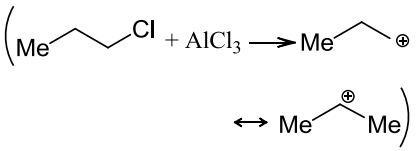
305 **(b,d)**

306 **(b,c,d)**

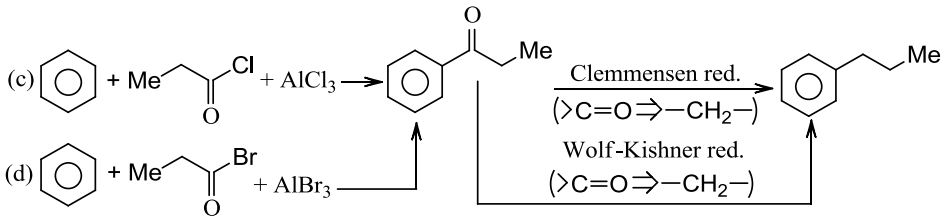
(a) Products would be:

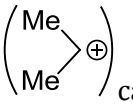
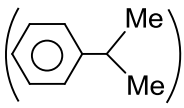


Due to stabilization of carbonium ion



b. Same explanation as in (a), the product would be a mixture of (I) and (II)



Products would be a mixture of (I) and (b),(c), (d) would produce stable  carbonium ion and would yield 100% of cumene 

308 **(b,d)**

Allyl chloride is much more reactive than $n-$ PrCl although it is 1° RX, due to resonance stabilisation $\left[H_2C{=}CH{-}\overset{\oplus}{C}H_2 \longleftrightarrow H_2\overset{\oplus}{C}{-}CH{=}CH_2\right]$

(Stabilized by extended π-bonding)

Allyl chloride is reactive by both $SN^1$and SN^2 mechanisms, but more reactive by SN^1 mechanism

309 **(a,b,c,d)**

All statements are self -explanatory

310 **(c)**

In (c), phenol is *o*- and *p*-directing, so both the products would be obtained. Thus, to obtain

$SN^2$and E2 are both stereospecific because the attack from the back by $Nu^{\ominus}$ in SN^2 and attack by base E2 (at β-H atom) are specific. Both of them form exclusively only one product

ortho-product exclusively, *p*-position has to be blocked first, and then Br introduced in *ortho*-position, followed by the removal of group from *p*-position

311 **(d)**

$PhSO_3H + NaHCO_3 \rightarrow PhSO_3Na + CO_2 + H_2O$. $p\text{-}O_2N - C_6H_4 - OH + NaHCO_3 \rightarrow p\text{-}NO_2 - C_6H_4 - ONa + CO_2 + H_2O$

313 **(d)**

In E1cB, the first step is the abstraction of β-H atom to give carbanion is specific, but they form a mixture of possible pairs of enantiomers or a mixture of possible diastereomers

314 **(a,b,c)**

SN^1has two steps and has two transition stateintermediatecarbocations. In the first, higher T.S. $(C - X)$ bond stretches $(R_3C^{+\delta}.....X^{-\delta})$

In the second, lower T.S. bond formation between carbocation intermediate and a nucleophile takes place

$(R_3C^{+\delta} ..... \ddot{\underset{\ominus}{N}}u)$.

So in Figs. (a) and (b), (I) and (IV) represent SN^1 reactions, respectively

SN^2 has one step, has one T.S., and no intermediate

So in Figs. (a) and (b), (II) and (III) represent SN^2reactions, respectively

The hydrolysis of RX by SN^1 path is 3°>2°>1°and by SN^2 path is 1°>2°>3°

Therefore, Fig. (a) represents hydrolysis of 1°RX, since SN^2 path is of lower energy

Figure. (b) represents hydrolysis of 3°RX, since SN^1path is of lower energy

So statements (a), (b), and (c) are correct

315 **(a,b,c)**

Statements a, b and c are correct but (d) is wrong because reaction (d) gives benzene

316 **(a)**

At $pH = 2$(acidic condition)

$H_2N-C_6H_4-SO_3H \xrightleftharpoons{H^{\oplus}} \overset{+}{N}H_3-C_6H_4SO_3H$ and will migrate tocathode

At $pH = 12$(basic condition)

$H_2N-C_6H_4-SO_3H \xrightleftharpoons{\overset{\ominus}{O}H} H_2N-C_6H_4SO_3^{\ominus}$ and will migrate to anode

317 **(c)**

Both (a) and (d) give ketone $\left(Me\text{-}\overset{O}{\overset{\|}{C}}\text{-}Me\right)$ with G.R.(MeMgBr), whereas both esters (b) and (c) give the required 3° alcohol. However, $(-OTs)$ is a better leaving group than $-OMe$

318 **(b,c,d)**

a. Stronger the base stronger is the nucleophile therefore $\overset{\ominus}{O}H$ is a stronger nucleohile than H_2O.Statement (a) is wrong

b. RSH is a stronger acid than ROH (except MeOH). $RS^{\ominus}$ is a weaker base and weaker nucleophile (stronger the acid, weaker is its conjugate base)

Therefore $RS^{\ominus}$ should be a weaker uncleophilethan $RO^{\ominus}$. But in polar protic solvent such as ethanol, RSH is less solvated than ROH (due to H-bonding)

Therefore,$RS^{\ominus}$ is a stronger uncleophile than $RO^{\ominus}$ statement (b) is correct

c. $H_2\ddot{N} - \ddot{O}H$ is a stronger base and hence a stronger nucleophile than NH_3. Statement (c) is correct

d. In (I), all β-C are tied up with a C atom, while in (II), the substituents bonded to N atom are almost free to rotate and causesteric hindrance during approach of LP$\bar{e}$'s to the attacking site

In other words, LP $\bar{e}$'s on N in (I) are easily available but in (II) they are sterically hindered

Thus, (I) is a stronger base and hence a stronger nucleophile than (II)

Statement (d) is correct

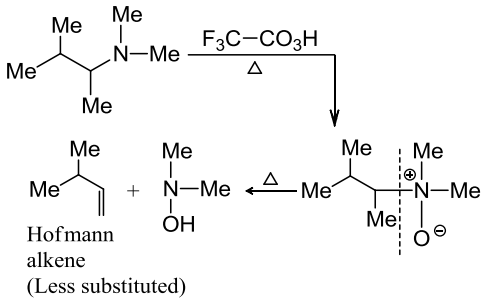
319 **(a,b,c,d)**

All of them contain active H atom and give benzene with PhMgBr

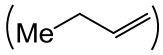
320 **(a,b,c)**

Hofmann elimination gives less-substituted alkene

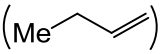
1. Cope reaction



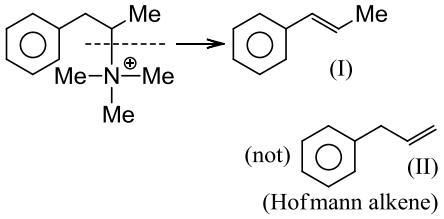
b.In case of bulky base, Hofmann alkene is formed



c.In case of RF (poor leaving group), whether the base is bulky or non-bulky,Hofmann alkene is formed.



d.



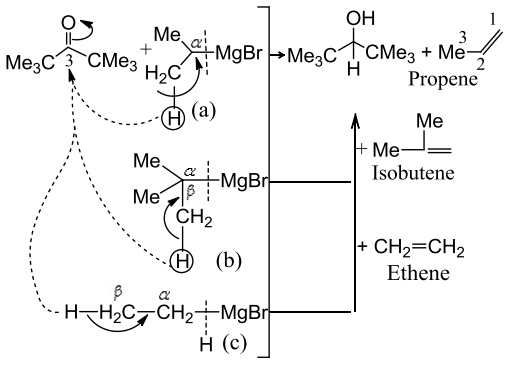
(I) is more stable due to extended conjugation with (=) bond of Ph-ring

321 **(a,b,c)**

Due to the steric hindrance of t-butyl group in ketone and G.R. containing bulky group or G.R. with β-H, the reaction fails, (i.e., 3° alcohol is not obtained). But a hydride ion ($H^{\ominus}$) transfer from the β-position of RMgX to (C = O) group takes place through a cyclic transition state to give 2° alcohol and alkene

Therefore, MeMgBr or PhMgBrwithout a β-H cannot act as a reducing agent and fail to react with di-t-butyl ketone.

(a),(b) and (c) react with di-t-butyl ketone to give 2° alcohol and alkene



323 **(a,b,c)**

Statements (a), (b), and (c) are the characteristics of E1cB reaction. Statement (d) is wrong since in E1cB reaction, deuterated product is obtained

325 **(a)**

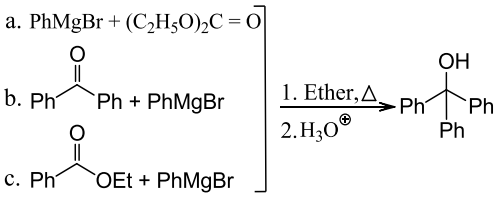
i. (I)and (II) are E2 reactions in which the R.D.S. is breaking of (C − H) or(C − D) bond. Thus E2 elimination of (I) is faster than that of (II) since (C − H) bond is weaker than (C − D) bond. Hence, (I) and (II) show 1°kinetic isotope effect

ii. (III) and (IV) are either El or SN^1 reactions, which involve the formation of same intermediate $Me_3C^{\oplus}$or $(CD_3)_3C^{\oplus}$ in the R.D.S. This step does not involve any (C − H) or (C − D) bond breaking, so H/D effect is not 1°but rather a small 2°isotope effect, where K_H/K_D= 0.7/1.5

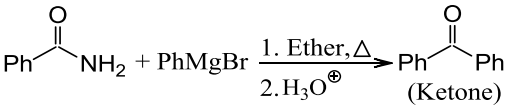
Reaction (III) is faster than (IV) since $(CD_3)_3C^{\oplus}$is not as stable as $Me_3C^{\oplus}$because CD_3 is not as good an $\overline{e}$-donator asCH_3. Moreover, (C − D) is not a good hyperconjugative participant as (C − H)

326 **(a,b,c)**

A 3° alcohol containing three identical alkyl groups (the values of R are obtained from G.R.) may be prepared by the reaction between 3 mol of G.R. (PhMgBr) with 1 mol of ethyl carbonate

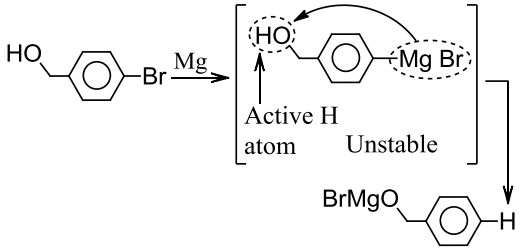


But benzamide gives ketone:



327 **(d)**

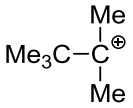
Aryl halide containing reactive substituent (e.g., $-COOH, -OH, -NH_2, -SO_3H$, and $-NO_2$) in the benzene ring cannot be used since G.R. obtained will at once react with the reactive group present in another molecule. Hence, no reaction will take place



328 **(a,d)**

i. Although $F^{\ominus}$is a poor leaving group, in acidic condition, F forms H-bonding and its departure is easier. So in acidic medium, reaction (I) is solvolysed faster than (II)

This is an example of electrophilic catalysis



ii.The formation of from (IV) reducessome of thesteric hindrance or

crowding in reactant in (IV), induced by the two (Me) groups and the *t*-Bu on the α-C atom. This is an example of steric acceleration

Moreover, carbocation is further stabilised by +I effect of two (Me) groups and *t*-Bu groups

So reaction (IV) is faster than (III)

329 **(c)**

Statement (c) is wrong

i.In path (I), $EtO^{\ominus}$is a strong base and with 2°RX groups. The E2 product predominates over the SN^2product to give $(Me-CH=CH_2)$

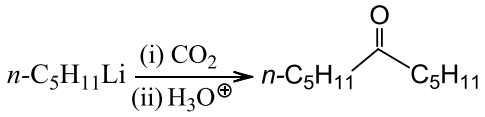
ii. In path (II), EtOH is a weak base, but a better nucleophile, so SN^1 reaction is favoured to give MeCH(OEt)Me

331 **(a,d)**

The IUPAC name of caproic acid is hexanoic acid (6-C-atom acid). So, G.R. must contain 5-C-atom alkyl group

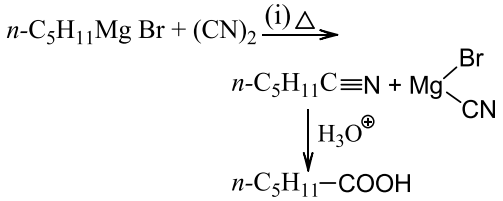
a. $n-C_5H_{11}Br \xrightarrow{Me/ether} n-C_5H_{11}Br \xrightarrow[(ii)H_3O^{\oplus}]{(i)CO_2} n-C_5H_{11}-COOH$

b.



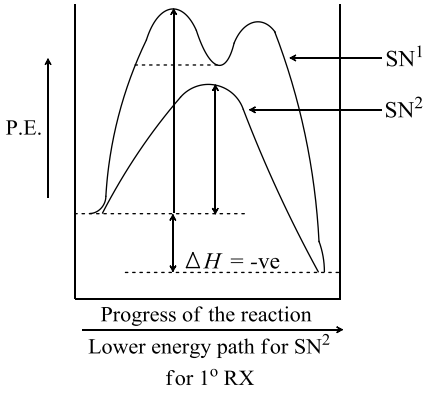
c. Gives pentanoic acid

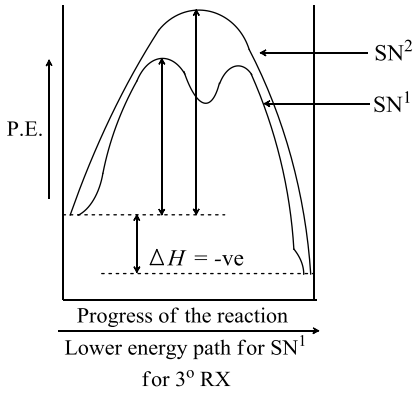
d.



333 **(c)**

In SN^2, there is only one step, and it is exothermic.But in SN^1 there are two steps first step; is endothermic and second step is exothermic





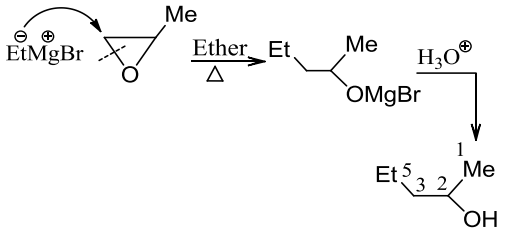
334 **(a,b)**

If the reactant and/or nucleophile are neutral, T.S. is stabilised; rate of SN^2reaction increases with the increase in polarity of the solvent

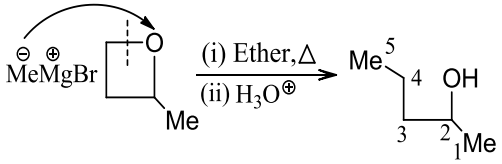
335 **(a,b,c,d)**

a. Nucleophile $Et^{\ominus}$ (from EtMgBr) attacks at less-

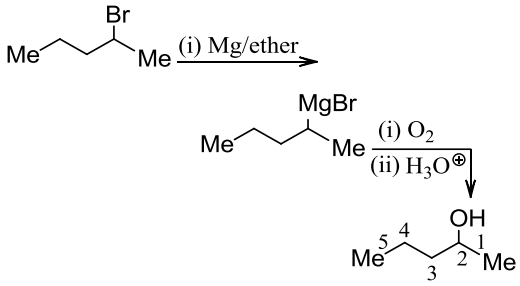
substituted C atom by SN^2 mechanism to give pentan-2-ol



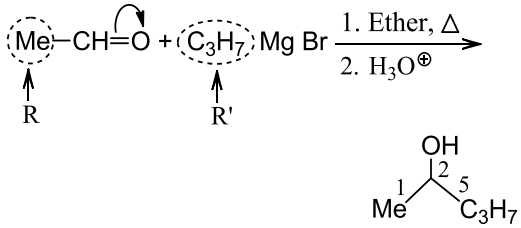
b.Nucleophile $Me^{\ominus}$ (from MeMgBr) attacks at less-substituted C atom by SN^2mechanism to give pentan-2-ol



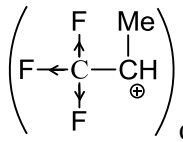
c.



d.



336 **(b,d)**

i. In (II)  carbocation is destabilisedbystronger−I effect of three F atoms, and thus solvolysis of (II) is slower than that of (I)

ii.D-bonds are not as stabilising as H-bonds. So reaction (IV) is faster than (III)

337 **(a)**

The reagent should be a strong Bronsted base

Acidic order:$HNO_3 > RCOOH > HCN > H_2O > ROH$

Basic order: $NO_3^{\ominus} < RCOO^{\ominus} < CN^{\ominus} < \overset{\ominus}{O}H < RO^{\ominus}$

$(V) > (III) < (IV) < (I) < (II)$

Decreasing order of basicities and hence β-elimination is (II)>(I)>(IV)> (III) >(V)

338 **(d)**

Correct Assertion:

It gives but-2-ene

Correct reason :

But-2-ene is more stable than but-1-ene

340 **(b)**

Correct reason:

Benzyl halide undergoes hydrolysis by SN^1mechanism

341 **(d)**

Aryl halides do not undergo nucleophilic substitution reaction under ordinary conditions, thus benzonitrile is not prepared by the reaction of chlorobenzene with KCN

Cyanide (CN^-) is a strong nucleophile

Hence, statement 1 is incorrect, but statement 1 is correct

342 **(b)**

Correct explanation :

Due to resonance (C − Br) bond in PhBr is a little stronger than (C − Br) bond in C_2H_5 Br

343 **(c)**

Correct reason :

(C − X) bond has some double bond character

345 **(a)**

It produces alkene

348 **(d)**

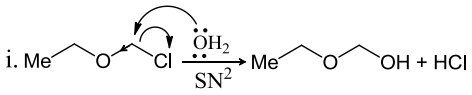
Aryl halides do not undergo nucleophilic substitution reaction under ordinary conditions. Thus, statement 1 is incorrect. In aryl halides, the carbon-halogen bond has a partial double bond character, so it becomes shorter and stronger and cannot be easily replaced by a nucleophile. Statement 1 is false but statement 2 is true

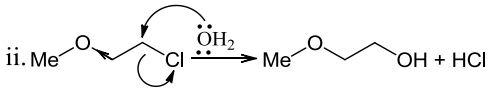
351 **(d)**

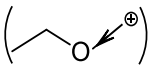
Correct assertion:

t-BuBron reaction with Na metal gives *n*-butane and isobutene.

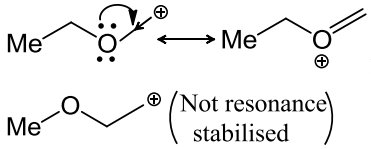
352 **(d)**





Reaction (ii) is faster than (i). Hence, the assertion is false because −I power of O atom destabilises the  ion

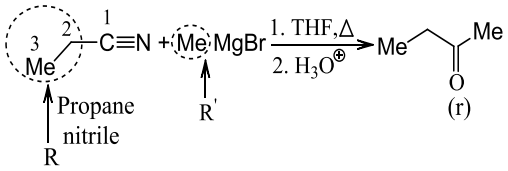
But reason (R) is true



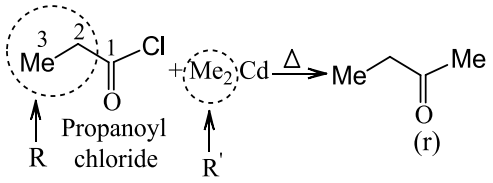
is stable than

353 **(a)**

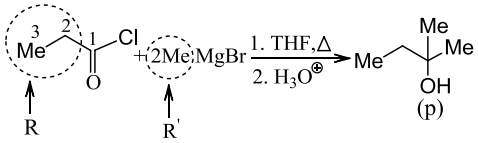
(a → r)



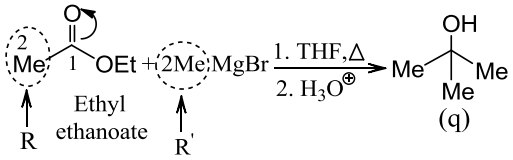
(b → r)



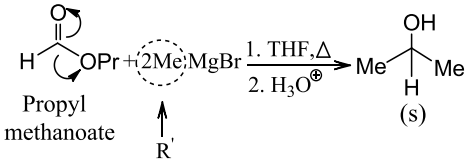
(c → p)



(d → q)

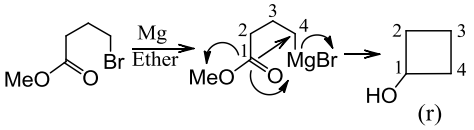


(e → s)



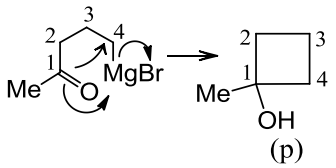
358 **(a)**

(**a→r**) All are examples of intramolecular G.R. reaction. Reactant is the G.R. of an ester. It will give a 2° alcohol



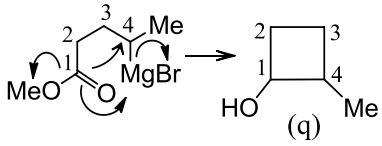
(**b→p**) Reactant is the G.R. of ketone. It will give a

3° alcohol



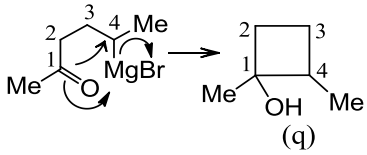
(p)

(**c→q**) Reactant is the G.R. of ester. It will give a 2° alcohol



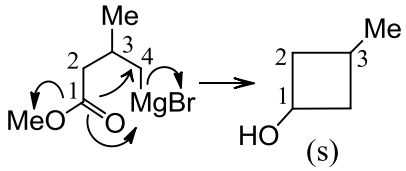
(q)

(**d→t**) Reactant is the G.R. of ketone. It will given 3° alcohol



(q)

(**e→s**) Reactant is the G.R. of ester. It will give a 2° alcohol



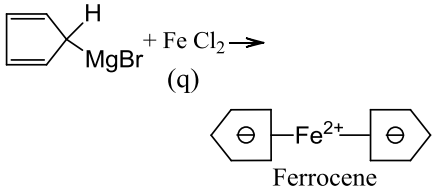
(s)

359 **(c)**

Reactants	Products
A. C_2H_5Cl , moist Ag_2O	(iii)$CH_3\ CH_2OH$
B. C_2H_5Cl , aqueous ethanolic AgCN	(iv)$CH_3\ CH_2NC$
C. C_2H_5Cl , aqueous ethanolic $AgNO_2$	(i) $CH_3\ CH_2ONO$
D. C_2H_5Cl , ethanolic KOH	(ii) C_2H_4

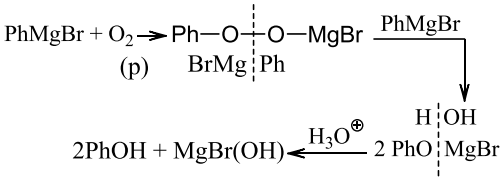
360 **(a)**

(a → q)

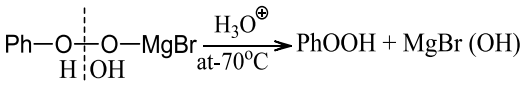


Ferrocene

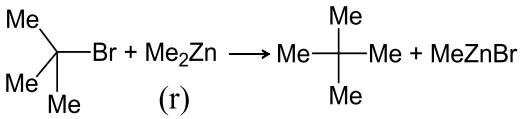
(b → p)



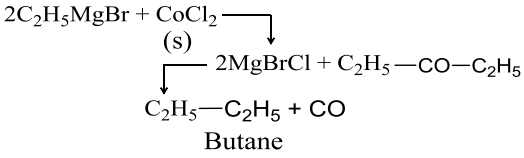
(c → p)

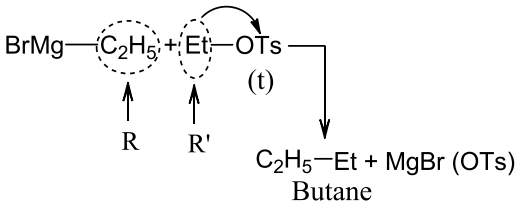


(d → r)



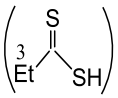
(e → s, t)

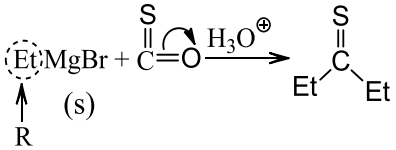


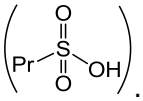


361 **(b)**

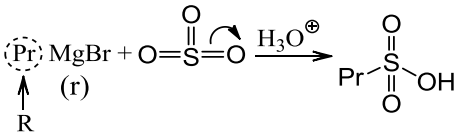
(**a→s**) Write the structure of propane dithioic acid diagram. The structure of G.R. would be EtMgBr



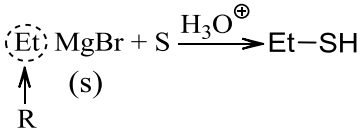


(**b→r**) Write the structure of propyl sulphonicacid 

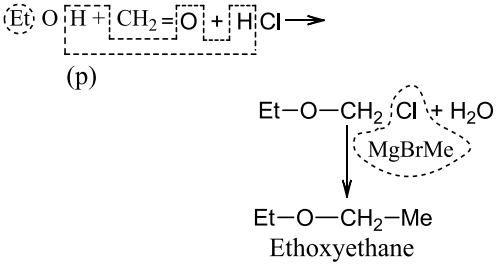
. The structure of G.R. would be PrMgBR



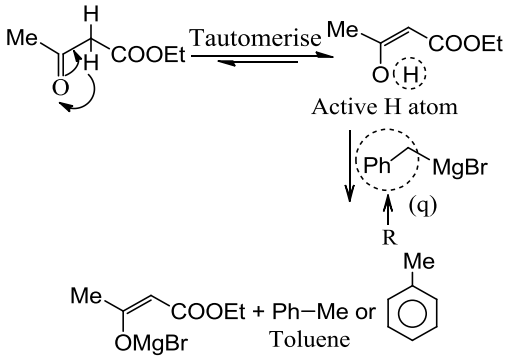
(**c→s**) Write the structure of ethyl mercaptan(Et − SH). The structure of G.R. would be EtMgBR



(**d→p**) It is a method of preparation of ether

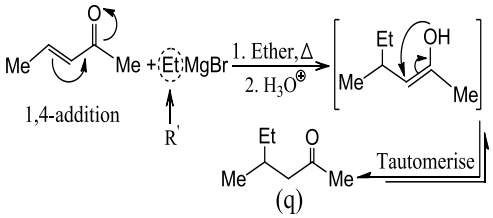


(**d→p**)

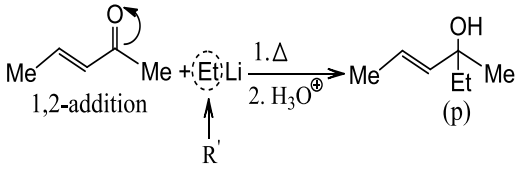


364 **(b)**

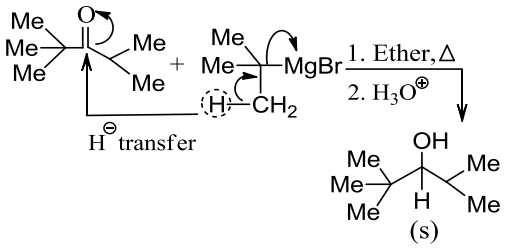
(a → q)



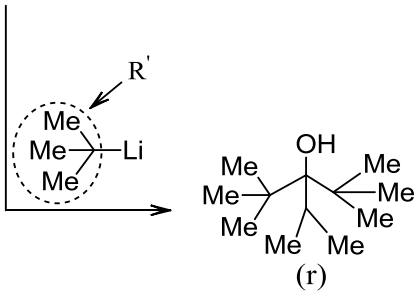
(b → p)



(c → s)

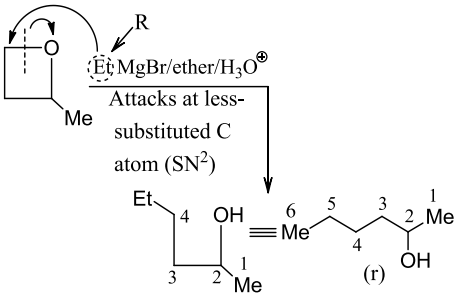


(d → r)

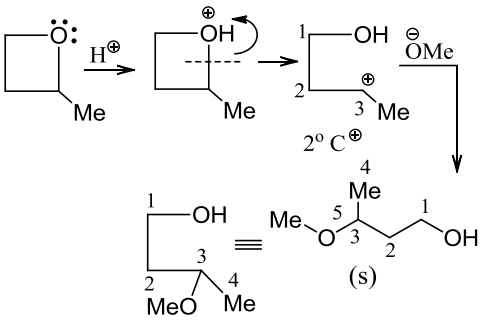


366 **(c)**

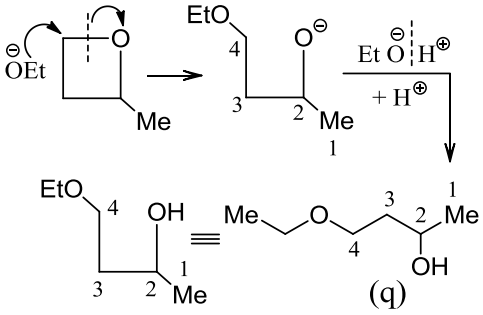
(a → r)



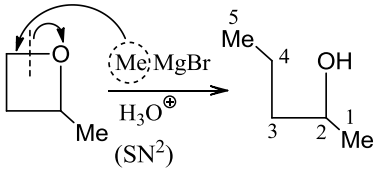
(b → s)



(c → q)



(d → p)

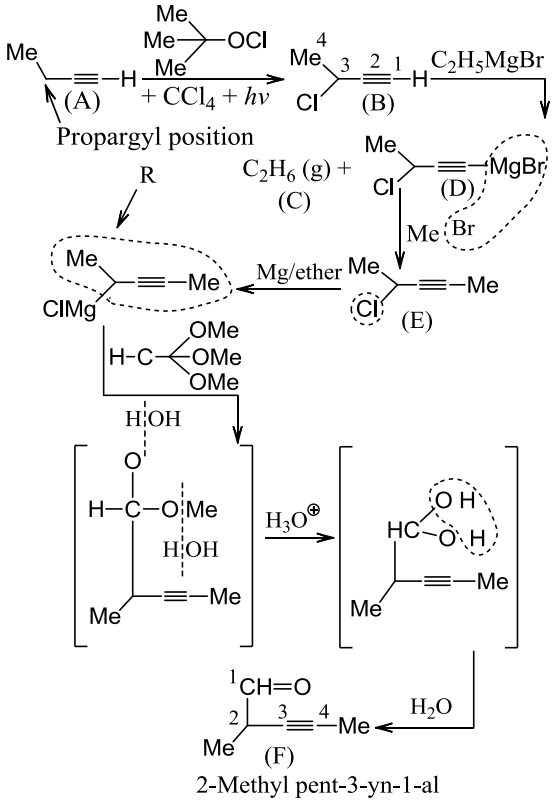


367 **(c)**

$LiAlH_4$ reduces(C ≡ C) to (C ≡ C) bond in anti manner to give *trans*-alkene and also reduces (CHO) group to $(-CH_2OH)$ group. Hence, the answer is (c)

369 **(b)**

With *t*-butoxychloride, allylic or propargylic chlorination takes place

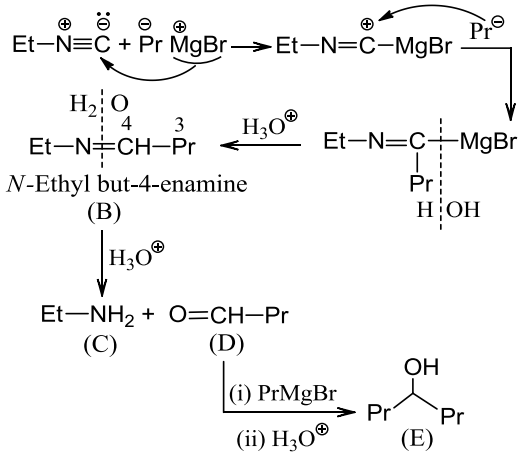


370 **(c)**

The order of reactivity of G.R. with different compounds is Alcohol> Aldehyde> Ketone>O
||
$R-C-X$ >Ester > Anhydride >Arnide>$-CH_2X$
So the first mole of G.R. will react with alcohols. (ROH + RMgX → Rh + ROMgX), Hence, answer is (c)

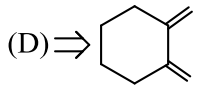
372 **(b)**

In an isocyanide, first an electrophile and then a nucleophile is added at the same Catom of $(-\overset{\oplus}{N}\equiv\overset{\ominus}{C})$ group to form a species which usually undergoes further transformations

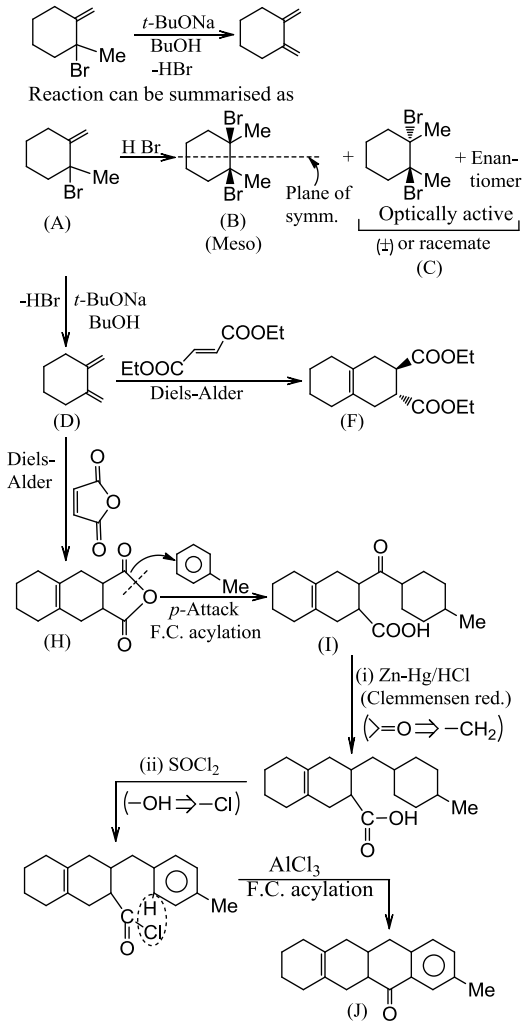


373 **(a)**

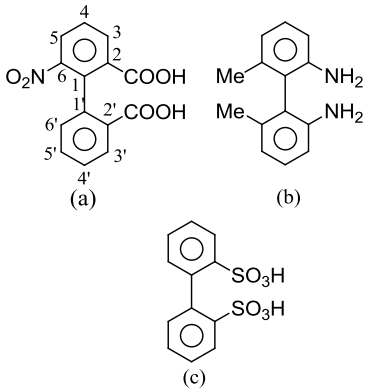
i. Proceed reverse from (E) to (D), (E) is obtained by the 1,4-addition of Br_2 on (D). (D) must be a conjugated diene



ii.(D) is obtained from (A), and (A) to (D) is elimination reaction by bulky base to give less-substituted alkene (Hofmann elimination). So (A) is:



375 **(c)**



If at least three of the 2, 2', 6, and 6' are occupied by sufficiently large groups, free rotation about the single bond joining the two phenyl groups is no longer possible, provided each ring has no vertical plane of symmetry. This restricted rotation gives rise to optical activity due to molecule being asymmetrical as a whole. Hence, 6-nitrobiphenyl-2-2' dicarboxylic acid (a) and 6, 6'- diamino-2, 2'- dimethyl biphenyl (b) have been resolved. If the substituent groups are large enough, then only two groups in the *o*- and *o*′- positions will cause restricted rotation, e.g., biphenyl-2, 2'- disulphonic acid (c) has been shown to be optically active

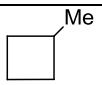
So, (a), (b), and (c) are resolvable

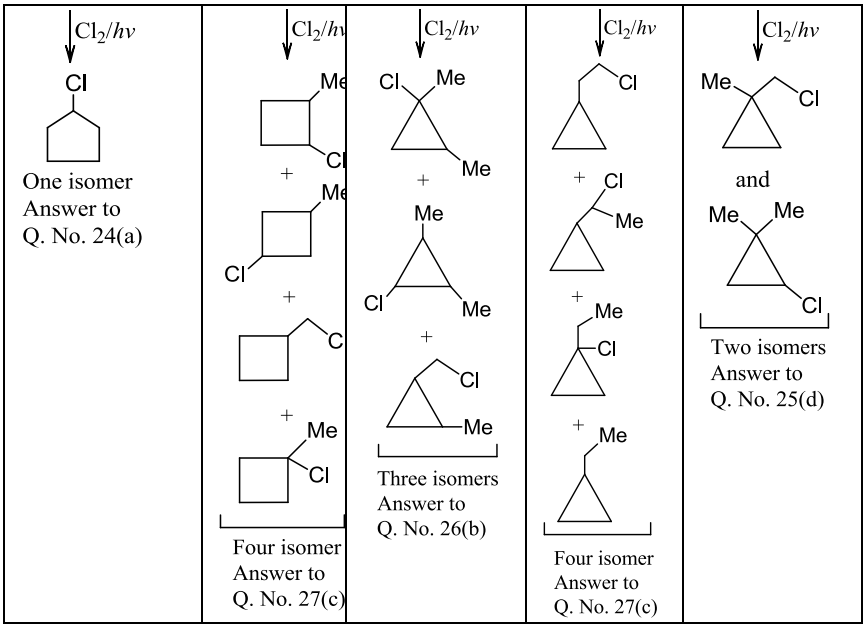
The cause of restricted rotation is mainly due to steric effects of the groups in the *o*- and *o*′- positions (not at *m* and *m*′, *p* and *p*′) this type of stereoisomerism arising from restricted rotation about a single bond and where the stereoisomers can be isolated is called **atropisomerism** and the isomers are called atropisomers

All examples are Ullmann reaction

376 **(c)**

Since compound (A) has 1 D.U. and is an alkane, so if should be cyclic. The number of cyclic isomers of (A) is five

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

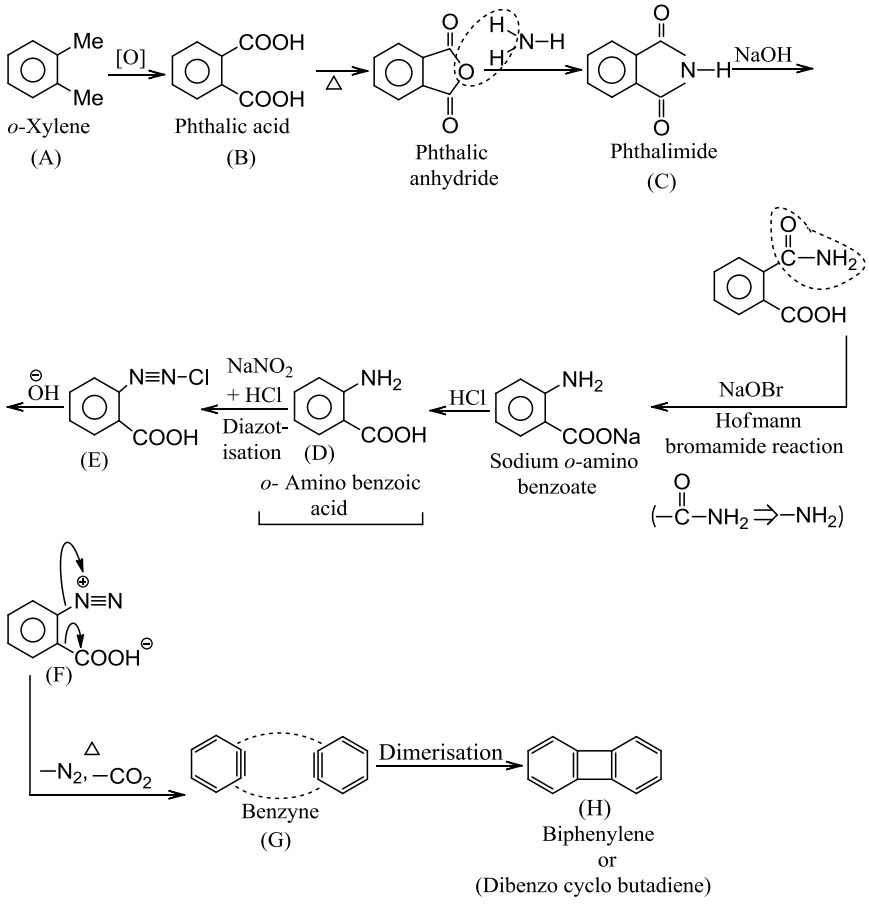


Total number of cyclic structures including stereoisomesrs for (A) = 7

378 **(d)**

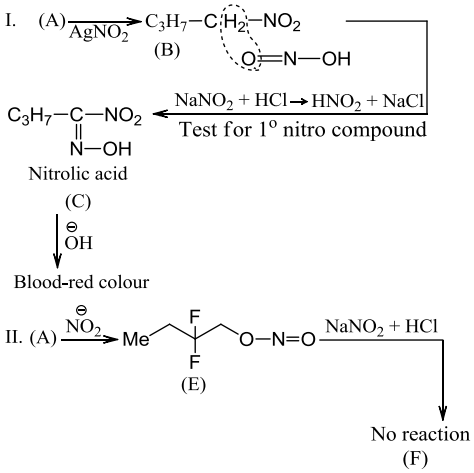
$$\text{D. U. in (A)} = \frac{(2n_C + 2) - n_H}{2} = \frac{(8 \times 2 + 2) - 10}{2} = 4°$$

4D.U. and C: H ≈ 1: 1 suggest that (A) contains benzene ring with two extra C atoms [i.e.,two (Me) groups]. Since compound (A) is steam volatile and on nitration gives two nitro-derivatives, so (A) is *ortho*-xylene



380 **(a)**

RX in (I) gives $R - NO_2$,while in (II) it gives $(R - O - N = O)$



381 **(d)**

All

382 **(d)**

All, (a)⇒ 1° RX, (b) ⇒ Allyl halide, (c) ⇒Benzyl halide

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