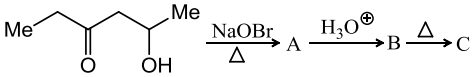
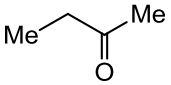
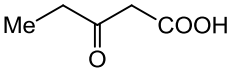
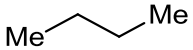
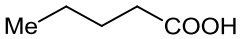
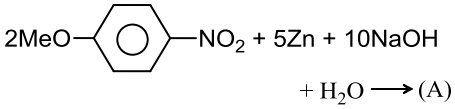
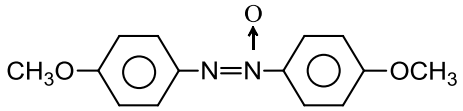
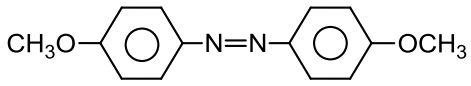
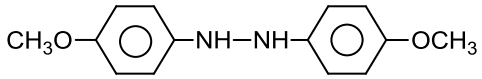
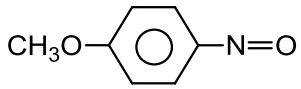
8.REDOX REACTIONS

Single Correct Answer Type

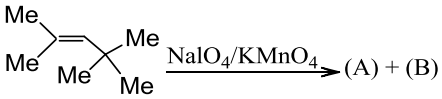
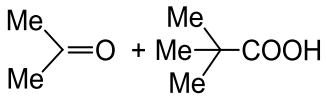
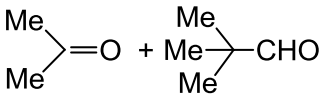
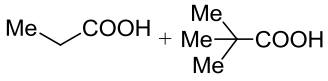
1. The reagent with which both acetaldehyde and acetone react easily is:
   a) Tollens reagent b) Schiffs regent c) Grignard reagent d) Fehling's solution

2. 
   The compound (C) is:
   a)  b)  c)  d) 

3. A metal ionM^{3+} loses three electrons; its oxidation number will be
   a) $+3$ b) $+6$ c) 0 d) -3

4. 
   The Product (A) is:
   a) 
   b) 
   c) 
   d) 

5. $aK_2Cr_2O_7 + bKCl + cH_2SO_4 \longrightarrow xCrO_2Cl_2 + yKHSO_4 + zH_2O$
   The above equation balanced when
   a) $a = 2, b = 4, c = 6$ and $x = 2, y = 6, z = 3$
   b) $a = 4, b = 2, c = 6$ and $x = 6, y = 2, z = 3$
   c) $a = 6, b = 4, c = 2$ and $x = 6, y = 3, z = 2$
   d) $a = 1, b = 4, c = 6$ and $x = 2, y = 6, z = 3$

6. 
   The product (A)and (B) are:
   a)  b) 
   c)  d) None

7. Which of the following is a redox reaction?
   a) $NaCl + KNO_3 \longrightarrow NaNO_3 + KCl$ b) $CaC_2O_4 + 2HCl \longrightarrow CaCl_2 + H_2C_2O_4$
   c) $Mg(OH)_2 + 2NH_4Cl \longrightarrow MgCl_2 + 2NH_4OH$ d) $Zn + 2AgCN \longrightarrow 2Ag + Zn(CN)_2$

8. When copper is treated with a certain concentration of nitric acid, nitric oxide and nitrogen dioxide are liberated in equal volumes according to the equation
   $xCu + yHNO_3 \longrightarrow Cu(NO_3)_2 + NO + NO_2 + H_2O$
   The coefficients x and y are
   a) 2 and 3 b) 2 and 6 c) 1 and 3 d) 3 and 8

9. For the redox reaction

$x\mathrm{MnO_4^{\ominus}} + y\mathrm{C_2O_4^{2-}} + z\mathrm{H^{\oplus}} \longrightarrow \mathrm{Mn^{2+}} + \mathrm{CO_2} + \mathrm{H_2O}$

the coefficients x, y, and z are

a) 2,5,16 b) 16,5,2 c) 5,16,2 d) 2,16,5

10. The number of moles of $\mathrm{KMnO_4}$requried to oxidize 1 mol of $\mathrm{Fe(C_2O_4)}$ in acidic medium is

a) 0.6 b) 1.67 c) 0.2 d) 0.4

11. The difference in the oxidation numbers of the two types of sulphur atoms in $\mathrm{Na_2S_4O_6}$ is

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

12. The oxidation state of S in $\mathrm{H_2S_2O_8}$ is

a) +2 b) +4 c) +6 d) +7

13. The oxidation state of Fe in $\mathrm{Fe_3O_8}$ is

a) 3/2 b) 4/5 c) 5/4 d) 16/3

14. In the balanced chemical reaction

$\mathrm{IO_3^{\ominus}} + a\mathrm{I^{\ominus}} + b\mathrm{H^{\ominus}} \longrightarrow c\mathrm{H_2O} + d\mathrm{I_2}$

a, b, c, and d, respectively, correspond to

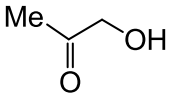
a) 5,6,3,3 b) 5,3,6,3 c) 3,5,3,6 d) 5,6,5,5

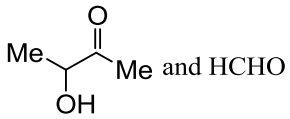
15. Which of the following is not a disproportionation reaction?

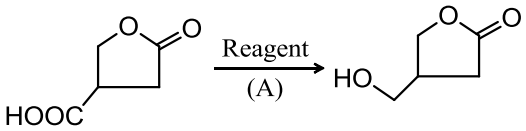
a) $\mathrm{P_4 + 5\overset{\ominus}{O}H \longrightarrow H_2PO_2^{\ominus} + PH_3}$ b) $\mathrm{Cl_2 + \overset{\ominus}{O}H \longrightarrow Cl^{\ominus} + ClO^{\ominus}}$

c) $\mathrm{2H_2O_2 \longrightarrow 2H_2O + O_2}$ d) $\mathrm{PbO_2 + H_2O \longrightarrow PbO + H_2O_2}$

16. Fehling's solution can make distinction between:

a) MeCHO and PhCHO b) MeCHO and 

c)  d) MeCHO and HCHO

17. 

The reagent (A) is:

a) LAH b) HI+P c) $\mathrm{NaAlH_4}$ d) $\mathrm{B_2H_6/H_2O}$

18. Which acetaldehyde is heated with Fehling's solution, it gives a precipitate of:

a) Cu b) CuO c) $\mathrm{Cu_2O}$ d) $\mathrm{Cu + Cu_2O + CuO}$

19. In which of the following is the highest oxidation state not possible?

a) $[\mathrm{XeO_6}]^{4-}$ b) $\mathrm{XeF_8}$ c) $\mathrm{OsO_4}$ d) $\mathrm{RuO_4}$

20. The oxidation state of nitrogen is correctly given for

Compound	**Oxidation state**

a)

$[\mathrm{CO(NH_3)_5Cl}]\mathrm{Cl_2}$	0

b)

$\mathrm{NH_2OH}$	-2

c)

$(\mathrm{N_2H_5})_2\mathrm{SO_4}$	+2

d)

$\mathrm{Mg_3N_2}$	−3

21. Which of the following statements is not correct about the reaction given below?

$K_4[Fe(CN)_6] \xrightarrow{\text{Oxidation}} Fe^{3+} + CO_2 + NO_3^{\ominus}$

a) Fe is oxidized from Fe^{2+} to Fe^{3+} b) Carbon is oxidised from C^{2+} to C^{4+}

c) N is oxidized from N^{3-} to N^{5+} d) Carbon is not oxidized

22. The oxidation number of P in $Mg_2P_2O_7$ is

a) $+3$ b) $+2$ c) $+5$ d) -3

23. $Ph-CH=CH-CHO \xrightarrow{A} Ph-CH=CH-COOH$

The compound (A) is:

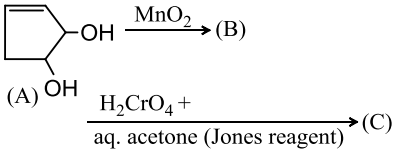
a) Aq.$KMnO_4$ b) NaOI c) $[Ag(NH_3)_2]^{\oplus}/H_3O^{\oplus}$ d) MnO_2

24. Which of the following compounds is oxidized to prepare methyl ethyl ketone?

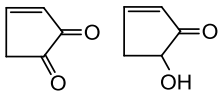
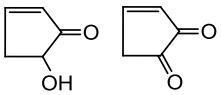
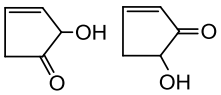
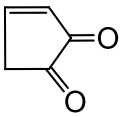
a) 2-Propanol b) 1-Butanol c) 2-Butanol d) *t*-Butyl alcohol

25. The oxidation number of carbon in CH_2Cl_2 is

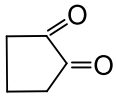
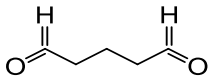
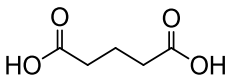
a) 0 b) 2 c) 3 d) 5

26. 

The compounds (B) and (C), respectively, are:

a)  b)  c)  d) Both 

27. The oxidation product of 1,2-cyclopentane diol with HIO_4 or $(CH_3COO)_4Pb$ is:

a)  b)  c)  d) None

28. The oxidation state of chromium in the final product formed in the reaction between KI and acidified potassium dichromate solution is

a) $+4$ b) $+6$ c) $+2$ d) $+3$

29. Which of the following represents redox reactions? I. $Cr_2O_7^{2-} + 2\overset{\ominus}{O}H \longrightarrow 2CrO_4^{2-} + H_2O$

II. $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

III. $2MnO_4^{\ominus} + 3Mn^{2+} + 4\overset{\ominus}{O}H \longrightarrow 5MnO_2 + 2H_2O$

IV. $2Cu^{\oplus} \longrightarrow Cu + Cu^{2+}$

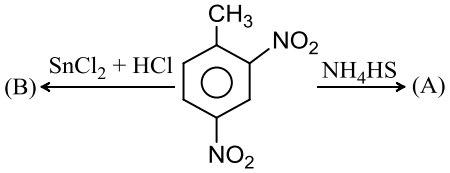
a) I,II b) I,III, c) III,IV d) II, III,IV

30. The number of moles of $KMnO_4$ that will be needed to react with 1 mol of sulphite ion in acidic solution is

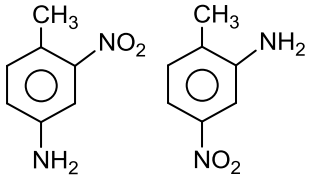
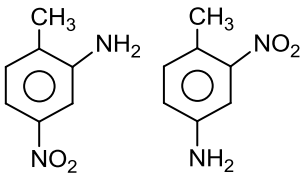
a) $\frac{2}{5}$ b) $\frac{3}{5}$ c) $\frac{4}{5}$ d) 1

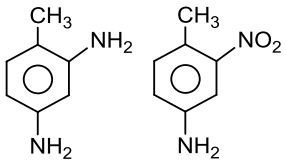
31. Of the following compounds, whose ozonolysis proves the Kekule structure of benzene?

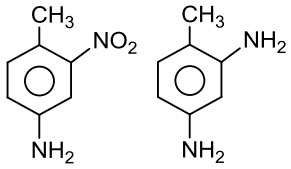
a) Benzene b) Toluene c) *o*-Xylene d) *p*-Xylene

32. 

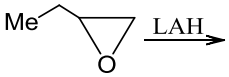
The products (A) and (B) are:

a)  b) 

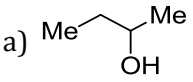
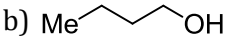
c) 

d) 

33. An oxidation process involves
    a) Increase in oxidation number
    b) Decrease in oxidation number
    c) Both decrease and increase in oxidation number
    d) No change in oxidation number

34. 

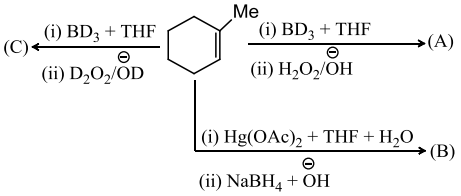
    The products are:

    a) 
    b) 
    c) Both (a) and (b)
    d) none

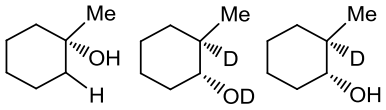
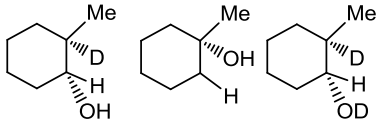
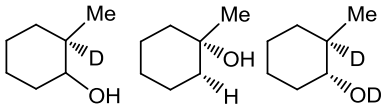
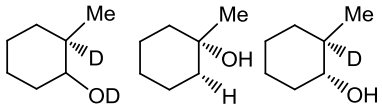
35. The equivalent weight of $MnSO_4$ is Half its molecular weight when it is converted to
    a) Mn_2O_3
    b) MnO_2
    c) $MnO_4^{\ominus}$
    d) MnO_4^{2-}

36. Caprolactone on reduction with LAH or H_2 + Pt or Pd gives:
    a) Butane –1, 4-diol
    b) Pentane -1,5–diol
    c) Hexane -1, 6-diol
    d) Heptane –1, 7-diol

37. The oxidation number of S in $Na_2S_4O_6$ is
    a) +0.5
    b) 2.5
    c) +4
    d) +6

38. 

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

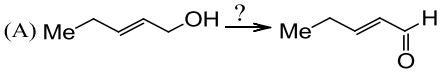
    a) 
    b) 
    c) 
    d) 

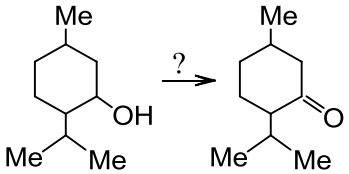
39. (B) $\xleftarrow{NaBH_4}$ Ethanoic anhydride $\xrightarrow{LAH}$ (A)
    $\downarrow H_2/Pt$
    (C)

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

	(A)	(B)	(C)
a)	$2CH_3CH_2OH$	$2CH_3CH_2OH$	$2CH_3CH_2OH$
b)	$2CH_3CH_2OH$	No reaction	$2CH_3CH_2OH$
c)	$2CH_3CH_2OH$	No reaction	No reaction
d)	No reaction	No reaction	$2CH_3CH_2OH$

40. Suggest a suitable oxidizing reagent for the following conversions:

    a) MnO_2 in (A) and CrO_3 (in glacial acetic acid) in (B)
    b) CrO_3 in (A) and MnO_2 in (B)

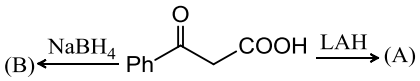
c) Both are correct

d) Both are incorrect

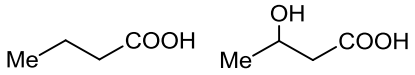
41. Which of the following reactions do not involve oxidation-reduction?

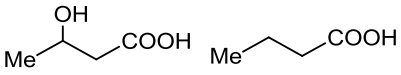
1. $2Cs + 2H_2O \longrightarrow 2CsOH + H_2$
2. $2CuI_2 \longrightarrow 2CuI + I_2$
3. $NH_4Br + KOH \longrightarrow KBr + NH_3 + H_2O$
4. $4KCN + Fe(CN)_2 \longrightarrow K_4[Fe(CN)_6]$

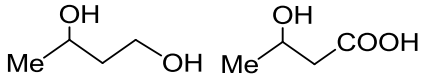
a) I,II b) I,III c) I,III,IV d) III,IV

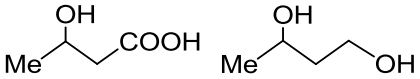
42. 

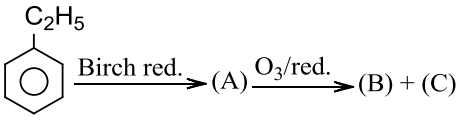
The product (A) and (B) are:

a) 

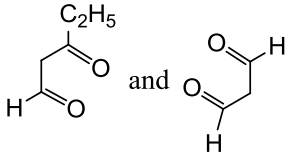
b) 

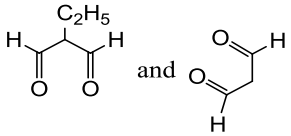
c) 

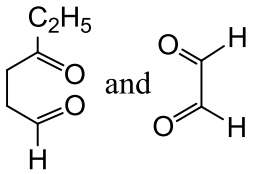
d) 

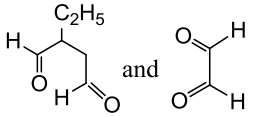
43. 

The products (B) and (C) are:

a) 

b) 

c) 

d) 

44. (B)$\overset{H_2+Ni}{\longleftarrow}$ $PhNO_2$ $\overset{LAH}{\longrightarrow}$ (A). The products (A) and (B) are:

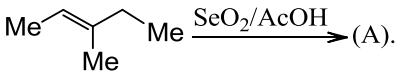
(A) (B)

a) $PhNH_2$ $PhNH_2$

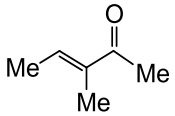
b) $Ph-N=N-Ph$ $Ph-N=N-Ph$

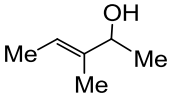
c) $Ph-N=N-Ph$ $PhNH_2$

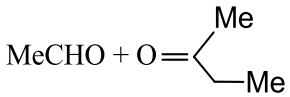
d) $Ph-NH-NH-Ph$ $PhNH_2$

45. 

(A) is:

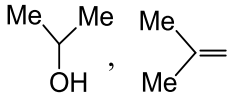
a) 

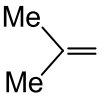
b) 

c) 

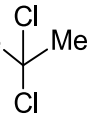
d) No reaction

46. Identify the set from the following which cannot form acetone in a single –step reaction

a) 

b) $(MeCOO)_2Ca$, 

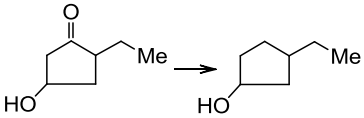
c) $(MeCOO)_2Ca, Me-\equiv -H$

d) $HC\equiv CH$, Me 

47. The oxidation number of Pt in $[Pt(C_2H_4)Cl_3]^{\ominus}$ is

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

48. The appropriate reagent for the following transformation is:



a) $Zn(Hg), HCl$ b) NH_2NH_2, OH c) H_2/Ni d) $NaBH_4$

49. Which of the following is not an intramolecular redox reaction?

a) $NH_4NO_2 \longrightarrow N_2 + 2H_2O$ b) $2Mn_2O_7 \longrightarrow 4MnO_2 + 3O_2$

c) $2KClO_3 \longrightarrow 2KCl + 3O_2$ d) $2H_2O_2 \longrightarrow 2H_2O + O_2$

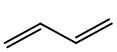
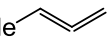
50. An aromatic compound (A),C_8H_{10}, on oxidation with acidic $KMnO_4$gives dibasic acid.The compound (A) on nitration gives three isomeric nitro derivatives.The compound (A) is:

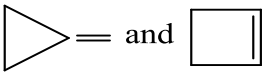
a) o-Xylene b) m-Xylene c) p-Xylene d) Ethyl benzene

51. In alkaline medium, ClO_2 oxidisesH_2O_2 toO_2 and is itself reduced to $Cl^{\ominus}$. How many moles of H_2O_2 are oxidized by 1 mol of ClO_2?

a) 1 b) 3/2 c) 5/2 d) 7/2

52. An organic Compound (A) (C_4H_6)forms a precipitate with Tollens and Fehling's regents. (A) has an isomer (B). (B) reacts with 1 mol of Br_2 to form 1, 4 dibromo-2-butene. (A) and (B) are:

a) Me—≡—H and  b) Me—≡—Me and 

c)  and d) Me—≡—Me and 

53. For the reaction

$M^{x+} + MnO_4^{\ominus} \longrightarrow MO_3^{\ominus} + Mn^{2+} + (1/2)O_2$

If 1 mol of $MnO_4^{\ominus}$ oxidises 1.67 mol ofM^{x+} to $MO_3^{\ominus}$, then the value of x in the reaction is

a) 5 b) 3 c) 2 d) 1

54. An element that never has a positive oxidation state in any of its compounds is

a) Boron b) Oxygen c) Chlorine d) Fluorine

55. Which of the following is the strongest oxidising agent?

a) I_2 b) F_2 c) Cl_2 d) Br_2

56. $C_2H_5\,O-\underset{\underset{\|}{O}}{C}-OC_2H_5 \xrightarrow{2MeMgBr}$(A). The product (A) formed can:

a) Give iodoform test

b) Further react with $MeMgBr/H_3O^{\oplus}$to give t-butyl alcohol

c) Be obtained by the ozonolysis of 2,3-dimethy 1-2-butene

d) All correct

57. In the reaction

$3Br_2 + 6CO_3^{2-} + 3H_2O \longrightarrow 5Br^{\ominus} + BrO_3^{\ominus} + 6HCO_3^{\ominus}$

a) Br_2 is oxidized and CO_3^{2-} is reduced b) Br_2 is reduced and H_2O is oxidised

c) Br_2 is neither reduced nor oxidised d) Br_2 is both reduced and oxidised

58. In which of the following compounds, the oxidation state of transition metal is zero?

a) CrO_5 b) Fe_3O_4 c) $FeSO_4$ d) $Fe(CO)_5$

59. The oxidation number of Fe in $Na_2[Fe(CN)_5NO]$ is

a) +2 b) +1 c) +3 d) −2

60. Which of following is not a disproportionation reaction?

a) $KO_2 + H_2O + CO_2 \longrightarrow KHCO_3 + O_2$ b) $KClO_3 \longrightarrow KClO_4 + KCl$

c) $PbO_2 + H_2O \longrightarrow PbO + H_2O_2$ d) $OHC{-}COOH \xrightarrow{\overset{\ominus}{O}H} HOH_2C{-}COOH + \overset{\ominus}{O}OC{-}COO^{\ominus}$

61. The oxidation number P in$Ba(H_2PO_2)_2$is

a) +3 b) +2 c) +1 d) −1

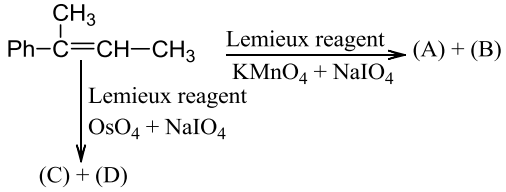
62. In which of the following processes is nitrogen oxidised?

a) $NH_4^{\oplus} \longrightarrow N_2$ b) $NO_3^{\ominus} \longrightarrow NO$ c) $NO_2 \longrightarrow NO_2^{\ominus}$ d) $NO_3^{\ominus} \longrightarrow NH_4^{\oplus}$

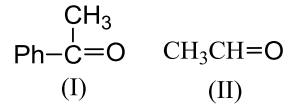
63. Which of the following is an intermolecular redox reaction?

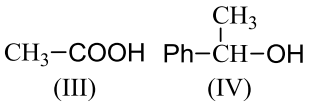
a) $2\,OCH - CHO \xrightarrow{\overset{\ominus}{O}H} HOCH_2 - CH_2OH$ b) $2C_6H_5CHO \xrightarrow{Al(OC_2H_5)_3} C_6H_5COOH + C_6H_5CH_2OH$

c) $4CrO_5 + 6H_2SO_4 \longrightarrow 2Cr_2(SO_4)_3 + 6H_2O + 7O_2$ d) $As_2S_3 + HNO_3 \longrightarrow H_3AsO_4 + H_2SO_4 + NO$

64. 

Which of the following compounds are (A), (B), (C) and (D)?





(A)and (B) (C) and (D)

a) I, II I, II b) I , III I , II

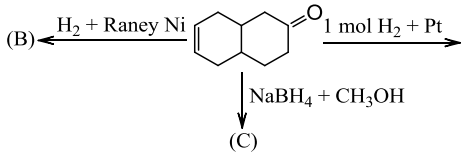
c) IV, V I,III d) VI, III I, III

65. The compound that will not give iodoform on treatment with alkali and iodine is:

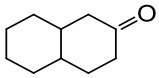
a) Acetone b) Ethanol c) Diethyl ketone d) Isopropyl alcohol

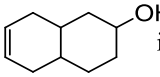
66. A mole of N_2H_4 loses 10 mol of electrons to form a new compound *Y*. Assuming that all the nitrogen appears in the new compound, what is the oxidation state of nitrogen in *Y*? (There is no change in the oxidation number of hydrogen)

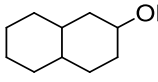
a) −1 b) −3 c) +3 d) +5

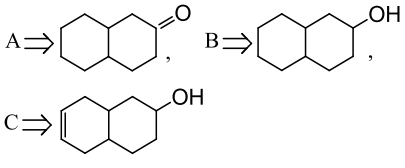
67. 

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

a)  in all cases

b)  in all cases

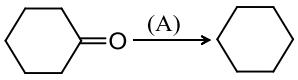
c)  in all cases

d) 

68. Which of the following is the best description of the behavior of bromine in the reaction given below?
$H_2O + Br_2 \longrightarrow HOBr + HBr$
a) Proton acceptor only
b) Both oxidized and reduced
c) Oxidised only
d) Reduced only

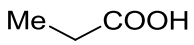
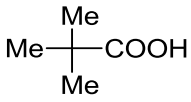
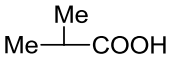
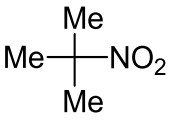
69. The oxidation state of A, B and C in a compound are +2, +5, and −2 respectively. The compound is
a) $A_2(BC)_2$ b) $A_2(BC)_3$ c) $A_3(BC_4)_2$ d) $A_2(BC_4)_3$

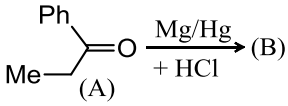
70. Hydrogenation of benzoyl chloride in the presence of Pd on $BaSO_4$gives:
a) Benzyl alcohol b) Benzaldehyde c) Benzoic acid d) Phenol

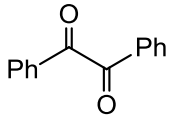
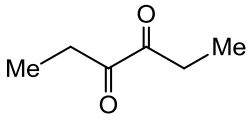
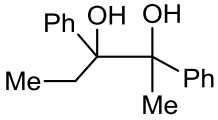
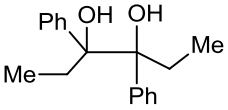
71. 

a) Wolf – kishner
b) Clemmensen reduction
c) HI+P
d) All

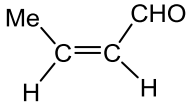
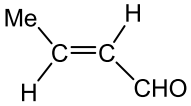
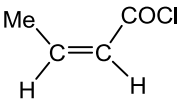
72. Which of the following represents a redox reaction?
a) $NaOH + HCl \longrightarrow NaCl + H_2O$
b) $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$
c) $CuSO_4 + 2H_2O \longrightarrow Cu(OH)_2 + H_2SO_4$
d) $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$

73. The compound $Me_3C - NH_2$ on oxidation with acidic $KMnO_4$ gives:
a) 
b) 
c) 
d) 

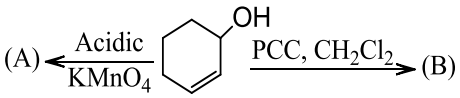
74. 

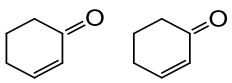
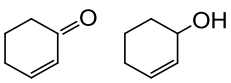
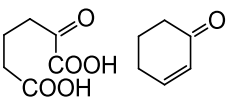
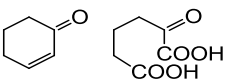
The compound (B) is:
a) 
b) 
c) 
d) 

75. For decolourisation of 1 mol of $KMnO_4$, the moles ofH_2O_2 required is
a) 1/2 b) 3/2 c) 5/2 d) 7/2

76. $MeC \equiv C - COCl \xrightarrow{H_2 + \text{Lindlar's Catalyst}} (A)$
The product (A) is:
a) $Me - C \equiv C - CHO$
b) 
c) 
d) 

77. Starch iodide is used to test for the presence of
a) Iodine b) Iodide ion c) Oxidising agent d) Reducing agent

78. Identify(A) and (B) in the reaction:


a) 
b) 
c) 
d) 

79. Which of the following statements is not correct?
a) The oxidation number of S in$(NH_4)_2S_2O_8$ is +6
b) The oxidation number of Os in OsO_4 is +8
c) The oxidation number of S in H_2SO_5 is +8
d) The oxidation number of O in KO_2 is −1/2

80. The oxidation number of Cl in $CaOCl_2$ is
a) −1 and +1 b) +2 c) −2 d) None

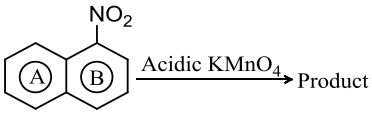
81. Excess of KI reacts with $CuSO_4$ solution, and $Na_2S_2O_3$ solution is added to it.Which of the following statements is **incorrect**for the reaction?

a) EvolvedI_2 is reduced
b) CuI_2 is formed
c) $Na_2S_2O_3$ is oxidized
d) Cu_2I_2 is formed

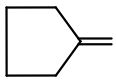
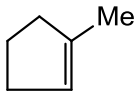
82. The oxidation number of oxygen in OF_2 is
a) $+2$ b) -2 c) $+1$ d) -1

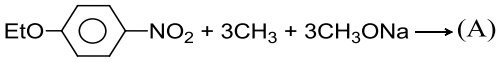
83. In the reaction
$3Br_2 + 6CO_3^{2-} + 3H_2O \longrightarrow 5Br^{\ominus} + BrO_3^{\ominus} + 6HCO_3^{\ominus}$
a) Bromine is oxidized and carbonate is reduced
b) Bromine is reduced and water is oxidised
c) Bromine is neither reduced nor oxidised
d) Bromine is both reduced and oxidised

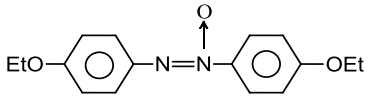
84. For the following reaction, which of the following statements is correct?

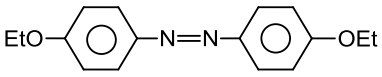


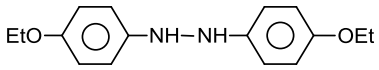
a) Ring (A) is oxidised b) Ring (B) is oxidised c) Both are oxidised d) None is oxidised

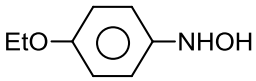
85. Acid-catalysed hydration, oxymercuration-demercu-ration, and hydroboration oxidation reaction will give the same product with:
a) But-2-ene b) But-1-ene
c) 
d) 

86. 

The product (A) is:
a) 

b) 

c) 

d) 

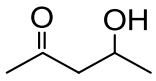
87. The oxidation number of cobalt in $K[Co(CO)_4]$ is
a) $+1$ b) $+3$ c) -1 d) -3

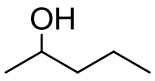
88. The oxidation number of C in HNC is
a) $+2$ b) -3 c) $+3$ d) 0

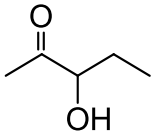
89. Imines or enamines are selectively reduced to 1° or 2° amines with:
a) $NaBH_4$ b) LAH c) $NaCNBH_3$ d) $NaAlH_4$

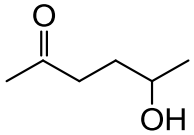
90. The values of x and y in the following redox reaction
$_xCl_2 + 6\overset{\ominus}{O}H \longrightarrow ClO_3^{\ominus} + yCl^{\ominus} + 3H_2O$ are
a) $x = 2, y = 4$ b) $x = 5, y = 3$ c) $x = 3, y = 5$ d) $x = 4, y = 2$

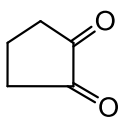
91. 1-Propanol and 2-propanol can be best distinguished by:
a) Oxidation with alkaline $KMnO_4$followed by reaction with Fehling's solution
b) Oxidation with acidic dichromate followed by reaction with Fehling's solution
c) Oxidation by heating with copper followed by reaction with Fehling's solution
d) Oxidation with concentrated H_2SO_4followed by reaction with Fehling solution

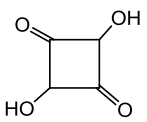
92. Which one of the following will most readily by dehydrated in acidic conditions?
a) 

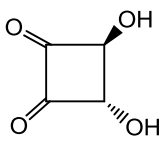
b) 

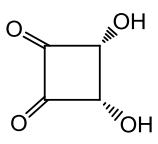
c) 

d) 

93. Compound (A) $\xrightarrow[HIO_4]{2 \text{ mol of}}$ 2 mol of glyoxalic acid.The compound (A) is:
a) 

b) 

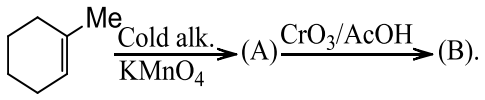
c) 

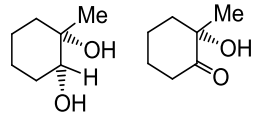
d) 

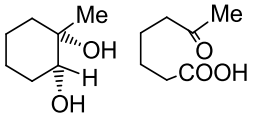
94. When $KMnO_4$ acts as an oxidizing agent and ultimately from MnO_4^{2-}, MnO_2, Mn_2O_3, and Mn^{2+} then the numbers of electrons transferred in each case, respectively, are
a) 4, 3, 1, 5 b) 1, 5, 3, 7 c) 1, 3, 4, 5 d) 3, 5, 7, 1

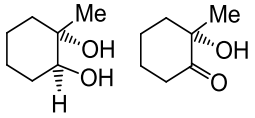
95. The number of moles of $K_2Cr_2O_7$ reduced by 1 mol of Sn^{2+} is
a) 1/6 b) 1/3 c) 2/3 d) 1

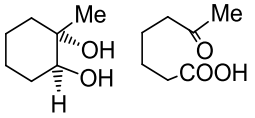
96. Which of the following acids possesses oxidising, reducing, and complex forming properties?
a) HNO_3 b) H_2SO_4 c) HCL d) HNO_2

97. 

a) 

b) 

c) 

d) 

98. $CH_3CH_2NO_2 \xrightarrow[\text{at } 0°C]{NaNO_2+HBr}$ (A).(A) is:
a) CH_3CH_2OH b) $CH_3CH_2 - N == N - Br$
c) $(CH_3)_2C(NO_2)-NHOH$ d) No reaction

99. The oxidation states of sulphur in the anions SO_3^{2-}, $S_2O_4^{2-}$and$S_2O_6^{2-}$ follow the order
a) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$ b) $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$
c) $S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$ d) $S_2O_6^{2-} < S_2O_4^{2-} < SO_3^{2-}$

100. In Which of the following cases is the oxidation state of N atom wrongly calculated?

Compound	Oxidation state

a)
NH_4Cl	-3

b)
$(N_2H_5)_2SO_4$	$+2$

c)
Mg_3N_2	-3

d)
NH_2OH	-1

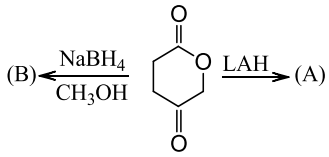
101. In the reaction
$2FeCl_3 + H_2S \longrightarrow 2FeCl_2 + 2HCl + S$
a) $FeCl_3$ acts as an oxidising agent b) Both H_2S and $FeCl_3$ are oxidised
c) $FeCl_3$ is oxidized while H_2S is reduced d) H_2S acts as an oxidising agent

102. In the reaction
$SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$
The substance oxidized is
a) H_2S b) SO_2 c) S d) H_2O

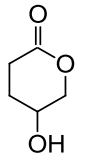
103. The oxidation numbers of S in S_8, S_2F_2 and H_2S , respectively, are
a) 0,+1 and -2 b) +2,+1 and -2 c) 0,+1 and +2 d) -2,+1 and -2

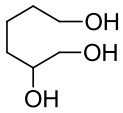
104. The oxidant which cannot act as a reducing agent is
a) SO_2 b) NO_2 c) CO_2 d) ClO_2

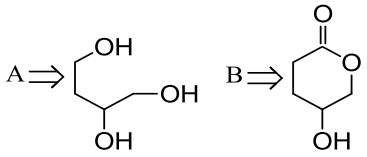
105. The oxidation number of phosphorous is PO_4^{3-}, P_4O_{10} and $P_2O_7^{4-}$ is
a) +5 b) +3 c) -3 d) +2

106. 

The products (A) and (B) are:

a)  in both cases

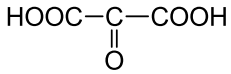
b)  in both cases

c) 

d) No reaction in both cases

107. Lactic acid on oxidation with Fenton's reagent gives:

a) $CH_3COCOOH$ (Pyruvic acid) b) CH_3COOH

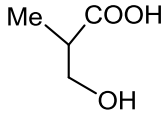
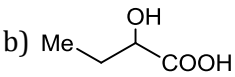
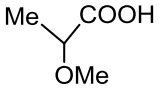
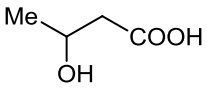
c)  d) $HOOC-COOH$

108. Oxidation of aldehyde and ketone by peroxybenzoic acid to ester is called:

a) Elbs oxidation b) Hell-Volhard-Zelinsky oxidation

c) Oppenauer oxidation d) Baeyer –Villiger oxidation

109. Compound (A)($C_4H_8O_3$) reacts with $NaHCO_3$ and evolves CO_2(g). (A) reacts with LAH to give a compound (B) which is a chiral. The structure of (A) is:

a)  b)  c)  d) 

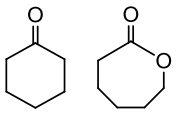
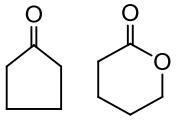
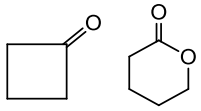
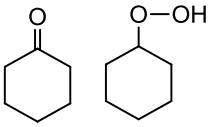
110. Which type of reaction in the reduction of carbonyl compound with LAH and $NaBH_4$occurs, and which nucleophile takes part in the reaction?

a) Nucleophilic addition and $AlH_4^{\ominus}$ or $BH_4^{\ominus}$ b) Nucleophilic addition and $H^{\ominus}$

c) Nucleophilicsubstitution and $AlH_4^{\ominus}$ or $BH_4^{\ominus}$ d) Nucleophilicsubstitution and $H^{\ominus}$

111. Barium adipate $\xrightarrow{\text{Dry distillation}}$ (A) $\xrightarrow{MeCO_3H}$(B)

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

a)  b)  c)  d) 

112. Which of the following reactions does not involve either oxidation or reduction?

a) $VO^{2+} \longrightarrow V_2O_3$ b) $Na \longrightarrow Na^{\oplus}$ c) $CrO_4^{2-} \longrightarrow Cr_2O_7^{2-}$ d) $Zn^{2+} \longrightarrow Zn$

113. Which of the following is not a disproportionation reaction?

1. $NH_4NO_3 \xrightarrow{\Delta} N_2O + H_2O$
2. $P_4 \xrightarrow{\Delta} PH_3 + HPO_2^{\ominus}$
3. $PCl_5 \xrightarrow{\Delta} PCl_3 + Cl_2$
4. $IO_3^{\ominus} + I^{\ominus} \longrightarrow I_2$

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

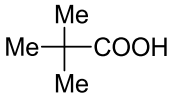
114. $Et - N^{\oplus} \equiv C^{\ominus} \xrightarrow[\text{or HgO or } O_3]{Cl_2+DMSO}$. The compound (A) is:

a) Ethyl methyl amine b) Ethyl nitrile c) Ethyl isocyanate d) Ethyl cyanate

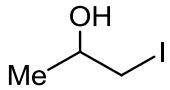
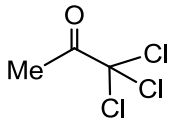
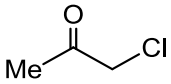
115. In the compound $YBa_2Cu_3O_7$ which shows superconductivity, what is the oxidation state of Cu? Assume that the rare earth element yttrium is in its usual +3 oxidation state

a) $+\frac{7}{3}$ b) $-\frac{7}{3}$ c) $\frac{5}{3}$ d) $-\frac{5}{3}$

116. An alkene on ozonolysis yields only ethanal. There is an isomer of the alkene which on ozonolysis yields:
a) Propanone and methanal b) Propanone and ethanal
c) Ethanal and methanal d) Only Propanone

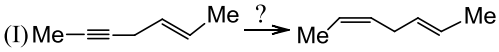
117. The final product obtained in the oxidation of t-butyl benzene with $Na_2Cr_2O_7 + H_2SO_4$ is:
a) Benzoic acid b) $PhCH_2COOH$ c)  d) CH_3COOH

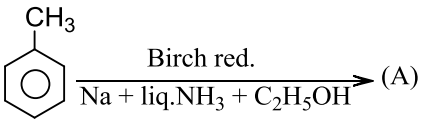
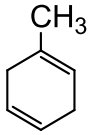
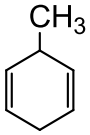
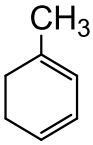
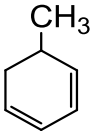
118. The number of moles of $KMnO_4$ reduced by 1 mol of KI in alkaline medium is
a) 1 b) 2 c) 5 d) 1/5

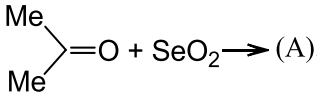
119. Which of the following gives yellow precipitate with NaOI?
a)  b)  c)  d) All

120. To an acidic solution of an anion, a few drops of $KMnO_4$ solution are added. Which of the following, if present, will not decolourise the $KMnO_4$ solution?
a) CO_3^{2-} b) $NO_2^{\ominus}$ c) S^{2-} d) $Cl^{\ominus}$

121. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are
a) II, III in haematite and III in magnetite b) II, III in haematite and II in magnetite
c) II in haematite and II, III in magnetite d) III in haematite and II, III in magnetite

122. Which single reagent can be used in the following conversions?

(II) $PhCH_2OH \rightarrow PhCH_3$
(III) $MeN_3 \rightarrow MeNH_2$ (IV) $PhNO_2 \rightarrow PhNH_2$
a) H_2 + Poisoned Pd b) H_2 + Raney Ni c) H_2 + Pd + C d) H_2 + Ni + B

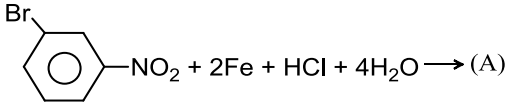
123. 
The product (A) is:
a)  b)  c)  d) 

124. 
(A)will not
a) Reduce Tollens reagent
b) Give Iodoform test
c) Form dioxime
d) Give ceric ammonium nitrate test

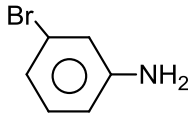
125. The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is
a) +3 b) +2 c) +1 d) −1

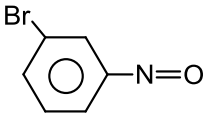
126. The coordination number and oxidation number of Cr in $K_3[Cr(C_2O_4)_3]$ are, respectively,
a) 4 and +2 b) 6 and +3 c) 3 and −3 d) 3 and 0

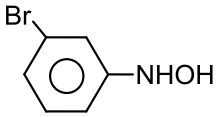
127. In which of the following pairs is there the greatest difference in the oxidation numbers of the underlined elements?
a) $\underline{N}O_2$ and $\underline{N}_2O_4$ b) $\underline{P}_2O_5$ and $\underline{P}_4O_{10}$ c) $\underline{N}_2O$ and $\underline{N}O$ d) $\underline{S}O_2$ and $\underline{S}O_3$

128. 

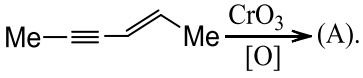
The product (A) is:

a) 

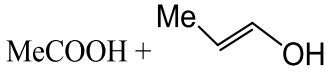
b) 

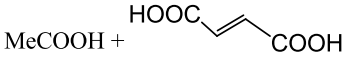
c) 

d) None

129. 

The product(A) is:

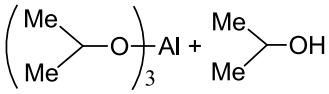
a) 

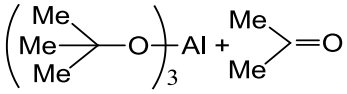
b) 

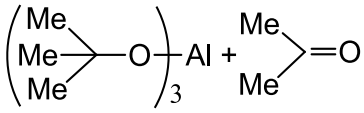
c) $Me-\equiv -COOH + MeCOOH$

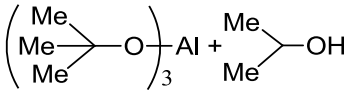
d) None

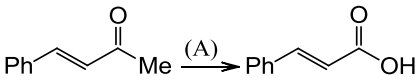
130. The catalyst and solvent used in MPV (Meerwein-Ponndorf-Verley) reaction are:

a) 

b) 

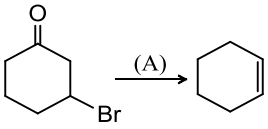
c) 

d) 

131. 

The compound (A) is:

a) Acidic $KMnO_4$ b) $KOBr/H_3O^{\oplus}$ c) $SeO_2/MeCOOH$ d) Jones reagent

132. 

The reagent (A) is:

a) LAH $+ AlCl_3$ b) $NaBH_4 + PtCl_2$

c) Wolff – Kishner reduction d) Clemmensen reduction

133. Reaction of Br_2 with Na_2CO_3 in aqueous solution gives sodium bromide and sodium bromate with evolution of CO_2 gas. The number of sodium bromide molecules involved in the balanced chemical equation is

a) 1 b) 3 c) 5 d) 7

134. A compound that gives a positive iodoform test is:

a) 1-Pentanol b) 3-Pentanone c) 2-Pentanone d) Pentanal

135. In the equation

$NO_2^{\ominus} + H_2O \longrightarrow NO_3^{\ominus} + 2H^{\oplus} + ne^-$

$n$stands for

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

136. Which of the following leads to redox reaction?

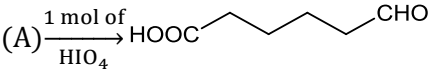
a) $AgNO_3 + HCl$ b) $KOH + HCl$ c) $KI + Cl_2$ d) $NH_3 + HCl$

137. Which of the following is not a reducing agent?

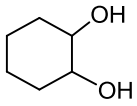
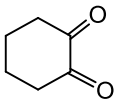
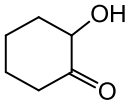
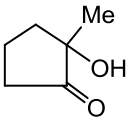
a) SO_2 b) H_2O_2 c) CO_2 d) NO_2

138. Among the following, identify the species with an atom in +6 oxidation state

a) $MnO_4^{\ominus}$ b) $[Cr(CN)_6]^{3-}$ c) $[Ni\ F_6]^{2-}$ d) CrO_2Cl_2

139. Compound (A) 

The Compound (A) is:

a)  b)  c)  d) 

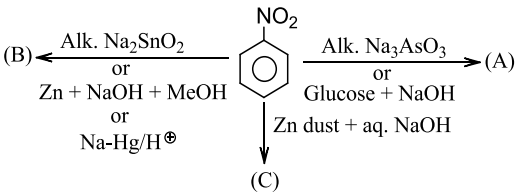
140. Toluene on reaction with CrO_3 and Ac_2O gives benzaledehyde as the main product.The intermediate compound formed in the reaction is:

a) $PhCH_2OH$ b) $PhCH(OAc)_2$ c) $PhCH_2OAc$ d) $PhCH(OH)_2$

141. Which of the following is disproportionation reaction?

a) $Cu_2O + 2H^{\oplus} \longrightarrow Cu + Cu^{2+} + H_2O$ b) $2CrO_4^{2-} + 2H^{\oplus} \longrightarrow Cr_2O_7^{2-} + H_2O$

c) $CaCO_3 + 2H^{\oplus} \longrightarrow Ca^{2+} + H_2O + CO_2$ d) $Cr_2O_7^{2-} + 2\overset{\ominus}{O}H \longrightarrow 2CrO_4^{2-} + H_2O$

142. 

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

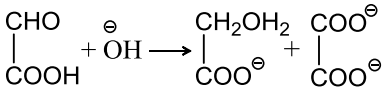
a) (A)⇒Azobenzene, (B)⇒Hydrazobenzene, (C)⇒Azoxybenzene

b) (A)⇒Azobenzene, (B)⇒Azoxybenzene, (C)⇒Hydrazobenzene,

c) (A)⇒ Azoxybenzene, (B)⇒ Azobenzene, (C)⇒Hydrazobenzene,

d) (A)⇒ Azoxybenzene,(B)⇒Hydrazobenzene, (C)⇒ Azobenzene

143. Which of the following is not a disporportionation reaction?

a) $2PhCHO \xrightarrow{Al(OEt)_3} PhCOOCH_2Ph$ b) 

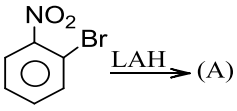
c) $NaH + H_2O \longrightarrow NaOH + H_2$ d) All

144. $PhCH_2CH_2CH_3 \xrightarrow[(ii)H_2O]{(i)CrO_2Cl_2/CCl_4}$ (A) The product (A) is:

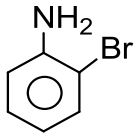
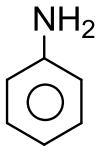
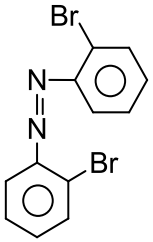
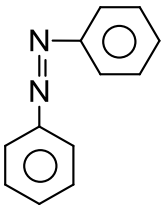
a) PhCHO b) $PhCH_2CHO$ c) $PhCH_2CH_2CHO$ d) $PhCH(CH_3)-CHO$

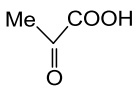
145. In Rosenmund reduction, which of the following does not poison the catalyst Pd?

a) $BaSO_4$ b) S c) Quinoline d) Xylene

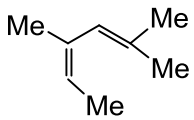
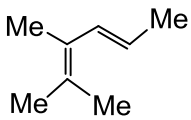
146. 

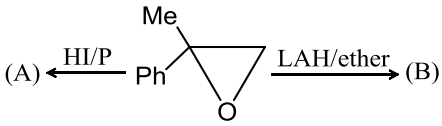
The product (A) is:

a)  b)  c)  d) 

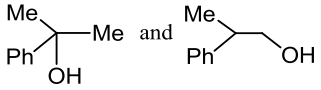
147. Alkene (A) $\xrightarrow{O_3/H_2O}$  $=O$ + MeCOOH + 

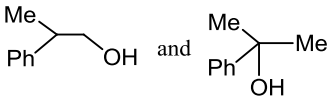
(A) can Be:

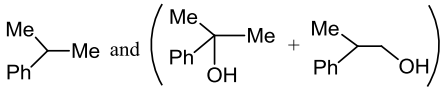
a)  b)  c) Both correct d) None is correct

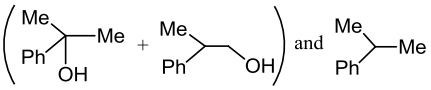
148. 

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

a) 

b) 

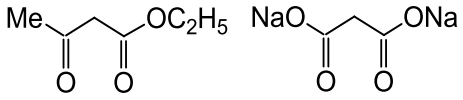
c) 

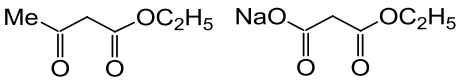
d) 

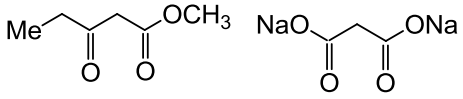
149. The oxidation number of in Pr in Pr_6O_{11} is

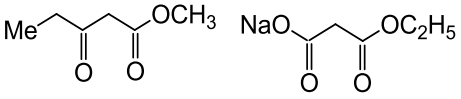
a) $\frac{22}{6}$ b) $\frac{20}{6}$ c) 3 d) 4

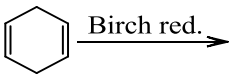
150. $C_6H_{10}O_3$ (Keto ester)$(A)\xrightarrow[\Delta]{NaOH+I_2}$ Yellow ppt. $+(B)\xrightarrow{H^{\oplus}}(C)\xrightarrow[-CO_2]{\Delta}CH_3COOH$. (A) and (B) are:

a) 

b) 

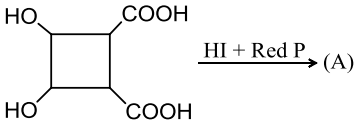
c) 

d) 

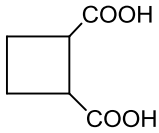
151. 

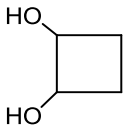
The product (A) is:

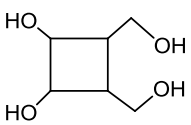
a) No reaction b)  c)  d) 

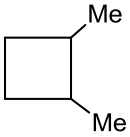
152. 

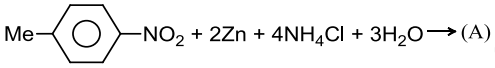
(A) The Compound (A) is:

a) 

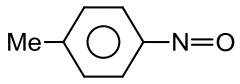
b) 

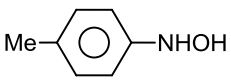
c) 

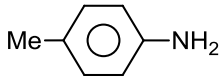
d) 

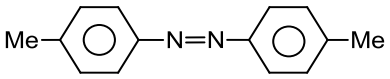
153. 

The product (A) is:

a) 

b) 

c) 

d) 

154. In the reaction

$K + O_2 \longrightarrow KO_2$

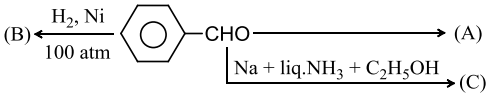
a) O_2 acts as an oxidizing agent b) Both K and O_2 are oxidized

c) O_2 is oxidized while K is reduced d) K acts as an oxidizing agent

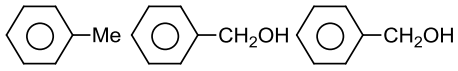
155. Which of the following is not a redox reaction?

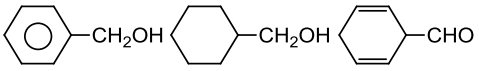
a) $CaCO_3 \longrightarrow CaO + CO_2$ b) $O_2 + 2H_2 \longrightarrow 2H_2O$

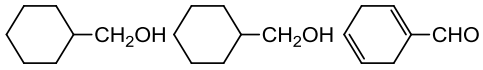
c) $Na + H_2O \longrightarrow NaOH + \frac{1}{2}H_2$ d) $MnCl_3 \longrightarrow MnCl_2 + (1/2)Cl_2$

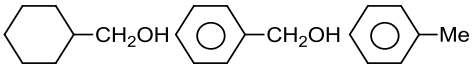
156. 

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

a) 

b) 

c) 

d) 

157. The oxidation state of chromium in $Cr(CO)_6$ is

a) 0 b) +2 c) −2 d) +6

158. The oxidation number of S in H_2SO_5 is

a) +8 b) +6 c) +4 d) +2

159. (B) $\xleftarrow{NaBH_4}$ CH_3N_3 $\xrightarrow{LAH}$ (A) the products (A) and (B) are:

(A) (B)

a) CH_3NH_2 CH_3NH_2

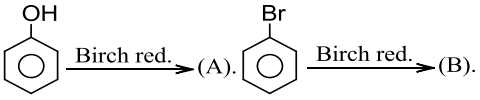
b) CH_3NH_2 No reaction

c) No reaction CH_3NH_2

d) No reaction No reaction

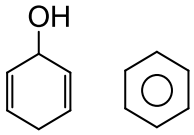
160. The oxidation states of the most electronegative elements in the products of the reaction between BaO_2 and H_2SO_4 are

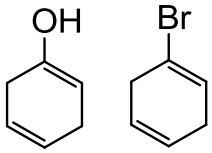
a) 0 and −1 b) −1 and −2 c) −2 and 0 d) −2 and +1

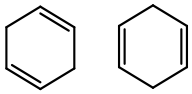
161. 

The products (A) and (B) is:

(A) (B)

a) 

b) 

c) 

d) No reaction 

162. The number of peroxide bond in perxenate ion $[XeO_6]^{4-}$ is

a) 0 b) 2 c) 3 d) 1

163. The number of moles of $K_2Cr_2O_7$ reduced by 1 mol of Sn^{2+} ions is

a) 1/3 b) 3 c) 1/6 d) 6

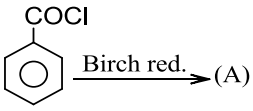
164. $CH_3-\underset{|}{CH}-NO_2 \xrightarrow[\text{at } 0°C]{NaNO_2+H_2SO_4}$ (A).(A) is:

a) $(CH_3)_2-CH-OH$ b) $(CH_3)_2CH-N=N-Br$

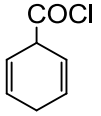
$(CH_3)_2C-N=O$ $(CH_3)_2C-NHOH$

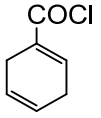
c) $\underset{|}{}$ d) $\underset{|}{}$

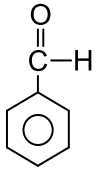
NO_2 NO_2

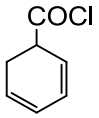
165. 

The product (A) is:

a) 

b) 

c) 

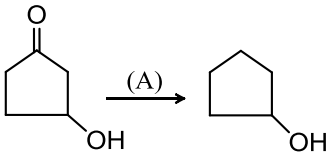
d) 

166. In the reaction

$3Cl_2 + 6NaOH \longrightarrow NaClO_3 + 5NaCl + 3H_2O$

the element which loses as well as gains electrons is

a) Na b) O c) Cl d) None of these

167. 

The reagent (A) is:

a) Wolff –Kishner reduction b) Clemmensen reduction

c) LAH d) $NaBH_4$

168. In the reaction

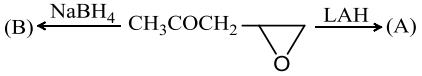
$8Al + 3Fe_3O_4 \longrightarrow 4Al_2O_3 + 9Fe$

The number of electrons transferred from the reductant to the oxidant is

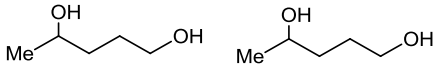
a) 8 b) 4 c) 16 d) 24

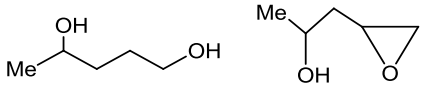
169. In the neutralization of $Na_2S_2O_3$ using $K_2Cr_2O_7$ by iodometry, the equivalent weight of $K_2Cr_2O_7$is

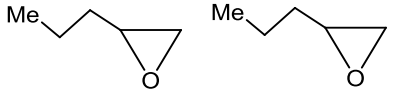
a) M/2 b) M/6 c) M/3 d) M

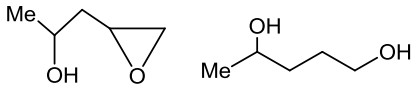
170. 

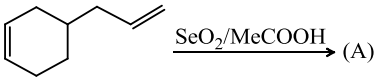
The products (A) and (B) are:

a) 

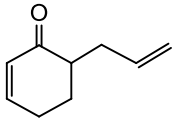
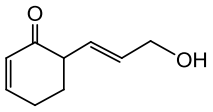
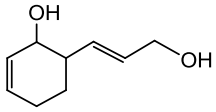
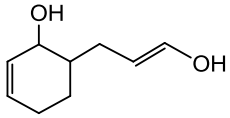
b) 

c) 

d) 

171. 

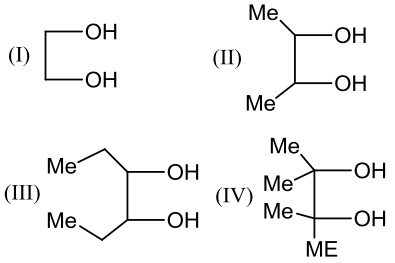
The compound (A) is:

a)  b)  c)  d) 

172. The oxidation state of chromium in $Cr(PPh_3)_3(CO)_3]$ is

a) +3 b) +8 c) 0 d) +5

173. The increasing order of the rate of oxidation with HIO_4oxidation of the following is:



a) IV < *III* < *II* < *I* b) I < *II* < *III* < *IV* c) IV < *III* = *II* < *I* d) I < *II* = *III* < *IV*

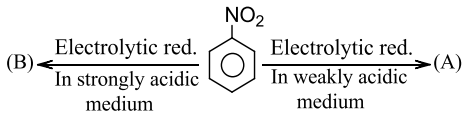
174. The oxidation state of Fe in $Fe(CO)_5$is

a) 0 b) +2 c) −2 d) +6

175. Which gas is evolved when PbO_2 is treated with concHNO_3?
a) NO_2 b) O_2 c) N_2 d) N_2O

176. The equivalent weight of FeC_2O_4 in the change
$FeC_2O_4 \longrightarrow Fe^{3+} + CO_2$is
a) M/3 b) M/6 c) M/2 d) M/1

177. The Number of electrons lost in the following change is
$Fe + H_2O \longrightarrow Fe_3O_4 + H_2$
a) 2 b) 4 c) 6 d) 8

178. 

The products (A) and(B) are:
a) (A)⇒Aniline (B)⇒ Aniline
b) (A)⇒Aniline (B)⇒ Phenylhydroxylamine
c) (A)⇒ p-Aminophenol (B)⇒Phenylhydroxylamine
d) (A)⇒Aniline (B)⇒ p-Aminophenol

179. The equivalents mass of oxidizing agent in the following reaction is
$SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$
a) 32 b) 64 c) 16 d) 8

180. Which of the following examples does not represent disproportionation?
a) $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$ b) $2H_2O_2 \longrightarrow 2H_2O + O_2$
c) $4KClO_3 \longrightarrow 3KClO_4 + KCl$ d) $3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$

181. For the redox reaction
$MnO_4^{\ominus} + C_2O_4^{2-} + H^{\oplus} \longrightarrow Mn^{2+} + CO_2 + H_2O$
The correct coefficients of the reactions for the balanced reaction are

$MnO_4^{\ominus}$	$C_2O_4^{2-}$	H

a)

2	5	16

b)

16	5	2

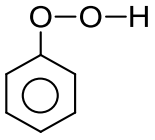
c)

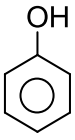
5	16	2

d)

2	16	5

182. Which of the following is a redox reaction?
a) H_2SO_4 with NaOH b) In atmosphere,O_3 from O_2 by lightning
c) Nitrogen oxides form nitrogen and oxygen by lightning d) Evaporation of H_2O

183. Fenton's reagent ($Fe^{2+} + H_2O_2$) with benzene gives:
a) No reaction b) 

c) 

d) 3(HOOC − COOH)

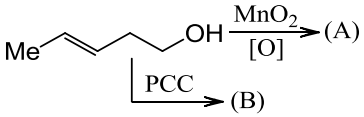
184. The oxidation number of Fe in $Fe_{0.94}$ O is
a) 200 b) 200/94 c) 94/200 d) None

185. The reaction
$3ClO^{\ominus}(aq) \longrightarrow ClO_3(aq) + 2Cl^{\ominus}(aq)$ is an example of

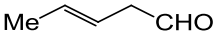
a) Oxidation b) Reduction c) Disproportionation d) Decomposition

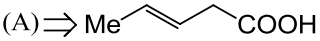
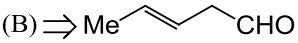
186. The oxidation state of iodine in $H_4IO_6^{\ominus}$ is

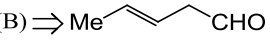
a) $+7$ b) -1 c) $+5$ d) $+1$

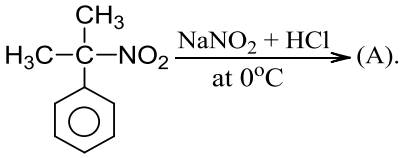
187. 

The compounds (A) and (B) are:

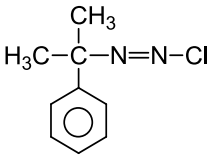
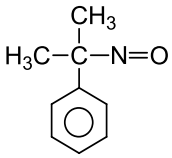
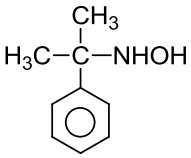
a) No reaction b) (A) and (B) are ⇒ 

c) (A) ⇒ 
(B) ⇒ 

d) (A) ⇒ No reaction (B) ⇒ 

188. 

The compound (A) is:

a)  b)  c)  d) No reaction

189. Which of the following is an incorrect statement:

a) The oxidation of 1,2-ethanediol with HIO_4 gives formaldeyde

b) 1° Alochol turns $K_2Cr_2O_7/H^{\oplus}$ solution green

c) t- Butyl alochol is converted to isobutene on heating with Cu

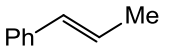
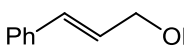
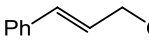
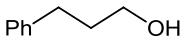
d) CH_3OH is also called denatured spirit

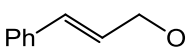
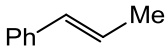
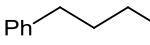
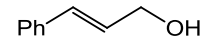
190. Which of the following compounds will not give haloform reaction?

a) α-Phenyl ethanol b) Acetophenone c) Ethyl bromide d) $(MeCO)_2O$

191. $(B) \xleftarrow{NaBH_4} PhCH = CH - CHO \xrightarrow[2.H_3O^+]{1.LAH,ether} (A)$

The products (A) and (B) are:

a)   b)  

c)   d)  

192. In the chemical reaction,

$K_2Cr_2O_7 + xH_2SO_4 + ySO_2 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + zH_2O$

x , y, and z are

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

193. Which of the following does not gives Liebermann's nitroso reaction?

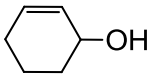
a) $PhOH$ b) $PhNHCH_3$ c) $PhN(CH_3)_2$ d) $Ph - \underset{\displaystyle NO}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{N}}}} -$

194. Chromic anhydride in H_2SO_4 is not turned blue by:

a) 1° alcohol

b) 2° alcohol

c) 3° alcohol

d) 

195. When iron is rusted, it is

a) Oxidised b) Reduced c) Evaporated d) Decomposed

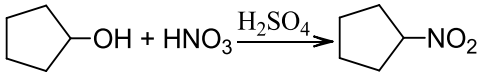
196. In which of the following pairs is there the greatest difference in the oxidation numbers of the underlined elements?

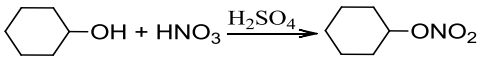
a) $\underline{N}O_2$ and $\underline{N}_2O_4$ b) $\underline{S}O_3^{2-}$ and $\underline{S}O_4^{2-}$ c) $\underline{S}^{2-}$ and $\underline{S}O_3^{2-}$ d) $\underline{S}^{2-}$ and $\underline{S}O_4^{2-}$

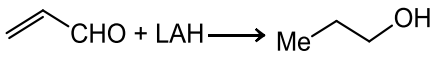
197. Caprolactam on reduction with LAH or H_2 + Pt or Pd gives:

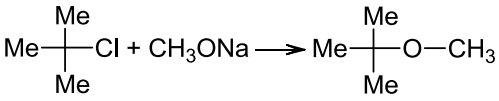
a) 4- Amino butane -1-ol b) 5- Aminopentan -1-ol c) 6- Aminohexan -1-ol d) 7- Aminoheptan -1-ol

198. Which of the following reaction is correct?

a) 

b) 

c) 

d) 

199. Which of the following is the strongest reducing agent in aqueous medium?

a) Mg b) Na c) Li d) Ca

200. Which of the following is not an intermolecular redox reaction?

a) $MgCO_3 \longrightarrow MgO + CO_2$ b) $O_2 + 2H_2 \longrightarrow 2H_2O$

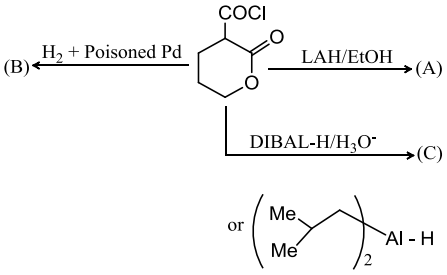
c) $K + H_2O \longrightarrow KOH + (1/2)H_2$ d) $MnBr_3 \longrightarrow MnBr_2 + (1/2)Br_2$

201. The brown ring complex compound is formulated as $[Fe(H_2O)_5\ NO]SO_4$. The oxidation state of Fe is

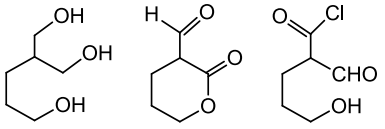
a) 1 b) 2 c) 3 d) 0

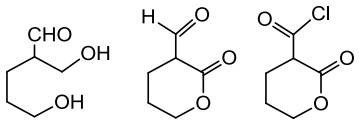
202. $Cr_2O_7^{2-} + X \xrightarrow{H^{\oplus}} Cr^{3+} + H_2O +$ oxidised product of X,X in the above reaction cannot be

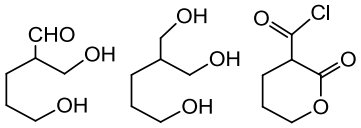
a) $C_2O_4^{2-}$ b) Fe^{2+} c) SO_4^{2-} d) S^{2-}

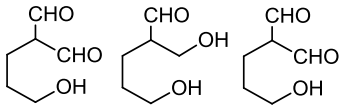
203. 

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

a) 

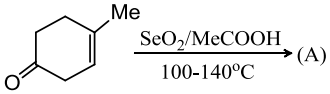
b) 

c) 

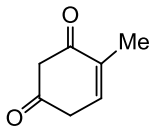
d) 

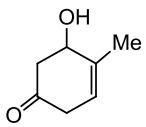
204. The oxidation number of C in CH_2O is

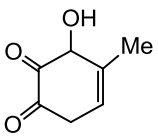
a) -2 b) $+2$ c) 0 d) $+4$

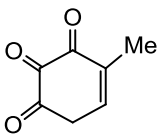
205. 

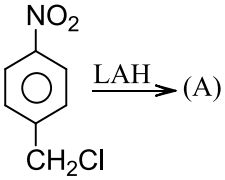
The compound (A) is:

a) 

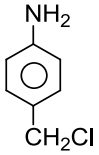
b) 

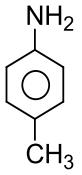
c) 

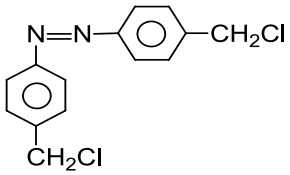
d) 

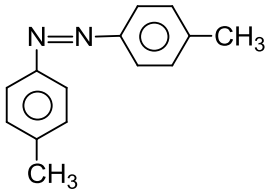
206. 

The product (A) is:

a) 

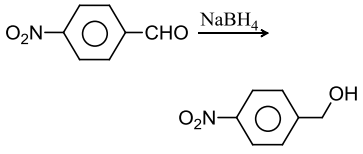
b) 

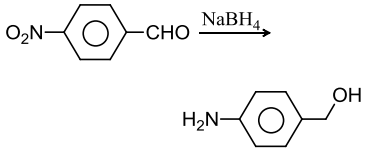
c) 

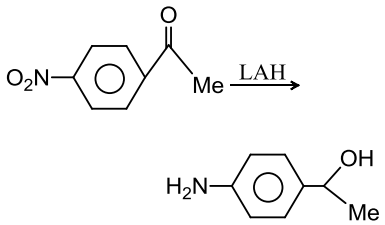
d) 

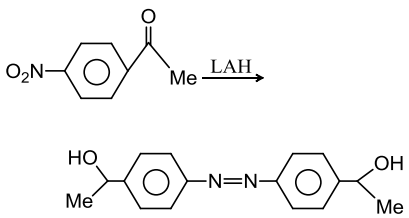
Multiple Correct Answers Type

207. 10 mL of $NaHC_2O_4$ is oxidised by 10 mL of 0.02 M MnO_4^-. Therefore, 10 mL of $NaHC_2O_4$ can be neutralized by :
   a) 10 mL of 0.1 M NaOH
   b) 10 mL of 0.02 M NaOH
   c) 10 mL of 0.1 N $Ca(OH)_2$
   d) 10 mL of 0.05 M $Ba(OH)_2$
208. 100 mL of 0.1 M $NaHC_2O_4$ is neutralised by V_1 mL of 0.1 M NaOH and V_2 mL of a M $KMnO_4$ separately, then for complete neutralization :
   a) Volume of NaOH required $= 200$ mL
   b) If M of $KMnO_4$ is 0.1 M then $\frac{V_1}{V_2} = 5:2$
   c) If M of $KMnO_4$ is 0.1 M then $V_2 = 40$ mL
   d) If M of $KMnO_4$ is 0.2 M then $V_2 = 2$ mL
209. Which of the following reaction(s) is/are correct?

a) 

b) 

c) 

d) 

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

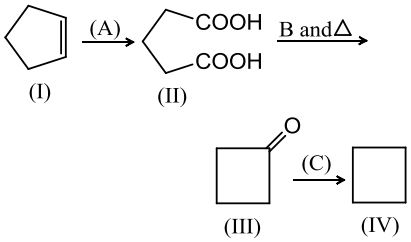
a) In the reaction $MnO_4^{2-} + H^{\oplus} \longrightarrow Mn^{2+} +$? the missing product is $MnO_4^{\ominus}$

b) In the above reaction (a) ,the missing product is MnO_2

c) In the reaction $NO_2 + H_2O \longrightarrow NO +$? the missing product is $NO_3^{\ominus}$

d) In the above reaction (c) , the missing product is $NO_2^{\ominus}$

211. Consider the following reactions:



Which of the following group(s) of reagents is/are used in the above conversion?

a) (A)⇒Acidic $KMnO_4$, (B) ⇒ $Ca(OH)_2$
(C) ⇒ $Zn - Hg/HCl$

b) (A)⇒ O_3/Ph_3P, (B)⇒ $Ba(OH)_2$,(C)⇒ LAH/ether

c) (A)⇒ O_3/H_2O, (B)⇒ $Sr(OH)_2$,
(C)⇒ NH_2NH_2/OH

d) (A)⇒ O_3/Ag_2O, (B)⇒ $Ba(OH)_2$, (C)⇒ HI +Red P

212. The process of reduction involves :

a) Addition of H_2 or removal of O_2 to a molecule

b) Addition of a metal or removal of a non-metal

c) Gain of electrons

d) None of the above

213. The process of oxidation involves :

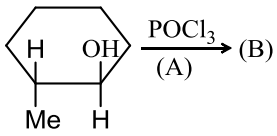
a) Addition of O_2 or removal of H_2 to a molecule

b) Addition of a non-metal or removal of metal

c) Loss of electrons

d) None of the above

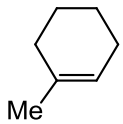
214.



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

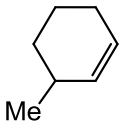
The compound (B) is

a)



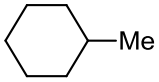
The compound (B) is

b)



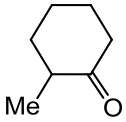
The compound (A) on reaction with HI +Red P gives

c)



The compound (A) on oxidation with MnO_2 gives

d)



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

1. $C_6H_{12}O_6 \xrightarrow{H_2SO_4(conc)} 6C + 6H_2O$
2. $H_2SO(dil) + ZnCO_3 \longrightarrow Zn^{2+} + CO_2 + SO_4^{2-} + H_2O$
3. $H_2SO_4(dil) + Zn \longrightarrow Zn^{2+} + H_2 + SO_4^{2-}$
4. $5H_2SO_4(conc) + 4Zn \longrightarrow H_2S + 4Zn^{2+} + 4SO_4^{2-} + 4H_2O$

a) In reaction (I),H_2SO_4 acts as a dehydrating agent

b) In reaction (II) ,H_2SO_4 acts as an acid

c) In Reaction (III), H_2SO_4 acts both as an acid and an oxidising agent

d) In reaction (IV), H_2SO_4 acts as an oxidizing agent

216. Which of the following has/have been arranged in order of decreasing oxidation number of sulphur?

a) $H_2S_2O_7 > Na_2S_4O_6 > Na_2S_2O_3 > S_8$ b) $SO^{2+} > SO_4^{2-} > SO_3^{2-} > HSO_4^{\ominus}$

c) $H_2SO_5 > H_2SO_3 > SCl_2 > H_2S$ d) $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$

217. Which of the following reactions is not a redox reaction?

a) $H_2O_2 + KOH \longrightarrow KHO_2 + H_2O$ b) $Cr_2O_7^{2-} + 2\overset{\ominus}{O}H \longrightarrow 2CrO_4^{2-} + H_2O$

c) $Ca(HCO_3)_2 \xrightarrow{\Delta} CaCO_3 + CO_2 + H_2O$ d) $H_2O_2 \longrightarrow H_2O + \frac{1}{2}O_2$

218. No reaction occurs in which of the following equations?

a) $I^{\ominus} + Fe^{2+} \longrightarrow$ b) $F_2 + 2NaCl \longrightarrow$ c) $Cl_2 + 2NaF \longrightarrow$ d) $I_2 + 2NaBr \longrightarrow$

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

a) PbO_2 reacts with HCl to evolve Cl_2 gas

b) PbO_2 reactswith HNO_3 to form O_2 gas

c) Pb_3O_4reacts with HCl to evolve Cl_2gas

d) Pb_3O_4 reacts with HNO_3 to form PbO_2, but O_2 is not liberated

220. Which of the following substances undergo(s) disproportionation reactions under basic medium?

a) F_2

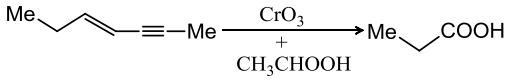
b) P_4

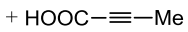
c) S_8

d) Br_2

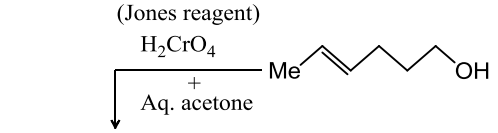
221. Which of the following reactions is/are correct?

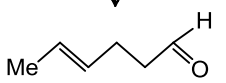
a)

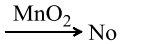


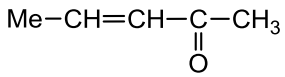


b)

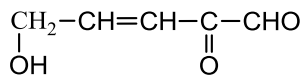




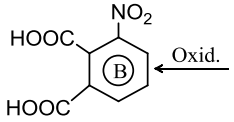


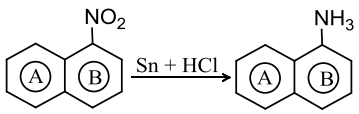


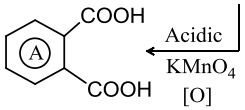
c) $\xrightarrow{SeO_2/CH_3COOH}$



d)







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

a) In the reaction $H_2O_2 + I_2 \longrightarrow I^{\ominus} + ?$
the missing product is O_2

b) In the above reaction (a),the missing products is H_2O

c) In the reaction $H_2O_2 + Sn^{2+} \longrightarrow Sn^{4+} + ?$, the missing product is O_2

d) In the above reaction (c), the missing products is H_2O

223. Which of the following statement(s) is/are true?

a) All reactions are oxidation and reduction reactions

b) Oxidizing agent is itself reduced

c) Oxidation and reduction always go side by side

d) Oxidation number during reduction decreases

224. Indicate in which of the following processes the nitrogen is reduced?

a) $NH_4^+ \longrightarrow N_2$ b) $NO_3^- \longrightarrow NO$ c) $NO_2 \longrightarrow NO_2^-$ d) $NO_3 \longrightarrow NH_4^+$

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

a) Oxidation of a substance is followed by reduction of another

b) Reduction of a substance is followed by oxidation of another

c) Oxidation and reduction are complementary reactions

d) It is not necessary that both oxidation and reduction should take place in the same reaction

226. The oxidation number of carbon is zero in

a) HCHO b) CH_2Cl_2 c) $C_6H_{12}O_6$ d) $C_{12}H_{22}O_{11}$

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

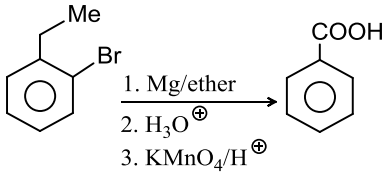
a) The oxidation state of H in $LiAlH_4$ is-1

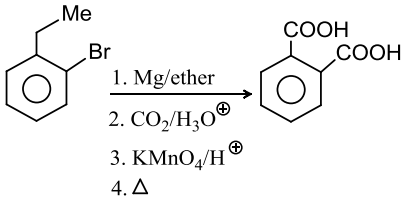
b) The oxidation state of H in $LiAlH_4$ is-1
The reaction of hydrogen in that oxidation state withH_2O is

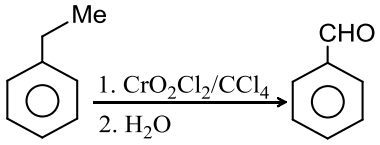
c) $H^{\ominus} + H_2O \longrightarrow H_2 + \overset{\ominus}{O}H$

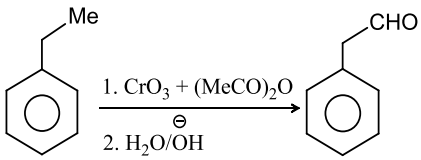
d) The Reaction of hydrogen in that oxidation state with H_2O is
$H^{\oplus} + H_2O \longrightarrow H_3O^{\oplus}$

228. Which of the following reaction(s) is/are wrong?

a) 

b) 

c) 

d) 

229. Which of the following is/are disproportionation redox changes?

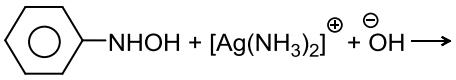
a) $(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$ b) $5H_2O_2 + 2ClO_2 + 2\overset{\ominus}{O}H \longrightarrow 2Cl^{\ominus} + 5O_2 + 6H_2O$

c) $3ClO^{\ominus} \longrightarrow ClO_3^{\ominus} + Cl^{\ominus}$ d) $2HCuCl_2 \xrightarrow[\text{with water}]{\text{Dilution}} Cu + Cu^{2+} + 4Cl^{\ominus} + 2H^{\oplus}$

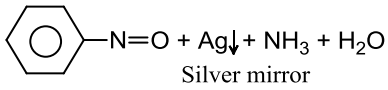
230. In the reaction, $3H_3PO_2 \longrightarrow PH_3 + 2H_3PO_3$:
   a) H_3PO_2 undergoes disproportionation
   b) Equivalent weight of H_3PO_2 is 22
   c) Equivalent weight of H_3PO_2 is 49.5
   d) Equivalent weight of H_3PO_2 is 66

231. Preparation of Cl_2 from HCl and MnO_2, involves the process of :
   a) Oxidation of MnO_2
   b) Reduction of MnO_2
   c) Dehydration
   d) Oxidation of chloride ion

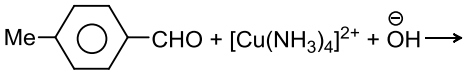
232. Which of the following unbalanced reaction is/are corret ?



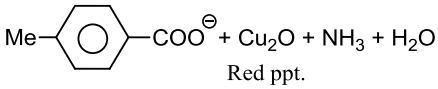
   a)



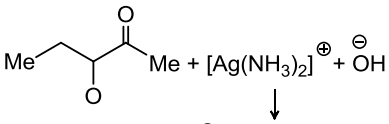
Silver mirror



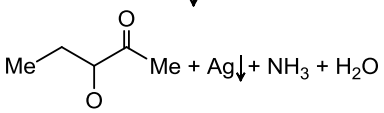
   b)



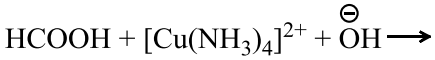
Red ppt.



   c)



   d)

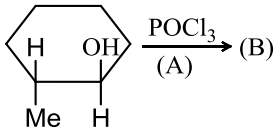


$$CO_2 + Cu_2O + 3H_2O$$

Red ppt.

233. Which of the following reactions should be balanced in basic medium?
   a) $NH_3 + MnO_4^{\ominus} \longrightarrow MnO_2 + NO_2$
   b) $Cr(OH)_2 + I_2 \longrightarrow Cr(OH)_3 + 2I^{\ominus}$
   c) $HNO_3 + Fe^{2+} \longrightarrow Fe^{3+} + NO_2$
   d) $H_2O_2 + Fe^{3+} \longrightarrow O_2 + Fe^{2+}$

234.



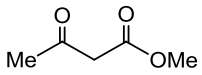
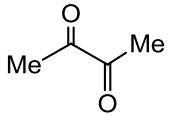
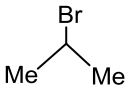
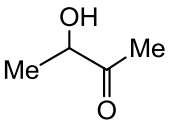
which of the following reagents can be used to convert (A) to (B)?
   a) Conc.H_2SO_4 at 413 K (140°C)
   b) DCC
   c) P_2O_5
   d) Conc.H_2SO_4 at 383 K (110°C)

235. For the reaction, $2KClO_3 \longrightarrow 2KCl + 3O_2$, which statement(s) is/are correct?
   a) It is disproportionation
   b) It is intramolecular redox change
   c) Cl atoms are reduced
   d) Oxygen atoms are oxidized

236. In the reaction ; $Cl_2 + OH^- \longrightarrow Cl^- + ClO_4^- + H_2O$, chlorine is :
   a) Oxidized
   b) Reduced

c) Disproportionate
d) Neither oxidized nor reduced

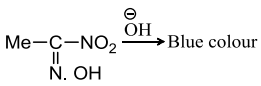
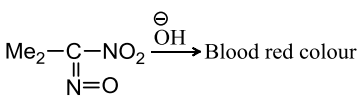
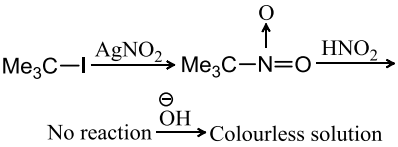
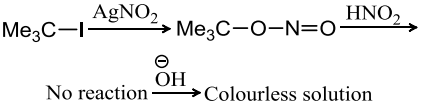
237. The oxidation number of carboxylic carbon atom in CH_3COOH is
a) $+2$ b) $+4$ c) $+1$ d) $+3$

238. Which of the following compounds do(es)not give haloform reaction?
a) 
b) 
c) 
d) 

239. Which of the following reactions does not involve oxidation-reduction?
a) $2Rb + 2H_2O \longrightarrow 2RbOH + H_2$ b) $2CuI_2 \longrightarrow 2CuI + I_2$
c) $NH_4Cl + NaOH \longrightarrow NaCl + NH_3 + H_2O$ d) $4KCN + FE(CN)_2 \longrightarrow K_4[Fe(CN)_6]$

240. Which of the following statements about the following reaction is/are wrong?
$2Cu_2O(s) + Cu_2S(s) \longrightarrow 6Cu(s) + 5O_2(g)$
a) Both Cu_2O and Cu_2S are reduced b) Only Cu_2S is reduced
c) Cu_2S is the oxidant d) Only Cu_2O is reduced

241. H_2O_2 can act as :
a) Oxidizing agent b) Reducing agent c) Bleaching agent d) None of these

242. Which of the following reaction is/are wrong?
$MeCH_2I \xrightarrow{AgNO_2} MeCH_2NO_2 \xrightarrow{HNO_2}$
a) 
$Me_2CHI \xrightarrow{AgNO_2} Me_2CH\,NO_2 \xrightarrow{HNO_2}$
b) 
c) 
d) 

243. Consider of the following represent redox reactions?
a) $Cr_2O_7^{2-} + 2\overset{\ominus}{O}H \longrightarrow 2CrO_4^{2-} + H_2O$ b) $SO_3^{2-} + H_2O + I_2 \longrightarrow SO_4^{2-} + 2I^{\ominus} + 2H^{\oplus}$
c) $Ca(OH)_2 + Cl_2 \longrightarrow Ca(OCl)_2 + CaCl_2$ d) $PCl_5 \longrightarrow PCl_3 + Cl_2$

244. Which of the following can reduce Benedict's solution?
a) Ethanoic acid b) Methanoic acid c) Phenyl methanal d) Methanal

245. Which can undergo disproportionation?
a) Br_2 b) Cu^+ c) Cl_2 d) None of these

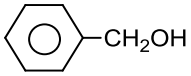
246. Which one are not correct about the reaction?
$FeS_2 + O_2 \longrightarrow Fe_2O_3 + SO_2$
a) Eq. weight of $FeS_2 = M/11$
b) Eq. wt. of $SO_2 = M/5$
c) 1 mole of FeS_2 requires 7/4 mole of O_2
d) S has -2 oxidation state in FeS_2

247. Which of the following reactions is/are not oxidation reduction?
a) $H^+ + OH^- \longrightarrow H_2O$
b) $\frac{1}{2}H_2 + \frac{1}{2}Cl_2 \longrightarrow HCl$

c) $CaCO_3 \longrightarrow CaO + CO_2$
d) $2H_2O_2 \longrightarrow 2H_2O + O_2$

248. Thermal decomposition of $(NH_4)_2Cr_2O_7$ involves :
a) Oxidation of N
b) Reduction of Cr
c) Disproportionation
d) Intramolecular redox process

249. Which of the following represent redox reactions?
a) $Cr_2O_7^{2-} + 2OH^- \longrightarrow CrO_4^{2-} + H_2O$
b) $2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$
c) $Ca(OH)_2 + Cl_2 \longrightarrow Ca(ClO)_2 + CaCl_2$
d) $PCl_5 \longrightarrow PCl_3 + Cl_2$

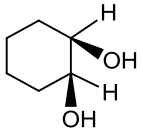
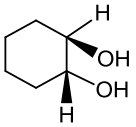
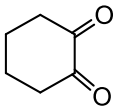
250. Which of the following compounds reacts with $NaCNBH_3$?
a) $Me - CH \equiv NH$ b) $Me_2C = N - Me$ c)  d) $PhNO_2$

251. Consider the redox reaction
$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^{\ominus}$
a) $S_2O_3^{2-}$ gets reduced to $S_4O_6^{2-}$ b) $S_2O_3^{2-}$ gets reduced to $S_4O_6^{2-}$
c) I_2 gets reduced to $I^{\ominus}$ d) I_2 gets reduced to $I^{\ominus}$

252. The reaction;
$H_3PO_4 + Ca(OH)_2 \longrightarrow Ca(HPO_4)_2 + 2H_2O$
Which statement(s) is/are true?
a) Equivalent weight of H_3PO_4 is 49
b) For complete neutralization 3/2 mole of $Ca(OH)_2$ are needed
c) Resulting mixture is neutralized by 1 mole of KOH
d) Equivalent weight of H_3PO_4 is 98

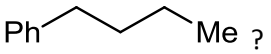
253. In $N_2 + 2H_2O \longrightarrow NH_4^+ + NO_2^-$, N is :
a) Oxidized b) Reduced c) Hydrated d) Disproportionate

254. Which molecules represented the bold atoms are in their lowest oxidation state?
a) $F_2\mathbf{O}$ b) $H_2\mathbf{S}$ c) $\mathbf{P}H_3$ d) $\mathbf{N}_2H_4$

255. Which of the following will undergo periodic oxidation?
a)  b)  c)  d) Glyxal

256. Methanamide is reduced to methanamine with:
a) LAH b) $NaBH_4$ c) $H_2 + Ni$ d) B_2H_6

257. The oxidation reaction(s) is/are :
a) $Sn^{2+} \longrightarrow Sn^{4+}$ b) $Fe^{3+} \longrightarrow Fe^{2+}$ c) $Pb^{2+} \longrightarrow Pb$ d) $F^- \longrightarrow F$

258. Which of the following methods is/are correct for the synthesis of  ?
a) $PhBr \xrightarrow[(4)Zn-Hg/HCl]{(1)Li\ (2)CuI\ (3)PrCOCl}$ b) $PhCOPr \xrightarrow{Zn-Hg/HCl}$
c) $PhCOPr \xrightarrow[\ominus\ OH,\Delta]{NH_2NH_2}$ d) $PhCOPr \xrightarrow[(ii)\ Raney\ Ni + H_2]{(i)\ \text{  }}$

259. An oxidizing agent is a substance which :
a) Gains electron
b) Gets reduced during the reaction
c) Undergoes decrease in oxidation number
d) None of the above

260. A reducing agent is a substance which :
   a) Donate electron
   b) Gets oxidized during the reaction
   c) Undergoes increase in oxidation number
   d) None of the above

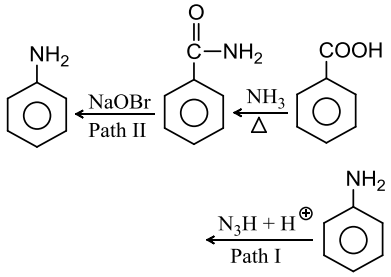
261. Which of the following statements is/are correct about $CH_2 = CCl_2$
   a) Both carbons are in $+2$ oxidation state
   b) Both carbons are in -2 oxidation state
   c) The first carbon has $+2$ and the second has -2 oxidation states
   d) The average oxidation number of carbon is zero

262. Acetonitrile $Me\overset{\oplus}{N}\equiv\overset{\ominus}{C}$ on reaction with $Cl_2$with DMSO gives methyl isocyanate ($MeN = C = O$). Isocyanides can also be oxidised to alkyl isocyanates with:
   a) HgO b) Hg_2O c) Ag_2O d) O_3

263. $H_2C_2O_4$ acts as an acid as well as an oxidizing agent. The correct statement (s) about $H_2C_2O_4$ is/are :
   a) It forms two series of salts
   b) Equivalent weight of $H_2C_2O_4$ as an acid for complete neutralization and as oxidant are same
   c) 100 mL of 0.1 N solution of $Ca(OH)_2$ will be completely neutralized by 50 mL of 0.2 M $H_2C_2O_4$
   d) 100 mL of 0.1 M solution of $KMnO_4$ (acid) will be completely reduced by 50 mL of 1 M $H_2C_2O_4$

264. Chlorine is the -1 oxidation state in :
   a) HCl b) $HClO_4$ c) ICl d) Cl_2O

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



   a) Path I is Claisen-Schmidt rearrangement reaction, whereas Path II is Hofmann bromamide rearrangement reaction
   Both paths proceeds *via* the formation of acyl nitrene as an intermediate species
   b) $(R-\overset{\overset{O}{\|}}{C}-\ddot{N}:)$
   c) In Path I and Path II the intermediate compound formed is alkyl isocynate ($R - N = C = O$)
   d) Both the paths proceed *via* the formation of nitrene $(R-\ddot{N}:)$ as a intermediate species

266. In the context of the reaction, $4Fe + 3O_2 \longrightarrow 4Fe^{3+} + 6O^{2-}$; which of the following statements is/are correct?
   a) It is a redox reaction
   b) Fe(s) is a reducing agent
   c) $Fe^{3+}(aq)$ is an oxidizing agent
   d) Fe(s) is reduced to $Fe^{3+}(aq)$

267. Which of the following will give yellow precipitate with KOI?
   a) Cyclopentyl methyl carbinol b) α-Phenyl ethanol
   c) AAE d) $I_3C - CHO$

268. Which statement(s) about oxidation number is/are correct?
   a) The oxidation number is the no. of electrons lost (+ve) or gained (−ve) by an atom for the ionic compounds
   b) For covalent compound, the oxidation number is indicated by the charge that an atom of element would have acquired if the substance would have been ionic

c) Oxidation number may have integer or fractional values

d) None of the above

269. Which of the following statements about tailing of Hg is/are correct?

a) It is due Hg_2O b) It is due to HgO c) It is removed byH_2O_2 d) It is removed by O_3

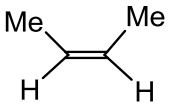
270. The metal oxide which decomposes on heating :

a) ZnO b) HgO c) Al_2O_3 d) Ag_2O

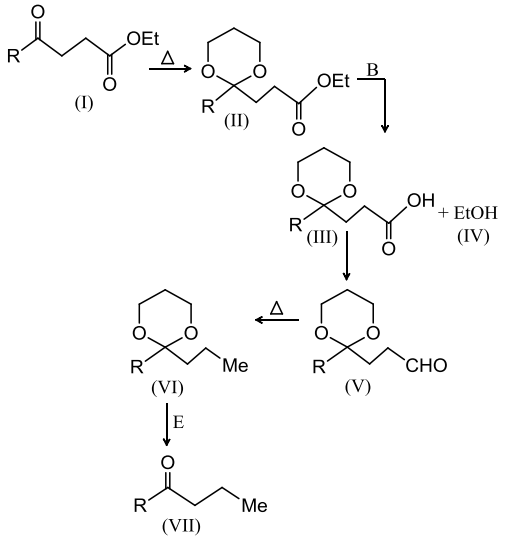
271. The eq. wt. of $Na_2S_2O_3$ in the reaction, $Na_2S_2O_3 + 5H_2O + 4Cl_2 \longrightarrow 2NaHSO_4 + 8HCl$ is/are :

a) $M/1$ b) $M/2$ c) $M/4$ d) $3M/8$

272. Which of the following compounds do(es)not react with $H_2 + Pd + C$?

a) $Me-\equiv -Me$ b)  c) MeCOMe d) $Me - N_3$

273. Consider the followings reactions



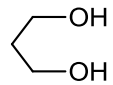
Which of the followings reagents is/are used in the above conversion?

A $\Rightarrow$ 

a) B $\Rightarrow$ LAH/ether, $H_3O^{\oplus}$

C $\Rightarrow$ PCC, D $\Rightarrow$ $NH_2.NH_2/\overset{\ominus}{O}H$,

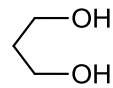
E $\Rightarrow$ $H_3O^{\oplus}$

A $\Rightarrow$ 

b) B $\Rightarrow$ $NaBH_4$/ether, $H_3O^{\oplus}$,

C $\Rightarrow$ H_2CrO_4/aq.acetone,

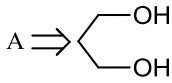
D $\Rightarrow$ Zn - Hg/HCl, E $\Rightarrow$ $H_3O^{\oplus}$

A $\Rightarrow$ 

c) B $\Rightarrow$ LAH/ether, $H_3O^{\oplus}$

C $\Rightarrow$ PCC, D $\Rightarrow$ Zn - Hg/HCl,

E $\Rightarrow$ $H_3O^{\oplus}$

d) 

,

B $\Rightarrow B_2H_6$/THF, C $\Rightarrow H_2CrO_4$/aq.acetone,

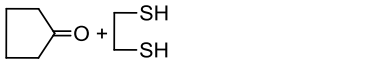
D $\Rightarrow$ PhNHNH$_2$/glycol + KOH, E $\Rightarrow H_3O^{\oplus}$

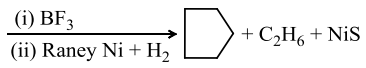
274. 0.1 mole of MnO_4^- in acidic medium can oxidise :
a) 0.5 mole of Fe^{2+} b) 0.166 mole of FeC_2O_4 c) 0.25 mole of $C_2O_4^{2-}$ d) 0.60 mole of $Cr_2O_7^{2-}$

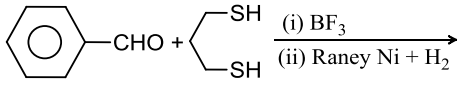
275. In the reaction; $3Br_2 + 6CO_3^{2-} + 3H_2O \longrightarrow 5Br^- + BrO_3^- + 6HCO_3^+$;
a) Bromine is oxidized and carbonate is reduced
b) Bromine is oxidized
c) Bromine is reduced
d) It is disproportionation reaction or auto redox change

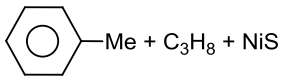
276. Which of the following statements about the reaction is/are correct?
$HgS + HCl + HNO_3 \longrightarrow H_2HgCl_4 + NO + S + H_2O$
a) Hg is reduced b) Sulphide is oxidised c) N is reduced d) $HNO_3$is an oxidant

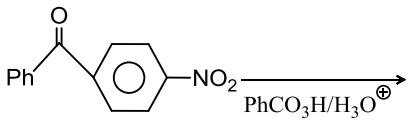
277. Which of the following can be used both as an oxidant and a reductant?
a) HNO_2 b) SO_2 c) O_2 d) CO

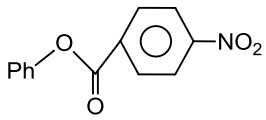
278. Which of the following reactions is/are correct?
a) 

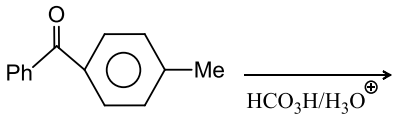


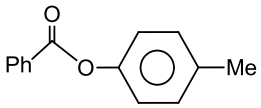
b) 



c) 



d) 



279. In which of the following sulphur has the highest oxidation state?
a) SO_2 b) SO_3 c) H_2SO_4 d) $H_2S_2O_8$

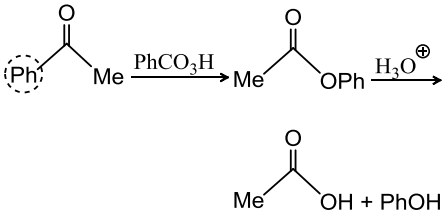
280. Which of the following compounds acts both as an oxidizing as well as a reducing agent?
a) HNO_2 b) H_2O_2 c) H_2S d) SO_2

281. Which of the following statement is/are correct about formic acid?
a) It reduces Tollens reagent
b) It gives CO and H_2O on heating with conc. H_2SO_4
c) It is a stronger acid than benzoic acid
d) It forms formyl chloride with PCl_5

282. White P reacts with caustic soda, the products are PH_3 and NaH_2PO_2. This reaction is an example of :

a) Oxidation-reduction b) Disproportionation c) Auto redox d) Neutralization

283. Consider the following Baeyer-Villiger oxidation



Which statement(s) is/are correct?

a) EWG in peracid facilitates the reaction

b) Strong $\overline{e}$-donating group migrates

c) The migrating group order is3° alkyl >Phenyl > H>2°alkyl >1° alkyl >Me

d) The migrating group order of substituted phenyl group is p-Anisyl>p- Tolyl>Ph>p-Chloro phenyl>p-Nitro phenyl

284. Which represents disproportionation?

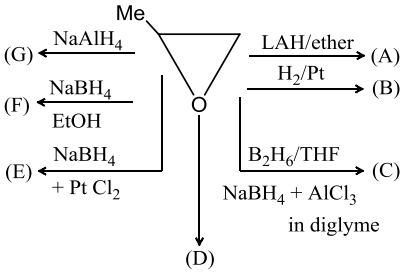
a) $2Cu^{+} \longrightarrow Cu^{2+} + Cu$

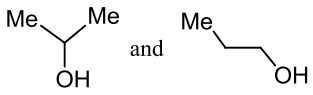
b) $3I_2 \longrightarrow 5I^{-} + I^{5+}$

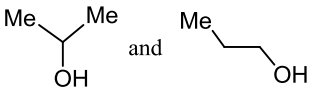
c) $Cu^{2+} + Zn \longrightarrow Zn^{2+} + Cu$

d) $(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$

285. Which statement(s) is/are correct about the reaction:



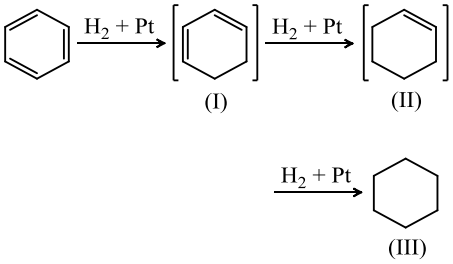
a) The products in (A),(B),(C) and (D) are 

b) The products in (E),(F) and (G) are 

c) No reaction takes place in (A),(B),(C) and (D)

d) No reaction takes place in (E),(F), and (G)

286. Which statement(s) is/are correct:



a) The intermediates I and II can be isolated

b) The intermediates I and II, all the resonance energy has been lost and the activation energy of this step is much greater than that required for each succeeding step in which the double bond behaves like their acylic analogue

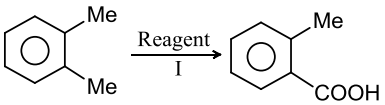
c) The conditions required for the formation of I and II are more vigorous than those required for the successive steps

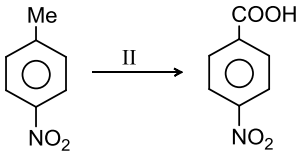
d) Because of this, it is not possible to stop the reaction proceeding to complete the reduction of benzene to III (cyclohexane), and consequently it is not possible to isolate the intermediates II and III

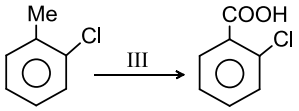
287. Reduction of the metal centre in aqueous permanganate ion involves :

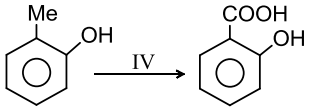
a) 3 electrons in neutral medium
b) 5 electrons in neutral medium
c) 3 electrons in alkaline medium
d) 5 electrons in acidic medium

288. Select the correct group(s) of reagent(s) used in the following conversions









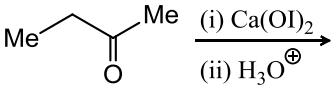
a) $\text{I} \Rightarrow \text{dil. } HNO_3,\ \text{II} \Rightarrow KMnO_4, H^{\oplus},$
$\text{III} \Rightarrow KMnO_4/NaOH,\ \text{IV} \Rightarrow PbO_4/\overset{\ominus}{O}H,\ H_3O^{\oplus}$

b) $\text{I} \Rightarrow \text{dil. } HNO_3,\ \text{II} \Rightarrow KMnO_4/H^{\oplus},$
$\text{III} \Rightarrow KMnO_4/NaOH,$
$\text{IV} \Rightarrow TsCl + \text{acidic } KMnO_4/H_2O$

c) $\text{I} \Rightarrow KMnO_4/NaOH,\ \text{II} \Rightarrow Na_2Cr_2O_7/H^{\oplus},$
$\text{III} \Rightarrow KMnO_4/\overset{\ominus}{O}H,\ \text{IV} \Rightarrow \text{dil. } HNO_3$

d) $\text{I} \Rightarrow CrO_3/MeCOOH,\ \text{II} \Rightarrow KMnO_4/\overset{\ominus}{O}H,$
$\text{III} \Rightarrow KMnO_4/OH^{\oplus},\ \text{IV} \Rightarrow \text{dil. } HNO_3$

289. Which of the following methods can be used to prepare propanoic acid?

a) 

b) $CH_2 = CH_2 + CO + H_2O \xrightarrow[570-670\ K]{\text{High pressure}}$
(Steam)

c) Reaction of EtMgBr with dry ice followed by the acidification with dil.HCl
d) Sodium ethoxide is heated with CO under pressure followed by the acidification with dil.HCl

290. Which of the following statements is/are correct?
a) The oxidation states of N in NH_3, HN_3,and N_2H_4 are $-3, -1/3$, and -2, respectively
b) The oxidation states of N in NO_2,N_2O_4,and $NO_2^{\ominus}$ are $+4$,$+4$, and $+3$, respectively
c) The oxidation states of N in NH_2OH, NO, and HNO_3 are -1,$+2$, and $+5$, respectively
d) The oxidation states of N in N_2O and HCN are $+1$ and -3, respectively

291. Which of the following is/are redox reaction(s)?
a) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$
b) $2BaO + O_2 \longrightarrow 2BaO_2$
c) $2KClO_3 \longrightarrow 2KCl + 3O_2$
d) $SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$

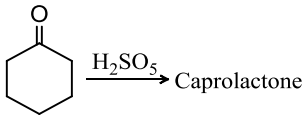
292. In the reaction, $Cu(s) + 2Ag + (aq) \longrightarrow Cu^{2+}(aq) + 2Ag(s)$:
a) Cu is oxidized to Cu^{2+}

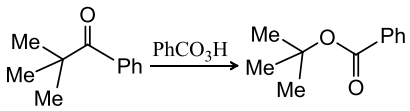
b) $Cu(s)$ is reduced to $Cu^{2+}(aq)$
c) Both $Cu(s)$ and $Ag^{+}(aq)$ are oxidized
d) $Ag^{+}(aq)$ is reduced to $Ag(s)$

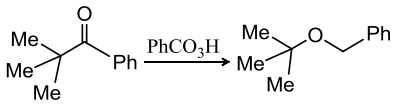
293. Which of the following compounds can be oxidized further with a strong oxidizing agent?
a) CrO_3 b) Al_2O_3 c) SO_2 d) MnO_3

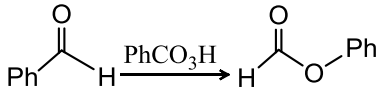
294. The oxidation number of Cr is $+6$ in
a) $FeCr_2O_4$ b) $KCrO_3Cl$ c) CrO_5 d) $[Cr(OH)_4]^{\ominus}$

295. Which represent redox reactions?
a) $Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$
b) $2CrO_4^{2-} + 2H^- \longrightarrow Cr_2O_7^{2-} + H_2O$
c) $2Cu^+ \longrightarrow Cu + Cu^{2+}$
d) $MnO_4^- + Mn^{2+} + OH^- \longrightarrow MnO_2 + H_2O$

296. Select the correct Baeyer- Villiger oxidation reaction:
a) 

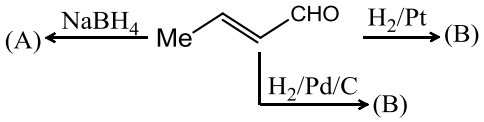
b) 

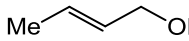
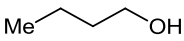
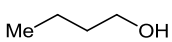
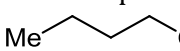
c) 

d) 

297. Which of the following statements is/are correct?
In the reaction $xCu_3P + yCr_2O_7^{2-} \longrightarrow Cu^{2+} + H_3PO_4 + Cr^{3+}$
a) Cu in Cu_3P is oxidized to Cu^{2+}whereas P in Cu_3P is also oxidized to PO_4^{3-}
b) Cu in Cu_3P is oxidized to Cu^{2+} whereas P in Cu_3P is reduced to H_3PO_4
c) In the conversion of Cu_3P to$Cu^{2+}$and H_3PO_4, 11 electrons are involved
d) The value of x is 6

298. Which of the following is/are correct in case of Mohr's salt?
a) It decolourises $KMnO_4$
b) It is primary standard titrant
c) It is a double salt
d) Oxidation state of Fe is $+3$ in the salt

299. 

Which statement(s) is/are correct?
a) The compounds (A) and (B) are  and respectively
b) The compounds (A) and (B)are  and respectively
c) The compounds (B) and (C)are  and respectively
d) Both compounds (B) and (C) are 

300. Quantitative estimation of Fe^{2+} can be made by $KMnO_4$ in acidified medium. In which medium it can be estimated by $KMnO_4$?
a) In H_2SO_4 b) In HNO_3 c) In HCl d) All of these

301. A mixture of $Na_2C_2O_4$ and $H_2C_2O_4$ requires 100 mL of 0.1 M $KMnO_4$ for complete neutralization. The same mixture on neutralization by a base requires 50 mL of 0.2 M NaOH solution. Which one are correct :
a) Mole ratio of $Na_2C_2O_4$ and $H_2C_2O_4 = 4 : 1$

b) Equivalent ration of $Na_2C_2O_4$ and $H_2C_2O_4 = 4:1$

c) Mole of $C_2O_4^{2-}$ in mixture $= 25 \times 10^{-3}$

d) Mole ratio of $Na_2C_2O_4$ and $H_2C_2O_4 = 1:4$

302. In the reaction

$$I_2 + C_2H_5OH + \overset{\ominus}{O}H \longrightarrow CHI_3 + HCOO^{\ominus} + H_2O + I^{\ominus}$$

Which of the following statements is/are correct?

a) The coefficients of $\overset{\ominus}{O}H$ and $I^{\ominus}$ in the given balanced equation are, respectively, 6 and 5

b) The coefficients of $\overset{\ominus}{O}H$ and $I^{\ominus}$ in the given balanced equation are, respectively, 5 and 6

c) C_2H_5OH is oxidized to $CHI_3$and $HCOO^{\ominus}$

d) The number of electrons in the conversion of C_2H_5OH to $CHI_3$and $HCOO^{\ominus}$ is 8

303. Which of the following on oxidation with alkaline $KMnO_4$followed by acidification with dil. HCl gives terephthalic acid?

a) *p*-Ethyl toluene

b) *p*-Xylene

c) 1,3-Diisopropyl benzene

d) *m*-Xylene

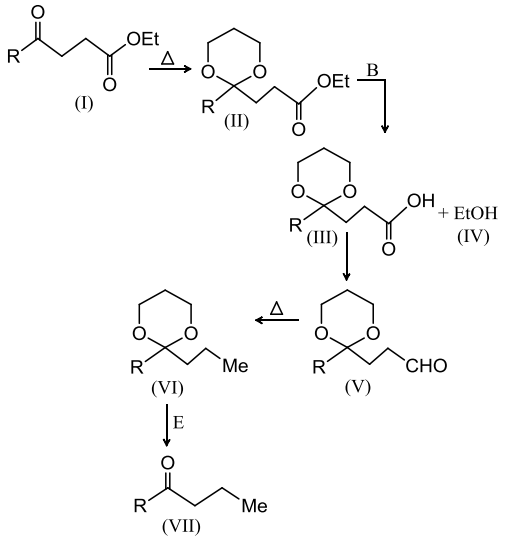
304. The equilibrium $2Cu^{I} \rightleftharpoons Cu^{0} + Cu^{II}$ in aqueous medium at 25°C shifts towards the left in the presence of :

a) NO_3^- b) Cl^- c) SCN^- d) CN^-

305. The oxidation number(s) of two Cl atoms in bleaching powder $CaOCl_2$ is/are :

a) -1 b) $+1$ c) -2 d) $+2$

306. Consider the followings reactions



direct conversion of II to V can be carried by:

a) $NaAlH_4$

b) DIBAL $-$ H

c) LAH $+ AlCl_3$

d) $NaBH_4 + AlCl_3$in diglyme

307. Equivalent weight of Mn is $M/2$ in the change :

a) $Mn^{7+} \longrightarrow Mn^{4+}$ b) $Mn^{6+} \longrightarrow Mn^{4+}$ c) $Mn^{4+} \longrightarrow Mn^{2+}$ d) $Mn^{3+} \longrightarrow Mn^{2+}$

308. Which of the following is/are disporportionation reactions?

a) $2O_3 \longrightarrow 3O_2$ b) $4KClO_3 \longrightarrow 3KClO_4 + KCl$

c) $2H_2O_2 \longrightarrow 2H_2O + O_2$ d) $2KO_2 + 2H_2O \longrightarrow 4KH + 3O_2$

309. Alkyl isocyanides $(R\overset{\oplus}{N}\equiv\overset{\ominus}{C})$ are reduced to 2°amines $(R - NH - CH_3)$with:

a) LAH b) $NaBH_4$ c) HI + P d) H_2 + Pt

310. In the reaction, $NaH + H_2O \longrightarrow NaOH + H_2$:

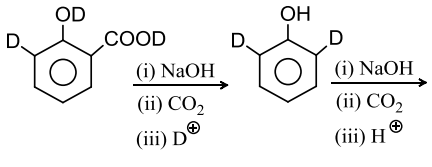
a) H^- is oxidized b) H^+ is reduced c) Both NaH and H_2O are reduced d) None of the above

311. The reaction, $KI + I_2 \longrightarrow KI_3$:
a) Oxidation b) Reduction c) Complex formation d) None of these

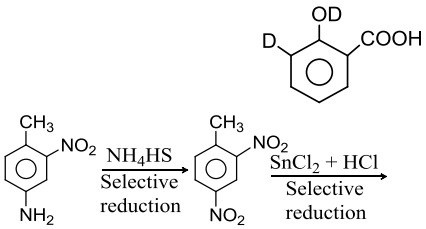
312. 25 mL of 0.50 M H_2O_2 solution is added to 50 mL of 0.20 M $KMnO_4$ in acid solution. Which two of the following statements are true?
a) 0.010 mole of oxygen is liberated
b) 0.005 mole of $KMnO_4$ does not react with H_2O_2
c) 0.0125 g-mol of oxygen gas is evolved
d) In the final solution there are only water molecules and Mn^{2+} ions

313. Which of the following reactions is/are correct?

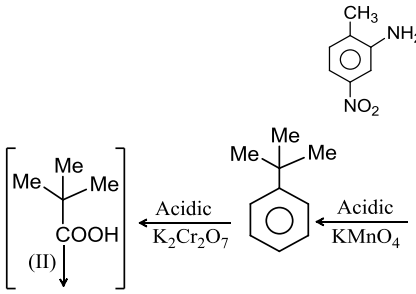
a)



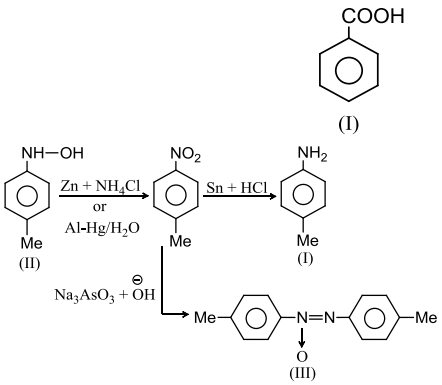
b)

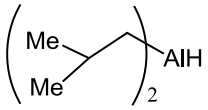


c) MeCOOH (III)



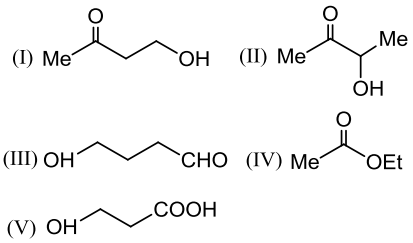
d)



314. Which of the following methods is/are correct for the synthesis of benzaldehyde?
a) $PhCOCl \xrightarrow{H_2+Pd+BaSO_4}$
b) $PhCOCl \xrightarrow[LiAlH(OCMe_3)_3]{}$
c) $PhC{\equiv}N \longrightarrow$ 

d) $PhCH_2OH \xrightarrow[\text{Collins ragent}]{}$

315. Compound $C_4H_8O_2$ exists in various structures as shown:



Which statement(s) is/are correct?

a) Compounds I and II give iodoform test.Compound I gives white turbidity on heating with Lucas reagent, while compound II reduces Tollens reagent

b) Compound III gives silver mirror with$[(Ag(NH_3)_2]^{\oplus}$ and does not react with NaOBr

c) Compound IV on acid hydrolysis gives C_2H_5COOH and MeOH

d) Compound V on heating is decarboxylated to propane

316. For the reaction $KO_2 + H_2O + CO_2 \longrightarrow KHCO_3 + O_2$, the mechanism of reaction suggest

a) Acid-base reaction b) Disproportionation reaction

c) Hydrolysis d) Redox change

317. Which molecules represented by the bold atoms are in their highest oxidation state?

a) $H_2\mathbf{S_2}O_8$ b) $\mathbf{P_4}O_{10}$ c) $\mathbf{F_2}O$ d) $\mathbf{Mn_2}O_7$

318. Which of the following is/are autoredox reactions?

a) $P_4 + \overset{\ominus}{O}H \longrightarrow H_2PO_2^{\ominus} + PH_3$ b) $S_2O_3^{2-} \longrightarrow SO_4^{2-} + S$

c) $H_2O_2 \longrightarrow H_2O + O_2$ d) $AgCl + NH_3 \longrightarrow [Ag(NH_3)_2]Cl$

319. Benzoic acid and carbolic acid can be distinguished By:

a) Aqueous $NaHCO_3$ b) Neutral$FeCl_3$ c) Aqueous NaOH d) Aqueous NH_3

320. Which is/are disproportionation reaction(s)?

a) $2RCHO \xrightarrow{Al(OEt)_3} RCOOCH_2R$

b) $4H_3PO_3 \xrightarrow{\Delta} 3H_3PO_4PH_3$

c) $PCl_5 \rightarrow PCl_3 + Cl_2$

d) $RCHO \xrightarrow{KOH} RCOOK + RCH_2OH$

Assertion - Reasoning Type

This section contain(s) 0 questions numbered 321 to 320. 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

321

Statement 1: The redox titrations in which liberated I_2 is used as oxidant are called as iodometric titrations.

Statement 2: Addition of KI of $CuSO_4$ liberates I_2 which is estimated against hypo solution.

322

Statement 1: Oxidation number of Ni in is zero.

Statement 2: Nickel is bonded to neutral ligand carbonyl.

323

Statement 1: If a strong acid is added to a solution of potassium chromate it changes its colour from yellow to orange.

Statement 2: The colour change is due to the oxidation of potassium chromate.

324

Statement 1: Change in colour of acidic solution of potassium dichromate by breath is used to test drunk drivers.

Statement 2: Change in colour is due to the complexation of alcohol with potassium dichromate.

325

Statement 1: Diisopropyl ketone on reaction with isopropyl magnesium bromide followed by hydrolysis gives 2° alcohol

Statement 2: Grignard reagent acts as a reducing agent

326

Statement 1: Iodimetric titration are redox titrations.

Statement 2: The iodine solution acts as an oxidant to reduce the reductant.
$I_2 + 2e \longrightarrow 2I^-$

327

Statement 1: The equivalence point refers the condition where equivalents of one species react with same number of equivalent of other species.

Statement 2: The end point of titration is exactly equal to equivalence point.

328

Statement 1: The two Fe atoms in Fe_3O_4 have different oxidation numbers

Statement 2: Fe^{2+} ions decolourise $KMnO_4$ solution

329

Statement 1: The reaction between NH_3 and $MnO_4^{\ominus}$ occurs in an acidic medium
$NH_3 + MnO_4^{\ominus} \longrightarrow MnO_2 + NO_2$

Statement 2: $MnO_4^{\ominus}$ is reduced to MnO_2 in acidic medium

330

Statement 1: In the process of drying dishes with a towel, the wetting agent is the dish and the drying agent is the towel

Statement 2: The wetting agent gets wet during the process

331

Statement 1: In aqueous solution,SO_2 reacts with H_2S liberating sulphur

Statement 2: SO_2 is an effective reducing agent

332

Statement 1: The equivalent weight of $KMnO_4$ when it is converted to K_2MnO_4 is equal to its molecular weight.

Statement 2: $Mn^{7+} + e \longrightarrow Mn^{6+}$ $\therefore E = \frac{M}{1}$

333

Statement 1: $KMnO_4$ is strong oxidant whereas Mn^{2+} is weaker reductant .

Statement 2: Stronger is the oxidant weaker is its conjugate reductant.

334

Statement 1: Sodium perxenate(Na_4XeO_6) reacts with NaF in acidic medium to give XeO_3 and F_2

Statement 2: XeO_6^{4-} is a stronger oxidant than F_2

335

Statement 1: SO_2 can be used as reductant as well as oxidant.

Statement 2: The oxidation number of S is $+4$ in SO_2 which lies in between its minimum (-2) and maximum $(+6)$ values.

336

Statement 1: Sn reacts with HCl to produce H_2 gas

Statement 2: Sn is a better reducing agent than H_2

337

Statement 1: F_2 undergoes disproportionation reaction

Statement 2: Fluorine shows both positive and negative oxidation states

338

Statement 1: Acryaldehyde ($CH_2 = CH - CHO$)is oxidized to acrylic acid($CH_2 == CH - COOH$) by Benedict's solution

Statement 2: Benedict's solution is ammoniacal $CuSO_4$ solution containing sodium potassium tartarate

339

Statement 1: O_3 can act as an oxidizing agent as well as a reducing agent, but SO_2 can act only as an oxidant

Statement 2: The oxidation number of O in O_3 is zero, and the oxidation number of S in SO_2 is $+4$

340

Statement 1: $2H_2O_2 \longrightarrow 2H_2O + O_2$ is a auto redox change.

Statement 2: One oxygen atom is oxidised and one oxygen atom is reduced.

341

Statement 1: Both oxygen atom in O_2 or O_3 has an oxidation number of -2.

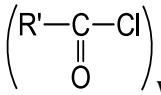
Statement 2: Oxygen is assigned an oxidation number -2 in almost all their compounds.

342

Statement 1: Oxidation number of metals in metal carbonyls is zero.

Statement 2: The oxidation number of CO has been taken to be zero.

343

Statement 1: The reaction of  with (R_2Cd)or with (R_2CuLi) gives a ketone but with (RMgX) gives a 3° alcohol ($R_2R'COH$)

Statement 2: ($C-Mg$) bond has more ionic character than ($C-Cu$) or ($C-Cd$)bond and (R) group in Grignard reagent more like $R^{\ominus}$ and is much more reactive for nucleophilic addition reaction

344

Statement 1: *tert*- Butylbenzene on oxidation does not give benzoic acid on oxidation with acidic $KMnO_4$

Statement 2: Due to the absence of benzylic hydrogen

345

Statement 1: Starch is generally used as absorption indicator in iodometric or iodimetric titrations.

Statement 2: Starch imparts blue colour with iodine.

346

Statement 1: HNO_3 acts only as an oxidizing agents, while HNO_2 acts both as an oxidizing agent and a reducing agent

Statement 2: The oxidation number of N in HNO_3 is maximum

347

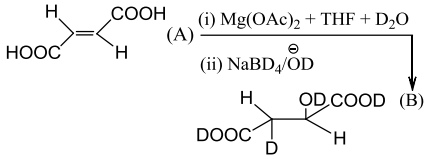
Statement 1: N atom has two different oxidation states in NH_4NO_2.

Statement 2: One N atom has –ve oxidation number as it is attached with less electronegative H atom and other has +ve oxidation number as it is attached with more electronegative atom.

348

Statement 1: $PbCl_4$ is more stable than $PbCl_2$

Statement 2: $PbCl_4$is a powerful oxidizing agent

349 

Statement 1: The product (B) formed will be racemic mixture

Statement 2: The above reaction is oxymercuration and demercuration, and it proceeds *via* the addition of D_2O, according to Markovnikov's rule, and with anti-regiospecificity

350

Statement 1: The colour of $KMnO_4$ discharges slowly in the beginning by the oxalic acid but fastens after sometime.

Statement 2: The Mn^{2+} ion act as auto-catalyst for the reaction.

351

Statement 1: VO_2^+ and VO^{2+} both are called vanadyl ions.

Statement 2: VO_2^+ is dioxovanddium (V) ion and VO^{2+} is oxovanadium (IV) ion.

352

Statement 1: H_2O_2 acts only as an oxidizing agent

$H_2O_2 \longrightarrow H_2O + O$

Statement 2: All peroxides behave as oxidizing agents only

353

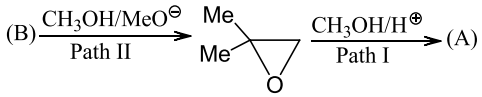
Statement 1: $KMnO_4$ is a stronger oxidising agent than $K_2Cr_2O_7$

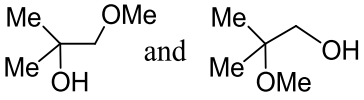
Statement 2: This is due to the increasing stability of the lower species to which they are reduced

354

Statement 1: The number of equivalent per mole of H_2S used in its oxidation to SO_2 is six.

Statement 2: $S^{2-} \longrightarrow S^{4+} + 6$ $\quad\quad$ $\therefore$ Equivalent = Mole $\times$ 6.

355 

Statement 1: The product (A) and (B) are 

respectively

Statement 2: Path I takes Place by SN^2 mechanism and Path II takes place by SN^1mechanism

356

Statement 1: Nitrous acid may acts as an oxidizing agent as well as reducing agnet.

Statement 2: The oxidation number of nitrogen remains same in all the compounds.

357

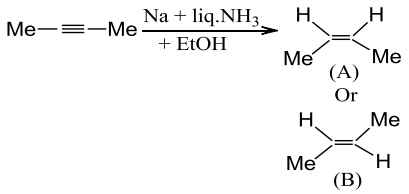
Statement 1: Oxidation state of H is $+1$ in CuH and -1 in CaH_2

Statement 2: Ca is strong electropositive metal.

358

Statement 1: Acetic acid does not undergo haloform reaction

Statement 2: Acetic acid has no alpha hydrogen

359 

Statement 1: The product formed is(B)

Statement 2: The reaction proceeds *via* the formation of the following species in the order: Radical anion→Vinylic anion →Vinylic radical → Product

360

Statement 1: $KMnO_4$ has different equivalent weights in acid, neutral or alkaline medium.

Statement 2: In different medium change in oxidation number shown by manganese is altogether different.

361

Statement 1: Oxygen atom in both O_2 and O_3 has oxidation number zero.

Statement 2: In F_2O, oxidation number of O is $+2$.

362

Statement 1: Bromide ion is serving as a reducing agent in a reaction.

Statement 2: Oxidation number of Br increases from -1 to5.

363

Statement 1: Oxidation number of Cu in CuH is -1.

Statement 2: Cu is placed below H in electrochemical series.

364

Statement 1: In the reaction : $3As_2S_3 + 28HNO_3 + 4H_2O \longrightarrow 6H_3AsO_4 + 9H_2SO_4 + 28$ NO electrons transferred are 84.

Statement 2: As is oxidation form $+3$ to$+5$ and sulphur form -2 to $+6$.

365

Statement 1: In acidic medium, equivalent weight of $K_2Cr_2O_7$ is 49.

Statement 2: $(Cr^{6+})_2 + 6e \longrightarrow 2Cr^{3+}$; Thus, $E = \frac{M}{6}$.

366

Statement 1: $KMnO_4$ acts as oxidant as well as self indicator in its titration with ferrous ammonium sulphate solution in acidic medium.

Statement 2: $KMnO_4$ reduced itself to Mn^{2+} ions and oxidises Fe^{2+} to Fe^{3+} as well as after redox reaction is complete, the $KMnO_4$ at the equivalence point imparts pink colour.

367

Statement 1: O_2 is a stronger reducing agent than F_2

Statement 2: F_2 is more electronegative

368

Statement 1: Schiff's reagent is a dilute solution of rosaniline hydrochloride in water whose magenta colour is discharged with aqueous SO_2 or H_2SO_3

Statement 2: Schiff's reagent oxidies benzaldehyde to benzoic acid

369

Statement 1: $Mg(s)+F_2(s)\rightarrow MgF_2(s)$: Magnesium loses electrons and acts as a reducing agnet.

Statement 2: Reduction in general means acceptance of electrons by a reactant.

370

Statement 1: Formic acid reduces 'Tollens regent'

Statement 2: Compounds containing $(-CHO)$ group reduse 'Tollens reagent'

371

Statement 1: A reaction between Fe and I_2 occurs, but a reaction between Fe^{2+} and $I^{\ominus}$ does not occur

Statement 2: Fe is a better reducing agent than $I^{\ominus}$

372

Statement 1: Reduction of 3-phenyl prop-2-en-1-al with LAH gives 3-phenyl prpan-1-ol

Statement 2: Both the double bond and the aldehyde group of α, β-unsaturated aldehydes are reduced by LAH

373

Statement 1: SO_2 and Cl_2 are both bleaching agents

Statement 2: Both are reducing agents

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**.

374. Match the reactions in column I with the molar ratio of their respective reductant and oxidant given in column II

Column-I		Column- II	
(A)	$Bi_2O_3 + ClO^{\ominus} + \overset{\ominus}{O}H \longrightarrow BiO_3^{\ominus} + Cl^{\ominus}$	(p)	4
(B)	$MnO_2 + PbO_2 + H^{\oplus} \longrightarrow MnO_4^{\ominus} + Pb^{2+}$	(q)	2
(C)	$TeO_3^{2-} + I^{\ominus} + H^{\oplus} \longrightarrow Te + I_2$	(r)	$\frac{1}{2}$
(D)	$[Fe(CN)_6]^{3-} + Cr_2O_3 + \overset{\ominus}{O}H \longrightarrow [Fe(CN)_6]^{4-} + CrO_4^{2-}$	(s)	$\frac{2}{5}$

(E) $CoCl_2 + Na_2O_2 + \overset{\ominus}{O}H \longrightarrow Co(OH)_3$ (t) $\frac{1}{6}$

CODES :

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

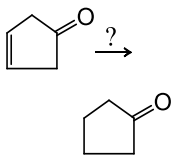
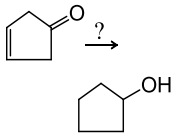
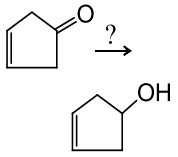
375.

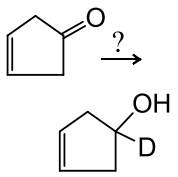
Column-I	Column- II
(A) $Bi_2S_3 \rightarrow Bi^{5+} + S$	(1) 6
(B) $FeS_2 \rightarrow Fe^{3+} + 2SO^2$	(2) 10
(C) $(NH_4)_2\ Cr_2O_7 \rightarrow N_2 + Cr_2O_3$	(3) 11
(D) $Al_2(Cr_2O_7)_3 \rightarrow Al^{3+} + Cr^{3+}$	(4) 18

CODES :

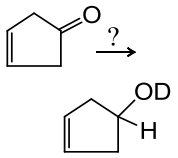
	A	B	C	D
a)	3	1	2	4
b)	2	3	1	4
c)	1	2	3	4
d)	3	4	1	2

376.

Column-I	Column- II
(A) 	(p) H_2 + Raney Ni
(B) 	(q) $NaBD_4 + H_2O$
(C) 	(r) 1 mol of H_2/Pd

(D) 

(s) $NaBH_4 + MeOH$

(E) 

(t) $NaBH_4 + D_2O$

CODES :

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

377.

Column-I	**Column- II**
(A) $Fe_3O_4 \rightarrow Fe_2O_3$	(1) 4/3
(B) $Fe_2O_3 \rightarrow Fe_3O_4$	(2) 2/3
(C) $P_2H_4 \rightarrow PH_3 + P_4H_2$	(3) 1
(D) $H_3PO_2 \rightarrow PH_3 + H_3PO_3$	(4) 5/3
(E) $I_2 \rightarrow I^- + IO_3^-$	(5) 6/5

CODES :

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

378. Match the reactions in column I with the coefficients x and y given in column II

Column-I	**Column- II**
(A) $x\text{Cu} + y\text{HNO}_3 \longrightarrow \text{Cu(NO}_3)_2 + \text{NO} + \text{NO}_2 + \text{H}_2\text{O}$	(p) 2 and 6
(B) $x\text{KI} + y\text{BaCrO}_4 \xrightarrow{\text{H}^\oplus} \text{I}_2 + \text{CrCl}_3$	(q) 6 and 2
(C) $x\text{As}_2\text{S}_3 + y\text{NO}_3^\ominus \longrightarrow \text{AsO}_4^{3-} + \text{NO} + \text{SO}_4^{2-}$	(r) 3 and 28

(D) $4P + 3\overset{\ominus}{O}H + 3H_2O \longrightarrow xPH_3 + yH_2PO_2^{\ominus}$ (s) 1 and 3

(E) $xKI + yH_2SO_4 \longrightarrow I_2 + H_2S + K_2SO_4$ (t) 8 and 5

CODES :

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

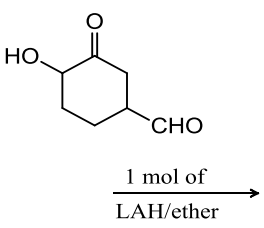
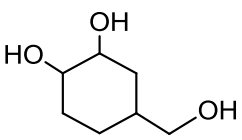
379. Match the reactions given in column I with their respective oxidant/reductant given in column II

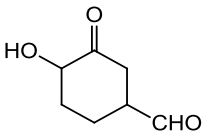
Column-I	Column- II
(A) $3I_2 + 6NaOH \longrightarrow NaIO_3 + 5NaI + 3H_2O$ (I_2 acts as)	(p) None act as oxidant or reductant
(B) $BaCl_2 + Na_2SO_4 \longrightarrow BaSO_4$and 2NaCl $BaCl_2$ acts as	(q) Reductant
(C) $AlCl_3 + 3Na \longrightarrow 3NaCl + AlAlCl_3$ acts as	(r) Both act as oxidant and reductant
(D) $SO_2 2H_2S \longrightarrow 3S + H_2O$ H_2S acts as	(s) Oxidant

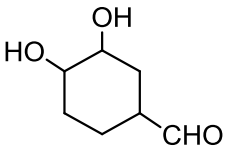
CODES :

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

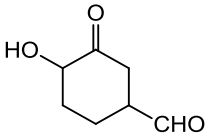
380.

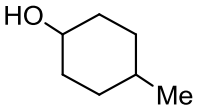
Column-I	Column- II
(A) 	(p) 

(B) 

(q) 

$NaBH_4/MeOH$

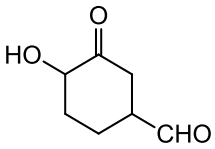
(C) 

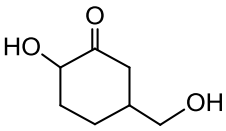
(r) 

(i) mol of 

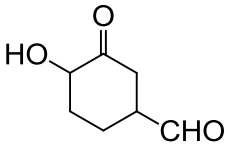
(ii) $NaBH_4/MeOH$

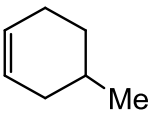
(iii) $H_3O^{\oplus}$

(D) 

(s) 

$Zn/Hg/HCl$

(E) 

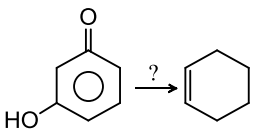
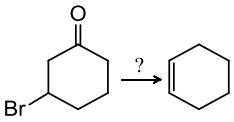
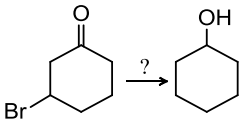
(t) 

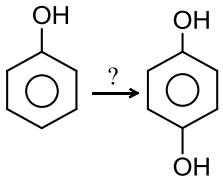
$PhNHNH_2$ + glycol + KOH

CODES :

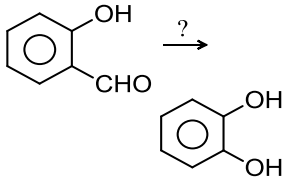
	A	B	C	D	E
a)	p	q	s	r	t
b)	s	p	q	t	t
c)	r	s	t	p	t
d)	t	r	p	q	t

381.

	Column-I	Column- II
(A)		(p) $PhNHNH_2 + glycol + \overset{\ominus}{O}H$
(B)		(q) $H_2O_2 + \overset{\ominus}{O}H/H_3O^{\oplus}$
(C)		(r) $Zn - Hg + HCl$

(D) 

(s) LAH+ ether

(E) 

(t) $K_2S_2O_8 + \overset{\ominus}{O}H/H_3O^{\oplus}$

CODES :

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

382. Match the reactions given in column I with the number of electrons lost or gained in column II

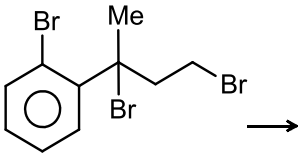
Column-I	**Column- II**
(A) $Mn(OH)2 + H_2O_2 \longrightarrow MnO_2$	(p) 8
(B) $AlCl_3 + 3K \longrightarrow Al + 3KCl$	(q) 2
(C) $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$	(r) 3
(D) $H_2S + NO_3^{\ominus} \longrightarrow S + NO$	(s) 6

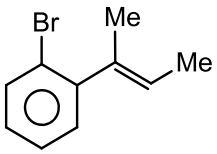
CODES :

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

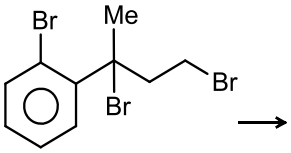
383.

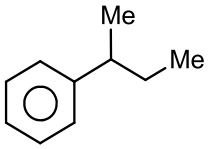
Column-I	**Column- II**

(A) 

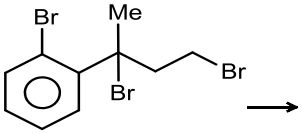


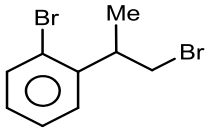
(p) $NaBH_4$ +Ethanol

(B) 

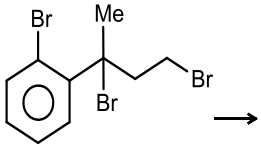


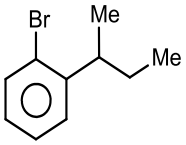
(q) Ph_3SnH

(C) 



(r) LAH +Ether

(D) 



(s) HI + Red P

(t) H_2 + Raney Ni

CODES :

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

384.

Column-I	**Column- II**
(A) Intermolecular redox change	(1) $CO_2 + C \longrightarrow 2CO$

(B) Intramolecular redox change

(C) Auto-redox change

(D) Precipitation

(2) $As_2O_3 + 3H_2S$

(3) $KClO_4 \longrightarrow KCl + 2O_2$

(4) $C_3O_2 \longrightarrow CO_2 + 2C$

CODES :

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

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. 385 to -385

This section contains five paragraphs. Based on each paragraph, $3-7$ multiple choice questions have to be answered.Each question has four choices (a), (b), (c), and (d), out of which only one is correct, except in the paragraph for problem $19-25$

Consider the following unbalanced redox reaction:

$H_2O + AX + BY \longrightarrow HA + OY + X_2B$

The oxidation number of X is -2,and neither X nor water is involved in the redox process

385. The element(s) undergoing oxidation is/are

a) A b) B c) Y d) B or Y or both

Paragraph for Question Nos. 386 to - 386

Oxidation reaction involves loss of electrons, and reduction reaction involves gain of electrons. The reaction in which a species disproportionate into two oxidation states (lower and higher) is called disproportionate reaction

386. Which of the following statements is wrong?

a) An acidified $K_2Cr_2O_7$ paper on being exposed to SO_2 turns green

b) Mercuric chloride and stannous chloride cannot exist as such

c) Iron turning on addition to $CuSO_4$ solution decolourises the blue colour

d) $[CuI_4]^{2-}$ is formed but $[CuCl_4]^{2-}$ is not

Paragraph for Question Nos. 387 to - 387

The valency of carbon is generally 4, but its oxidation state may be $-4, -2, 0, +2, -1$, etc. In the compounds containing C,H, and O, the oxidation number of C is calculated as

Oxidation number of C $= \frac{2n_O - n_H}{n_C}$

Where n_O, n_H, and $n_C$are the number of oxygen, hydrogen and carbon atoms , respectively

387. The oxidation state of C in diamond is

a) 0 b) +1 c) −1 d) +2

Paragraph for Question Nos. 388 to - 388

Redox equations are balanced either by ion-electron method or by oxidation number method. Both methods lead to the correct from of the balanced equation. The ion electron method has two advantages. So some chemists prefer to use the ion-electron method for redox reactions carried out in dilute aqueous solutions, where free ions have more or less independent existence
The oxidation state method for redox reactions is mostly used for solid chemicals or for reactions in concentrated acid media

388. For the reaction

$K_4[Fe(CN)_6] \rightarrow Fe^{3+} + CO_2 + NO_3^{\ominus}$

The n-factor is

a) 1 b) 11 c) $\frac{5}{3}$ d) 61

Paragraph for Question Nos. 389 to - 389

Certain materials such as turpentine oil, unsaturated organic compound, phosphorous, metals such as Zn, and Pb, etc., can absorb O_2 from air in the presence of H_2O which is converted toH_2O_2. This is called autoxidation. Intermolecular redox reactions are those in which one molecule is oxidized and the other atom is reduced.Intramolecular redox reactions are those in which one atom of a molecule is oxidized and the other atom is reduced

389. Which of the following reactions is/are intramolecular redox reaction(s)?

a) $2Mn_2O_7 \rightarrow 4MnO_2 + 3O_2$

b) $K_3[Fe(CN)_6] + 30H_2O \rightarrow Fe^{3+} + 6CO_2 + 6NO_3^{\ominus} + 60H^{\oplus} + 60e^-$

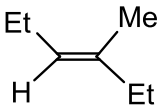
c) $2HgO \rightarrow 2Hg + O_2$

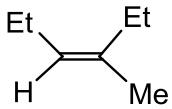
d) $PhCHO \xrightarrow{NaOH} PhCH_2OH + PhCOONa$

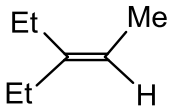
Paragraph for Question Nos. 390 to - 390

(A)$A(C_7H_{14}) \xrightarrow{O_3/Red} B(C_3H_6O) + C$
(B)Gives positive Tollens test but negative iodoform test
(C)Gives negative Tollens test but positive iodoform test

390. The compound (A) is:

a) 

b) 

c) 

d) Both (a) and (b)

Paragraph for Question Nos. 391 to - 391

(A) $(C_8H_{14}) \xrightarrow[\text{Acidic } KMnO_4]{[O]} (B) + (C) + (D)$

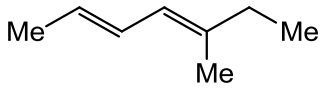
(A) Requires 2 mol of H_2 for its saturation

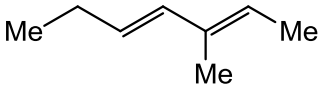
(B) Reduces ammoniacal $AgNO_3$ and gives yellow colour with $NaOH + I_2$

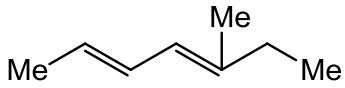
(C) does not reduce Tollens reagent but gives iodoform test

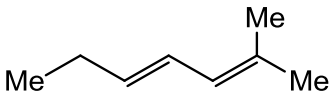
(D) On dehydration with conc. H_2SO_4 gives a mixture of colourless gases

391. The compound (A) is:

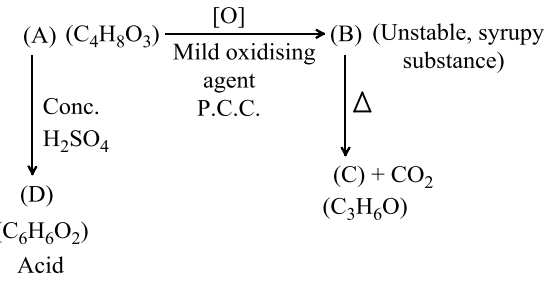
a) 

b) 

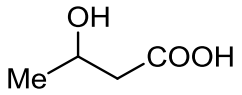
c) 

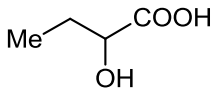
d) 

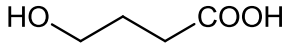
Paragraph for Question Nos. 392 to - 392

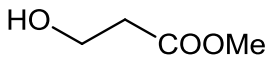


392. The compound (A) is:

a) 

b) 

c) 

d) 

Paragraph for Question Nos. 393 to - 393

(A) $(C_9H_{12}O) \xrightarrow[\text{Hot } KMnO_4]{[O]} PhCOOH$

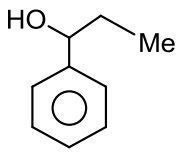
i. (A) does not decolourise Br_2 in CCl_4; reacts with Na to give a colourless and odourless gas (B)

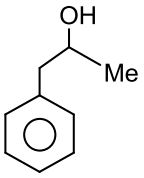
ii. (A) does not give iodoform test

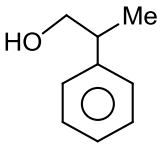
iii. (A) is a chiral compound and oxidation of (A) with CrO_3/Py gives a chiral compound (C)

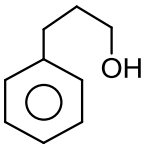
iv. The colour of $Cr_2O_7^{2-}$ changes to blue-green when added to compound (A)

393. The structure of compound (A) is:

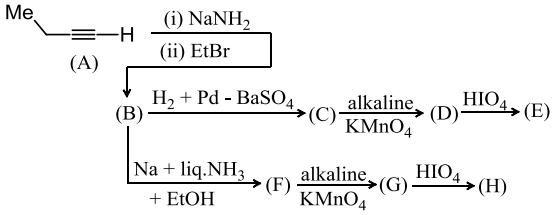
a) 

b) 

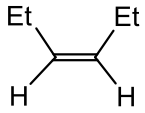
c) 

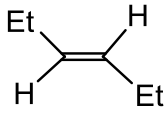
d) 

Paragraph for Question Nos. 394 to - 394



394. The compound (C) is:

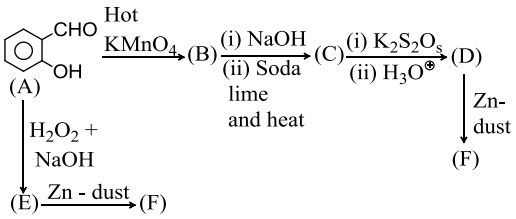
a) 

b) 

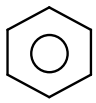
c) Et−≡ −Et

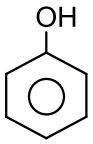
d) Both (a) and (b)

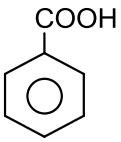
Paragraph for Question Nos. 395 to - 395

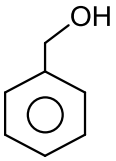


395. The compound (C) is:

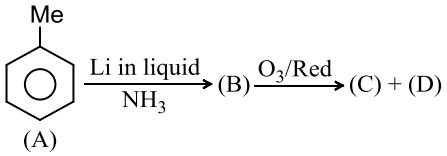
a) 

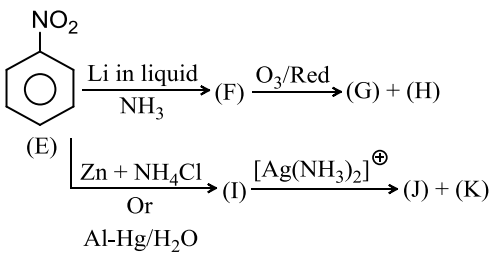
b) 

c) 

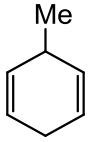
d) 

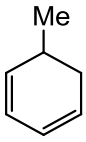
Paragraph for Question Nos. 396 to - 396

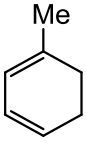


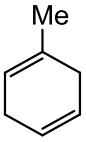


396. The compound (B) is:

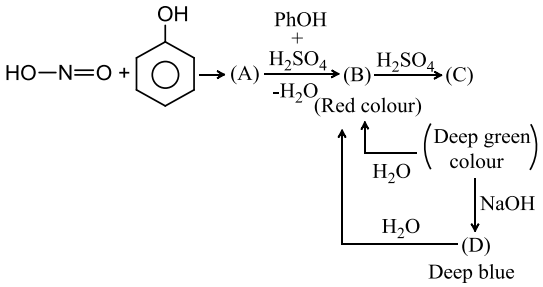
a) 

b) 

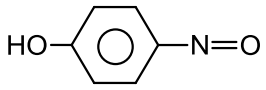
c) 

d) 

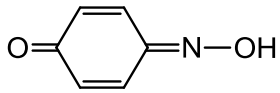
Paragraph for Question Nos. 397 to - 397



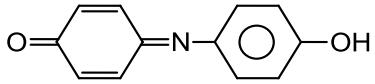
397. The compound (A) is:

a) 

p-Nitrosophenol
(Benezenoid from)

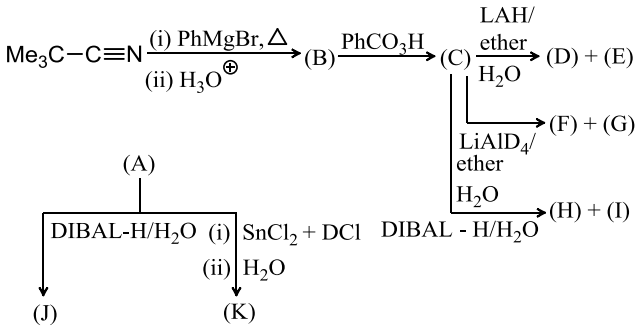
b) 

p-Nitrosophenol
(Quinoid from)

c) 

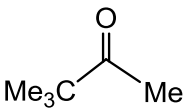
d) Both (a) and (b)

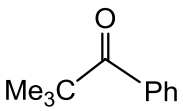
Paragraph for Question Nos. 398 to - 398

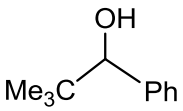


398. The compound B is:

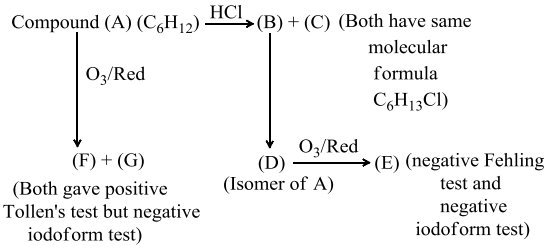
a) $Me_3C - CHO$

b) 

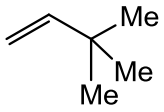
c) 

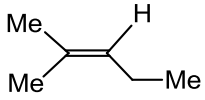
d) 

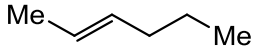
Paragraph for Question Nos. 399 to - 399

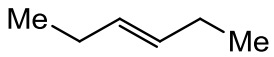


399. The compound (A) is:

a) 

b) 

c) 

d) 

Paragraph for Question Nos. 400 to - 400

In the chemical change : $a\mathrm{N_2H_4} + b\mathrm{BrO_3^-} \longrightarrow a\mathrm{N_2} + b\mathrm{Br^-} + 6\mathrm{H_2O}$

400. The element oxidized and reduced in the reaction are respectively :

a) $\mathrm{N_2H_4}, \mathrm{BrO_3^-}$ b) N, Br c) H, Br d) $\mathrm{BrO_3^-}, \mathrm{N_2H_4}$

Paragraph for Question Nos. 401 to - 401

2.5 g sample of copper is dissolved in excess of $\mathrm{H_2SO_4}$ to prepare 100 mL of 0.02 M $\mathrm{CuSO_4}(aq)$. 10 mL of 0.02 M solution of $\mathrm{CuSO_4}(aq)$ is mixed with excess of KI to show the following changes.

$\mathrm{CuSO_4} + 2\mathrm{KI} \longrightarrow \mathrm{K_2SO_4} + \mathrm{CuI_2}$

$2\mathrm{CuI_2} \longrightarrow \mathrm{Cu_2I_2} + \mathrm{I_2}$

The liberated iodine is titrated with hypo $(\mathrm{Na_2S_2O_3})$ and requires V mL of 0.1 M hypo solution for its complete reduction.

401. The volume(V) of hypo required is :

a) 2 mL b) 20 mL c) 1 mL d) 10 mL

Paragraph for Question Nos. 402 to - 402

$\mathrm{K_2Cr_2O_7}$ acts as a good oxidizing agent in acidic medium.

$$\mathrm{Cr_2O_7^{2-}} + 14\mathrm{H^+} + 6\mathrm{e^-} \longrightarrow 2\mathrm{Cr^{3+}} + 7\mathrm{H_2O}$$

Orange Green

In alkaline solution, orange colour of $\mathrm{Cr_2O_7^{2-}}$ changes to yellow colour due to formation of $\mathrm{CrO_4^{2-}}$ and again yellow colour changes to orange colour on changing the solution to acidic medium.

$$Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$$

Orange Yellow

$$2Cr\,O_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$$

Yellow Orange

$CrO_4^{2-}$and $Cr_2O_7^{2-}$ exist in equilibrium at pH = 4 and are interconvertible by altering the pH of the solution. When heated with H_2SO_4 and metal chloride, $K_2Cr_2O_7$gives vapours of chromyl chloride (CrO_2Cl_2). Chromyl chloride (CrO_2Cl_2) when passed into aqueous NaOH solution, yellow colour solution of CrO_4^{2-} is obtained. This on reaction with lead acetate gives yellow ppt. of $PbCrO_4$.

When H_2O_2 is added to an acidified solution of dichromate ion, a complicated reaction occurs. The products obtained depend on the pH and concentration of Cr.

$$Cr_2O_7^{2-} + 2H^+ + 4H_2O_2 \longrightarrow 2CrO(O_2)_2 + 5H_2O$$

A deep blue-violet coloured peroxo compound, $CrO(O_2)_2$, called chromic peroxide is formed. This decomposes rapidly in aqueous solution into Cr^{3+} and oxygen.

402. What happens when a solution of potassium chromate is treated with an excess of dilute nitric acid?
   a) Cr^{3+} and $Cr_2O_7^{2-}$ are formed
   b) $Cr_2O_7^{2-}$ and H_2O are formed
   c) CrO_4^{2-} is reduced to +3 state of Cr
   d) CrO_4^{2-} is reduced to 0 state of Cr

Paragraph for Question Nos. 403 to - 403

Bleaching powder and bleach solution are produced on a large scale and used in several household products. The effectiveness of bleach solution is often measured by iodometry.

403. Bleaching powder contains a salt of an oxoacid as one of its components. The anhydride of that oxoacid is :
   a) Cl_2O b) Cl_2O_7 c) ClO_2 d) Cl_2O_6

Paragraph for Question Nos. 404 to - 404

Given that 50.0 mL of 0.01 M $Na_2S_2O_3$ solution and 5×10^{-4} mole of Cl_2 react according to equation, $Cl_2(g) + S_2O_3^{2-} \longrightarrow SO_4^{2-} + Cl^- + S$.

Answer the following :

404. The balanced molecular equation is :
   a) $Cl_2 + H_2O + Na_2S_2O_3 \longrightarrow Na_2SO_4 + S + 2HCl$
   b) $Cl_2 + Na_2S_2O_3 \longrightarrow 2NaCl + Na_2SO_4$
   c) $Cl_2 + S_2O_3^{2-} \longrightarrow SO_4^{2-} + S + Cl^-$
   d) None of the above

Integer Answer Type

405. 80 mL of $M/24$ $K_2Cr_2O_7$ solution oxidises 22.4 mL H_2O_2 solution. The volume strength of H_2O_2 solutin is ……

406. 0.31 g of an alloy of Fe + Cu was dissolved in excess dilute H_2SO_4 and the solution was made upto 100 mL. 20 mL of this solution required 3 mL of $\frac{N}{30}K_2Cr_2O_7$ solution for exact oxidation. The % purity (in closest value) of Fe in wire is :

407. In the reaction $P_4 + NaOH \longrightarrow PH_3 + NaH_2PO_2$, mole ratio of NaH_2PO_2 and PH_3 is ....
408. $CN^{\ominus}$ ion is oxidized by a powerful oxidizing agent to $NO_3^{\ominus}$ and CO_2 or CO_3^{2-} depending on the acidity of the reaction mixture
$CN^{\ominus} \longrightarrow CO_2 + NO_3^{\ominus} + H^{\oplus} + ne^-$
What is the number (n) of electrons involved in the process, divided by 10?
409. The reaction $Cl_2(g) + S_2O_3^{2-} \longrightarrow SO_4^{2-} + Cl^-$ is to be carried out in basic medium. 1.5 mole of Cl_2 are allowed to react with 0.1 mole of $S_2O_3^{2-}$ in presence of 3.0 mole of OH^-. Moles of OH^- left after the reaction is ……..
410. Among the compounds given in question 3, what is the sum of the oxidation states of all underlined elements?
411. 30 mL of 0.3 M $MnSO_4$ is completely oxidised by 3 mL of $KMnO_4$ of unknown normality, each forming Mn^{4+}oxidation state. The normality of $KMnO_4$ is ……..
412. $'n'$ factor for Cu_2S in the reaction $Cu_2S + KMnO_4 \longrightarrow Cu^{2+} + SO_2 + Mn^{2+}$ is :
413. Among the species given in
a. F_2 **b**. $F^{\ominus}$ **c**. Na **d**.$Na^{\oplus}$ **e**. $MnO_4^{\ominus}$ **f**.$I^{\ominus}$ **g**. $Cl^{\ominus}$ **h**.Ce^{4+} **i**. $Cr_2O_7^{2-}$ **j**. $Cr_2O_4^{2-}$ **k**.HNO_3 **l**. Fe^{2+}
what is the total number of species which are neither oxidizing nor reducing agents?
414. Among the compounds give in question 1, what is the total number of compounds having +5 oxidation state of the underlined elements?
415. What is the n-factor for the phenol on the following reaction?
Phenol $\xrightarrow{(NH_4)_2Cr_2O_7}$?
416. The value of n in the molecular formula $Be_nAl_2Si_6O_{18}$ is …….
417. Among the following, the number of elements showing only one non-zero oxidation state is ……
O, Cl, F, N, P, Sn, Tl, Na, Ti
418. Total number of electrons involved per molecule oxidation of FeC_2O_4 to Fe^{3+} and CO_2.
419. $'n'$ factor for H_2S during its oxidation to SO_2 is ……..
420. In the following reaction
$xZn + yHNO_3(dil) \longrightarrow aZn(NO_3)_2 + bH_2O + cNH_4NO_3$
What is the sum of the coefficients $(a + b + c)$?
421. 2 M solution of HNO_3 is reduced to NO by suitable reductant. The normality of HNO_3, if HNO_3 is used like this is ……
422. Among the following, what is the total number of compounds having zero oxidation state of the underlined elements?
a. $\underline{S}O_3^{2-}$ **b**. $H_2\underline{C}O$ **c**. $\underline{C}H_2Cl_2$ **d**.$Na_2\underline{Cr_2}O_7$ **e**.$\underline{O}_3$
423. Among the following what is the total number of compound having +3 oxidation state of the underlined elements
a. $K_4\underline{P_2}O_7$ **b**.Na Au Cl_4 **c**.$Rb_4Na\left[H\underline{V_{10}}O_{28}\right]$ **d**.$\underline{I}Cl$ **e**. $Ba_2\underline{Xe}O_6$ **f**.$\underline{O}F_2$ **g**.$Ca\left(\underline{Cl}O_2\right)_2$ **h**.$\underline{N}O_2^{\ominus}$
424. Among the following, what is the total number of species which are very good oxidizing agents?
a. F_2 **b**. $F^{\ominus}$ **c**. Na **d**.$Na^{\oplus}$ **e**. $MnO_4^{\ominus}$ **f**.$I^{\ominus}$ **g**. $Cl^{\ominus}$ **h**.Ce^{4+} **i**. $Cr_2O_7^{2-}$ **j**. $Cr_2O_4^{2-}$ **k**.HNO_3 **l**. Fe^{2+}
425. Among the following elements, what is the total number of elements having the lowest oxidation state of zero?
a. Tab. Tec. Tcd. Ti e.Tl
426. The total number of electrons involves in redox change :
$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$
427. Five moles of Ferric oxalate are oxidised by how much mole of $KMnO_4$ in acid medium?
428. The tailing of mercury on exposure to air shows a change in oxidation number by ….
429. $'n'$ factor for SO_2 in $FeS_2 + O_2 \longrightarrow Fe_2O_3 + SO_2$ is …….
430. The stoichiometric coefficient of blue perchromate in its reaction with H_2SO_4 is ….
431. The ratio of oxygen atom having -2 and -1 oxidation numbers in $S_2O_8^{2-}$ is ……

432. 10 mL of 0.2 M solution of $K_xH(C_2O_4)_y$ requires 8 mL of 0.2 M acidified $KMnO_4$ solution. The value of x is …….

433. No. of peroxide bonds in blue perchromate is ….

434. Intramolecular redox $(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$ shows a loss and gain of how much electron?

435. A 5.6 g sample of limestone is dissolved in acid and calcium is precipitated as calcium oxalate. The precipitate is filtered, washed with water and dissolved in dil. H_2SO_4. The solution required 40 mL of 0.25 N $KMnO_4$ solution for titration. The % of CaO in limestone is …….

436. In the reaction : $Mn^{2+} + S_2O_8^{2-} \longrightarrow SO_4^{2-} + MnO_4^-$(acid mid.) the number of moles of $S_2O_8^{2-}$ required to oxidise 2 mole Mn^{2+}.

437. Equivalent weight of O_3 in the reaction : $2O_3 \longrightarrow 3O_2$ is ……

438. Among the species

a. F_2 **b**. $F^{\ominus}$ **c**. Na **d**.$Na^{\oplus}$ **e**. $MnO_4^{\ominus}$ **f**.$I^{\ominus}$ **g**. $Cl^{\ominus}$ **h**.Ce^{4+} **i**. $Cr_2O_7^{2-}$ **j**. $Cr_2O_4^{2-}$ **k**.HNO_3 **l**. Fe^{2+}

what is the total number of species which are very good reducing agents?

439. The stoichiometric coefficient n in the reaction is :

$nH_2CO_2 + 2KMnO_4 \longrightarrow nCO_2 + K_2O + MnO + H_2O$

: ANSWER KEY :

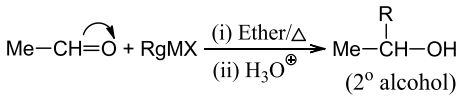
1)	c	2)	a	3)	b	4)	c	189)	d	190)	d	191)	d	192)	a
5)	d	6)	a	7)	d	8)	b	193)	c	194)	c	195)	a	196)	d
9)	a	10)	a	11)	b	12)	c	197)	b	198)	b	199)	c	200)	a
13)	d	14)	a	15)	d	16)	a	201)	a	202)	c	203)	a	204)	c
17)	d	18)	c	19)	b	20)	d	205)	c	206)	d	1)	a, c, d	2)	
21)	d	22)	c	23)	c	24)	c		b, c	3)	a,d	4)	a,c		
25)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

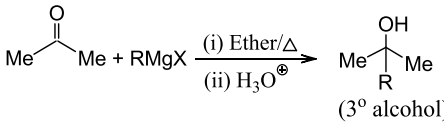
89)	**c, d**	**90)**	**a,b,d**	**91)**	**a,c,d**	**92)**	**a, b, c**
93)	**a,c**	**94)**	**a**	**95)**	**a, b, c**	**96)**	**a,c,d**
97)	**a,b**	**98)**	**b, c, d**	**99)**	**a, b**	**100)**	**a,b**
101)	**b, c**	**102)**	**a,b,c,d**	**103)**	**a,c**	**104)**	**a, b**
105)	**a, b, c**	**106)**	**b, c**	**107)**	**a,b,d**	**108)**	**a,b,c,d**
109)	**a,b**	**110)**	**a,b,c,d**	**111)**	**a,b,d**	**112)**	**a,b,c**
113)	**a,b**	**114)**	**a, b, d**	**1)**	**c**	**2)**	**a**
3)	**a**	**4)**	**c**				
5)	**a**	**6)**	**c**	**7)**	**a**	**8)**	**b**
9)	**e**	**10)**	**c**	**11)**	**b**	**12)**	**c**
13)	**c**	**14)**	**a**	**15)**	**c**	**16)**	**a**
17)	**e**	**18)**	**c**	**19)**	**d**	**20)**	**c**
21)	**d**	**22)**	**c**	**23)**	**a**	**24)**	**a**
25)	**c**	**26)**	**a**	**27)**	**c**	**28)**	**d**
29)	**a**	**30)**	**c**	**31)**	**d**	**32)**	**e**
33)	**a**	**34)**	**c**	**35)**	**d**	**36)**	**c**
37)	**c**	**38)**	**c**	**39)**	**c**	**40)**	**c**
41)	**d**	**42)**	**a**	**43)**	**c**	**44)**	**c**
45)	**c**	**46)**	**c**	**47)**	**d**	**48)**	**c**
49)	**a**	**50)**	**b**	**51)**	**a**	**52)**	**a**
53)	**c**	**1)**	**c**	**2)**	**b**	**3)**	**a**
4)	**a**						
5)	**b**	**6)**	**a**	**7)**	**b**	**8)**	**d**
9)	**b**	**10)**	**c**	**11)**	**c**	**1)**	**d**
2)	**d**	**3)**	**a**	**4)**	**d**		
5)	**a,c**	**6)**	**d**	**7)**	**a**	**8)**	**a**
9)	**c**	**10)**	**a**	**11)**	**b**	**12)**	**d**
13)	**d**	**14)**	**c**	**15)**	**a**	**16)**	**b**
17)	**a**	**18)**	**b**	**19)**	**a**	**20)**	**a**
1)	**5**	**2)**	**9**	**3)**	**3**	**4)**	**3**
5)	**2**	**6)**	**10**	**7)**	**2**	**8)**	**8**
9)	**3**	**10)**	**2**	**11)**	**4**	**12)**	**3**
13)	**2**	**14)**	**3**	**15)**	**6**	**16)**	**3**
17)	**6**	**18)**	**3**	**19)**	**3**	**20)**	**6**
21)	**4**	**22)**	**8**	**23)**	**6**	**24)**	**1**
25)	**5**	**26)**	**4**	**27)**	**3**	**28)**	**3**
29)	**2**	**30)**	**6**	**31)**	**5**	**32)**	**5**
33)	**8**	**34)**	**3**	**35)**	**5**		

: HINTS AND SOLUTIONS :

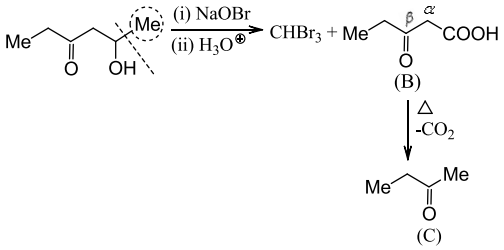
1 **(c)**

Acetaldehyde reacts with Tollens, Schiff''s, and Fehling''s solution but acetone does not. But with Grignard reagent both react





2 **(a)**



Theβ-keto acid on heating undergoes decarboxy lation easily

3 **(b)**

$M^{3+} \longrightarrow M^{6+} + 3e^-$

4 **(c)**

The reduction of $ArNO_2$ group under basic condition with (Zn dust + NaOH) gives hydrazobenzene compound. So the answer is (c)

5 **(d)**

The balanced equation is

$K_2Cr_2O_7 + 4KCl + 6H_2SO_4 \longrightarrow 2CrO_2Cl_2 + 6K_2SO_4 + 3H_2O$

6 **(a)**

Lemieux reagent $KMnO_4/NaIO_4$ oxidises RCH ≠ to RCOOH and $R_2C{=}$ to $R_2C{=}O$. So the answer is (a)

7 **(d)**

$Zn \longrightarrow Zn^{2+} + 2e^-$

$Ag^{\oplus} + e^- \longrightarrow Ag$

In (a),(b) and (c), oxidation number does not change

8 **(b)**

The balanced equation is

$Cu \longrightarrow Cu^{2+} + 2e^-$ ...(i)

$H^{\oplus} + e^- + HNO_3 \longrightarrow NO_2 + H_2O$ ...(ii)

$3H^{\oplus} + 3e^- + HNO_3 \longrightarrow NO + 2H_2O$ ...(iii)

Multiplying (i) by 2 and adding (i), (ii) and (iii), we get

$2Cu + 4H^{\oplus} + 2HNO_3 \longrightarrow 2Cu^{2+} + NO_2 + NO + 3H_2O$

or

$2Cu + 6HNO_3 \longrightarrow 2Cu(NO_3)_2 + NO_2 + NO + 3H_2O$

$\therefore$ x and y are 2 and 6

9 **(a)**

Balanced equation is

$2MnO_4^{\ominus} + 5C_2O_4^{2-} + 16H^{\oplus} \longrightarrow 2Mn^{+2} + 10CO_2 + 8H_2O$

$\therefore x.y$ and z are 2,5,16

10 **(a)**

Equivalent of $MnO_4^{\ominus}$ = Equivalent of$Fe\ (C_2O_4)$

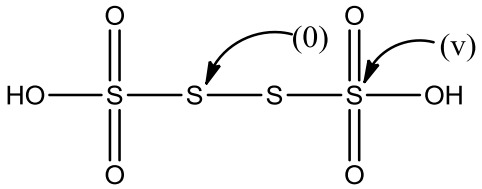
$(n = 5)\ (n = 3)$

$\frac{3}{5}$ mol of $MnO_4^{\ominus}$ = 1 mol of $Fe\ (C_2O_4)$

0.6 mol of $MnO_4^{\ominus}$ = 1 mol of $Fe\ (C_2O_4)$

11 **(b)**

$Na_2S_4O_6$ is salt of $H_2S_4O_6$ which has the following structure



⇒ Difference in oxidation number of two types of sulphur = 5

12 **(c)**

$H_2S_2O_8$: It is peroxodisulphuric acid. So oxidation state of S = +6

13 **(d)**

Fe_3O_8

$3x - 16 = 0 \Rightarrow x = \frac{16}{3}$

14 **(a)**

The balanced equation is

$$12H^{\oplus} + 10e^{-} + 2IO_3^{\ominus} \longrightarrow I_2 + 6H_2O$$

$$10I^{\ominus} \longrightarrow 5I_2 + 10e^{-}$$

$$10I^{\ominus} + 12H^{\oplus} + 2IO_3^{\ominus} \longrightarrow 6H_2O + 6I_2$$

$$\text{or } 5I^{\ominus} + 6H^{\oplus} + IO_3^{\ominus} \longrightarrow 3H_2O + 3I_2$$

(a) (b) (c) (d)

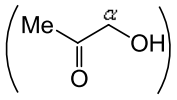
15 **(d)**

Disproportionation involves simultaneous oxidation and reduction of the same atom in a molecule

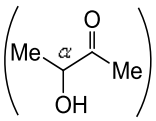
16 **(a)**

a.Fehling''''''''s solution reacts only with aliphatic aldehyde, not with aromatic aldehyde

b.F.S. reacts with MeCHO and also with α-hydroxy ketones



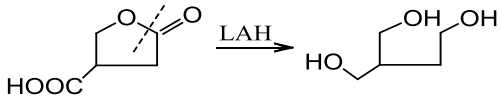
c.F.S. reacts with both HCHO and with α-hydroxy ketones



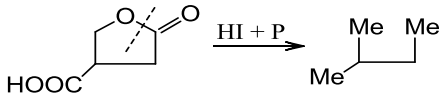
d.F.S. reacts with both aliphatic aldehydes (MeCHOand HCHO). So the answer is (a)

17 **(d)**

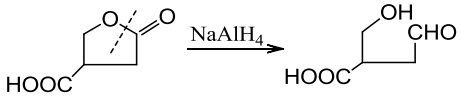
a. LAH reduces both ester and acid to alcohols



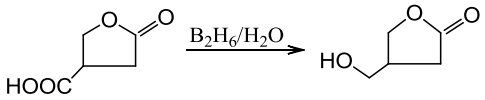
b. HI + P reduces both ester and acid to alkane



c. $NaAlH_4$reduces only ester to aldehyde and alcohol



d.B_2H_6/H_2O selectively reduces acid to alcohol (although it can also reduce ester to alcohols) but acid group is reduced in the presence of esters



So the answer is (d)

19 **(b)**

Xe shows +8 oxidation state inXeF_6, but it does not exist because of steric hindrance of 8 F atoms

20 **(d)**

a. $\left[\overset{+3}{C}O(\overset{0}{N}H_3)_5\,\overset{1-}{Cl}\right]^{+2}\overset{-1\times 2}{Cl_2}$

$NH_3: x + 3 = 0 \Rightarrow x = -3$;oxidation state of N= -3

b.$NH_2OH: x + 3 - 2 = 0 \Rightarrow x = -1$

Oxidation state of N= -1

c. $(N_2H_5)_2^{+1\times 2}SO_4^{2-}$:

$N_2H_5^{\oplus}: 2x + 5 = +1 \Rightarrow x = -2$

Oxidation number of N= -2

d. $\overset{+2\times 3}{Mg_3}\,\overset{-3\times 2}{N_2}$: Oxidation state of N = -3

21 **(d)**

In $CN^{\ominus}$, oxidation of C is +2, and it changes to +4 oxidation state in CO_2. So C is also oxidised

22 **(c)**

$Mg_2P_2O_7: 2\times 2 + 2x - 14 = 0 \Rightarrow x = 5$

Oxidation number of P = +5

23 **(c)**

In (a), aqueous $KMnO_4$ (cold) will hydroxylate the $(C = C)$ bond

In (b), NaOI (iodoform reaction) will not react since there is no $(MeCO -)$ or (MeCHO)or (MeCH OH) group

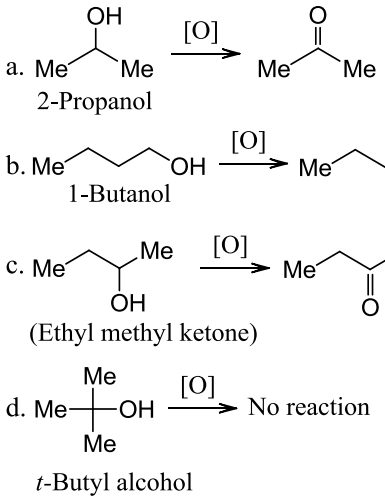
In (c), Tollens reagent will convert the $(-CHO)$ group to ($COO^{\ominus}$) group without affecting $(C = C)$ bond

$$Ph - CH = CH - CHO \xrightarrow[(ii)H_3O^{\oplus}]{\text{(i)Tollens reagent}} Ph - CH = CH - COOH$$

In (d), MnO_2 will not react, since it does not contain allylic or benzylic alcoholic group. So the answer is (c)

24 **(c)**

Thiscan be seen from the reaction below:



Hence the answer is (c)

25 **(a)**

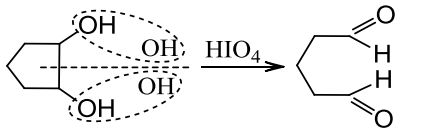
$CH_2Cl_2: x + 2 - 2 = 0 \Rightarrow x = 0$

Oxidation state of $C = 0$

26 **(b)**

MnO_2 selectively oxidises allylic or benzylic hydroxyl group to $(C = O)$ group, whereas Jones reagent oxidises 1° and 2°ROH to aldehydes and ketones, respectively. So, the answer is (b)

27 **(b)**



Product in (b).

So the answer is (b)

28 **(d)**

$6e^- + Cr_2O_7^{2-} \longrightarrow 2Cr^{3+}$

$2I^{\ominus} \longrightarrow I_2 + 2e^-$

Oxidation state of $Cr = +3$

29 **(d)**

II,III and IV are redox reactions

30 **(a)**

Eq of $MnO_4^{\ominus}$ = Eq of SO_3^{2-} $(SO_3^{2-} \rightarrow SO_4^{2-} + 2e^-)$

$(n = 5)$ $(n = 2)$

1 Eq = 1 Eq

$\frac{1}{5}$ mol = $\frac{1}{2}$ mol

$\frac{2}{5}$ mol of $MnO_4^{\ominus}$ = 1 mol of SO_3^{2-}

31 **(c)**

o-Xylene on ozonolysis gives glyoxal: methylglyoxal: dimethyl glyoxal in the ratio 3:2:1, which proves the existence of resonance in benzene and hence proves the Kekule structure of benzene. So the answer is (c)

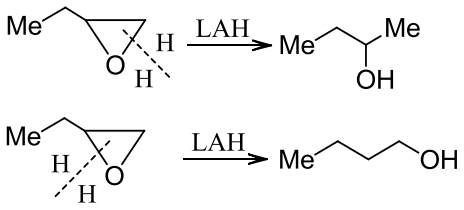
32 **(a)**

NH_4HS selectively reduces $(-NO_2)$ group *para*to the (Me) (EDG) group, whereas $(SnCl_2 + HCl)$ selectively reduces $(-NO_2)$ group *ortho*to the (Me) (EDG) group. So the answer is (a)

33 **(a)**

The statement is self-explanatory

34 **(c)**



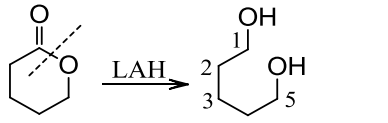
Hence, the answer is (c)

35 **(b)**

$\overset{+2}{Mn}SO_4^{2-} \longrightarrow \overset{+4}{Mn}O_2 + 2e^-$

$\therefore$ Equivalent weight $= M/2$

36 **(b)**



Caprolactone (Pentane-1, 5-diol)

hence the answer is (b)

37 **(b)**

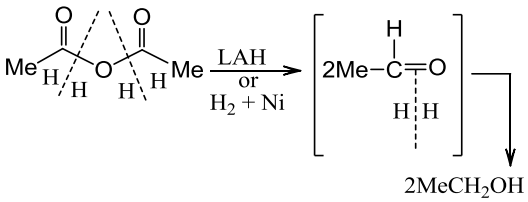
$Na_2S_4O_6: 2 + 4x - 12 = 0$

$\therefore x = \frac{10}{4} = 2.5$

Oxidation number of $S = 2.5$

39 **(b)**

Both LAH and $(H_2 + Pt)$ reduce anhydride to alcohols,but $NaBH_4$ does not reduce anhdyride. So the answer is (b)



40 **(a)**

In (A) the oxidation of allylic1°alcohol to aldehyde is carried out with MnO_2, while in (B) the oxidation of 2° alcohol to ketone is carried out with $CrO_3 + CH_3COOH$. So the answer is (a)

41 **(d)**

i. $Rb \longrightarrow Rb^{1+} + e^-$ (Oxidation)

$H_2O + e^- \longrightarrow \overset{\ominus}{O}H + \frac{1}{2} H_2$ (Reduction)

Hence, redox reaction.

ii. $e^- + Cu^{2+} \longrightarrow Cu^{1+}$ (Reduction)

$2I^{\ominus} \longrightarrow I_2 + 2e^-$ (Oxidation)

Hence, redox reaction.

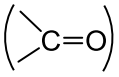
iii. $\overset{\oplus}{N}H_4 \longrightarrow NH_3$ (No change in oxidation number)

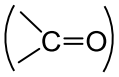
$x = -3$ $x = -3$

Hence, reaction is not redox.

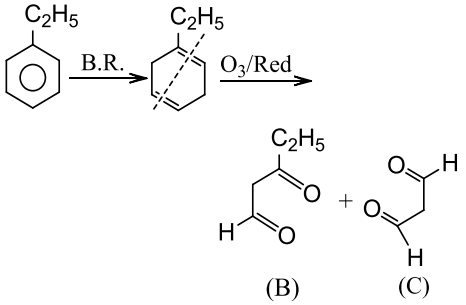
iv. No change in the oxidation number of either Fe^{2+} or $CN^{\ominus}$ in both reactant and products; hence not redox reaction

42 **(c)**

LAH reduces both  group and (−COOH) group to 2°alcohol and 1° alcohol,

respectively,whereas $NaBH_4$reduces only  group to2° alcohol. So the answer is (c)

43 **(a)**



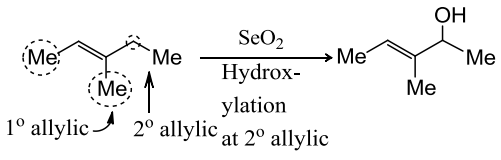
Hence, the answer is (a)

44 **(c)**

LAH reduces $PhNO_2$ group to (Ph— N = N— Ph) group, whereas (H_2+ Ni) reduces $PhNO_2$, group to $PhNH_2$. So the answer is (c)

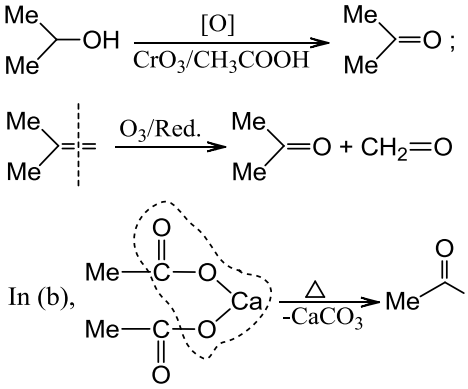
45 **(b)**

SeO_2/AcOH selectively hydroxylates allylic position.(3° > 2° > 1° allylic)

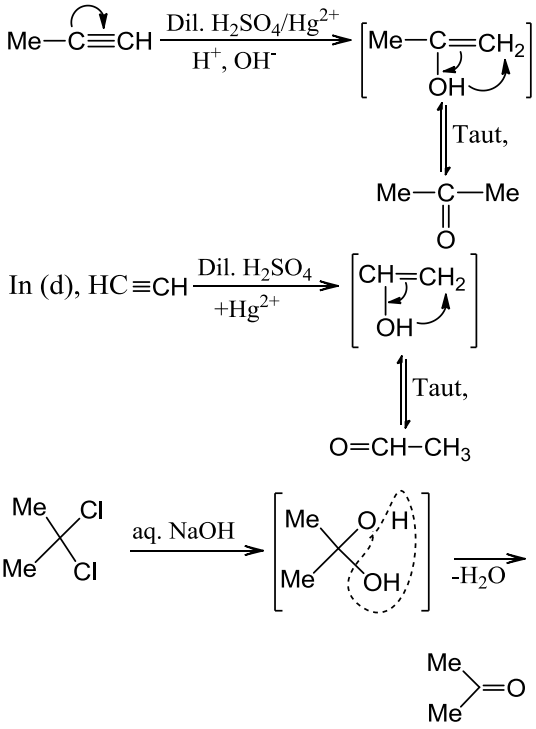


So the answer is (b)

46 **(d)**



In (c), $(MeCOO)_2Ca$ gives acetone as in (b);



Only in (d), the acetone cannot be obtained from CH ≡ CH in a single-step reaction

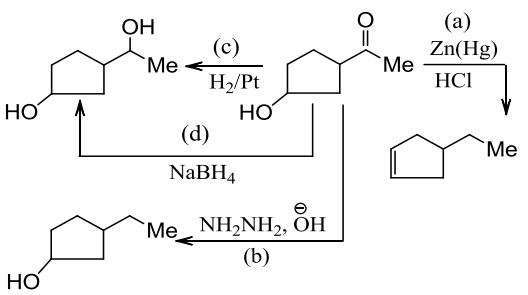
So the answer is (d)

47 **(b)**

$\left[Pt^{2+}\overset{0}{(C_2H_4)}\overset{3-}{Cl_3}\right]^{\ominus}$

Oxidation number of Pt = +2

48 **(b)**



a. Zn/Hg, HCl (Clemmensen reduction) is acid

catalysed.So, the dehydration will also take place along with the conversion of $\left(\diagdown C{=}O\right)$ group to $(-CH_2-)$ group

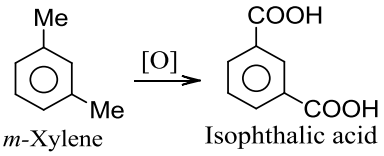
So the answer is (b)

49 **(d)**

Intramolecular redox change involves oxidation of one atom and reduction of the other atom within a molecule

50 **(b)**

The *ortho*compound on nitration (or halogenation or sulphonation or Friedel-Crafts reaction) gives twoisomers; *meta*gives three, and *para*gives onecompound (OMP = 231)



m-Xylene Isophthalic acid

So the answer is (b)

51 **(c)**

$5e^- + ClO_2 \longrightarrow Cl^{\ominus}$

Eq of ClO_2 = Eq ofH_2O_2

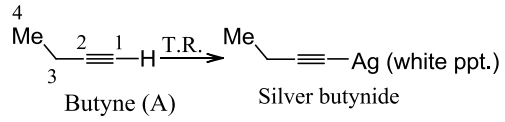
$(n = 5)(n = 2)$

$\frac{1}{5}$mol $\equiv \frac{1}{2}$mol

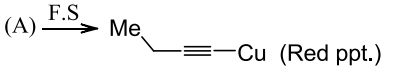
1 mole of $ClO_2 = \frac{5}{2}$ mol of H_2O_2

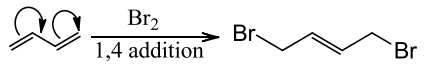
52 **(a)**

DU in (A) = 2°. So it contains terminal triple bond, since Tollens reagent and Fehling''s solution, besides aldehydes, also react with terminal triple bond. Triple bond is isomeric with diene. (B) must be a diene, since it reacts with Br_2 to give 1,4-addition product



Butyne (A) Silver butynide





Butadiene 1,4Dibromobut-2-ene

(B)

So the answer is (a)

53 **(c)**

$5e^- + MnO_4^{\ominus} \longrightarrow Mn^{2+}$

$M^{x+} \longrightarrow MO_3^{\ominus} + (5\text{-}x)$

$x - 6 = -1$

$x = 5$

Equivalent of $MnO_4^{\ominus}$ =Equivalent of M^{x+}

1 mol $\times$ 5 = 1.67 mol $\times$ $(5 - x)$

$\therefore x = 2$

54 **(d)**

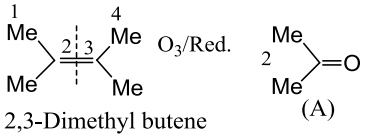
F has the highest electronegativity

55 **(b)**

Reduction potential of $F_2 > Cl_2 > Br_2 > I_2$

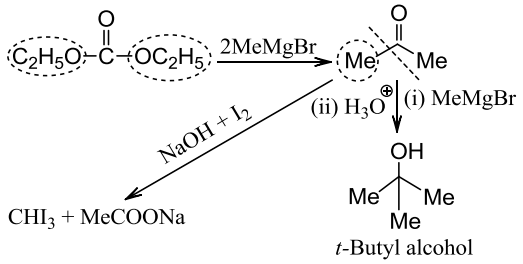
56 **(d)**

First, check the compound (A) from ozonlysis product



2,3-Dimethyl butene (A)

Now, find the product in the given reaction.



t-Butyl alcohol

Hence, all the statements are correct, i.e, the answer is (d).

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57 **(d)**

It is a disproportionation reaction in which Br_2 is both reduced and oxidized. The oxidation state of

C in both CO_3^{2-} and $HCO_3^{\ominus}$ does not change

58 **(d)**

$\overset{0}{Fe}\left(\overset{0}{CO}\right)_5$ Oxidation sate of Fe=0

59 **(a)**

$\overset{+2}{Na_2}\left[\overset{+2}{Fe}\ \overset{-5}{(CN)_5}\ \overset{+1}{NO}\right]^{2-}$

Oxidation state of Fe=+2

60 **(c)**

(c) is not a disproportionation reaction

61 **(a)**

$Ba^{2+}(H_2PO_2)_2^{-1\times2}$

$\therefore H_2PO_2^{\ominus} = 2 + x - 4 = -1$

$\therefore x = +1$

Oxidation state of P=+1

62 **(a)**

$NH_4^{\oplus} \longrightarrow N_2$

Oxidation state of N=−3 Oxidation state of N=0

In the other reaction, the oxidation state of N decreases

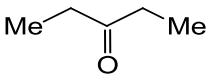
63 **(d)**

Intermolecular redox reaction involves oxidation of one molecule and reduction of the other molecule like in redox reactions

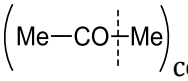
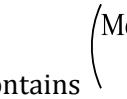
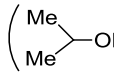
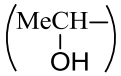
64 **(b)**

Lemieux reagent ($KMnO_4 + NaIO_4$) converts RCH= to RCOOH and $R_2C =$ to $R_2C = O$, while with ($OsO_4 + NaIO_4$) converts to RCHO and $R_2C =$ to $R_2C = O$ group. So the answer is (b)

65 **(c)**



(Diethyl ketone) does not contain (MeCO−) group, so it does not give iodoform reaction

Acetone  contains (MeCO−) group, ethanol ($MeCH_2OH$)contains  group; isoprrpylalcohol  contains  group.So they give iodoform test

66 **(c)**

$N_2H_4 \longrightarrow 2y + 10e^-$

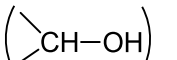
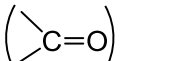
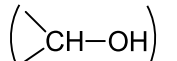
$2x + 4 = 0 \quad 2y = 2x$

$2x = -4$

$\overset{\uparrow}{2x - (-4) = 10}\overset{\uparrow}{}$

$x = 3$

67 **(d)**

(H_2 + Pt) can reduce both (C = C) bond and (C = O) group, but (C = C) is more reactive than (C = O) towards the reduction, so with 1 mol of (H_2 + Pt), only (C = C) bond is reduced to (C − C) bond. While (H_2 + Pt) or (H_2 + Raney Ni) in excess reduce both(C = C) bond to (C − C) bond and group to  group, $NaBH_4$ reduces only  group to  group, but does not reduce (C = C) bond. So the answer is (d)

68 **(b)**

It is a disproportionation reaction

69 **(c)**

$A^{2+}B^{5+}C^{2-}$

The positive charge $= 2x + 5y$

Total negative charge $= 2z$

$\therefore 2x + 5y = 2z$ ...(i)

$2x + 5y + 2z = 0$ ...(ii)

Solving equations (i) and (ii) , we get

$x = 3, y = 2, z = 8$

Formula is $A_3B_2C_8 = A_3(BC_4)_2$

Alternatively: Check that the total charge should be zero

1. $A_2(BC)_2 = 2 \times 2 + 2 \times 5 - 2 \times 2$

$= 10$ (not zero)

2. $A_2(BC)_3 = 2 \times 2 + 3 \times 5 - 2 \times 3$

$=13$ (not zero)

3. $A_3(BC_4)_2 = 2 \times 3 + 2 \times 5 - 2 \times 8$

$=0$

4. $A_2(BC_4)_3 = 2 \times 2 + 3 \times 5 - 2 \times 12$

$= -5$ (not zero)

71 **(d)**

All options are correct

72 **(d)**

(a) and (b) are neutralisation reactions

c. The oxidation state of Cu is +2 in both reactant and product and SO_4^{2-} ion does not change. So it is none reaction

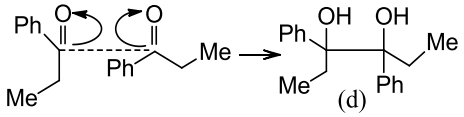
d. It is a redox reaction

$Zn \longrightarrow Zn^{2+} + 2e^-$ (Oxidation)

$2H^{\oplus} + 2e^- \longrightarrow H_2$ (Reduction)

73 **(d)**
Acidic $KMnO_4$ oxidises $(-NH_2)$ group to $(-NO_2)$ group. So the answer is (c)

74 **(d)**
It is an example of bimolecular reduction (formation of pinacol)



(d)

75 **(c)**
$\underset{(n=5)}{\text{Eq of } MnO_4^{\ominus}} \equiv \underset{(n=2)}{\text{Eq of } H_2O_2}$

$\frac{1}{5}$ mol $= \frac{1}{2}$ mol

1 mol of $MnO_4^{\ominus} = \frac{5}{2}$ mol of H_2O_2

76 **(b)**
Lindlar's catalyst reduces $(C \equiv C)$ to$(C = C)$ in syn (*cis*) addition and imultaneously reduces $(-COCl)$ group to $(-CHO)$ group. So the answer is (b)

77 **(c)**
Statement is self explanatory

78 **(c)**
Acidic $KMnO_4$ breaks the double bond and also oxidises 2°alcohol to ketone, whereas PCC only oxidises 2° alcohol to ketone. So the answer is (c)

79 **(c)**

$\left(\overset{+1}{NH_4}\right)_2 S_2O_4^{2-}$

$\therefore$Oxidation state of $S = +6$

(Since $S_2O_8^{2-}$has one peroxide bond)

Oxidation state of $Os = +8$

Oxidation state of S in $H_2SO_5 = +6$

(Since it has one peroxide bond)

$K^{1+}O_2^{1-}$, oxidation state of $O = -1/2$

80 **(a)**
$Ca^{2+}(OCl^{1-})Cl^{1-}$

$OCl^{\ominus}: -2 + x = -1 \Rightarrow x = +1$

$Cl^{\ominus}: -1$

Oxidation states of Cl are -1 and $+1$

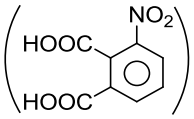
82 **(a)**

$\overset{+2\text{-}1\times2}{O\,F_2}$: $x - 2 = 0 \Rightarrow x = 2$

$\therefore$Oxidation number of $O = +2$

83 **(d)**
It is a disproportionation reaction, and hence,Br_2 is both reduced and oxidized

84 **(a)**
The rings containing EWG (e.g., NO_2group) are stable and are not oxidised by acidic $KMnO_4$. So the ring (A)is oxidised to give the product



85 **(a)**
Symmetrical alkenes on acid-catalysed hydration, oxymercuration-demercuration, and HBO reactions give the same product. So the answer is (a)

86 **(a)**
The reduction of $ArNO_2$ group under basic condition with CH_3ONa or $(Na_3AsO_3 + NaOH)$ or (glucose +NaOH) gives azoxybenzene compound. So the answer is (a)

87 **(c)**

$\overset{+1}{K}\left[\overset{-1}{CO}\left(\overset{0}{CO}\right)_4\right]^{1-}$

Oxidation state of $Co = -1$

88 **(a)**
HNC: $1 - 3 + x = 0 \Rightarrow x = 2$

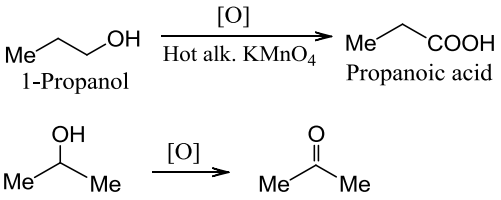
Oxidation state of $C = +2$

89 **(c)**
$NaCNBH_3$ reduces imines or enamines (RCH=NH, or RCH=NH$-R^1$) or $R_2C = NH$ or R_2C = NHR′) to 1° or 2° amines. So the answer is (c)

90 **(c)**
Balance the equation

$3Cl_2 + 6\overset{\ominus}{O}H \longrightarrow ClO_3^{\ominus} + 5Cl^{\ominus} + 3H_2O$

91 **(c)**
This can be seen from the reaction below:

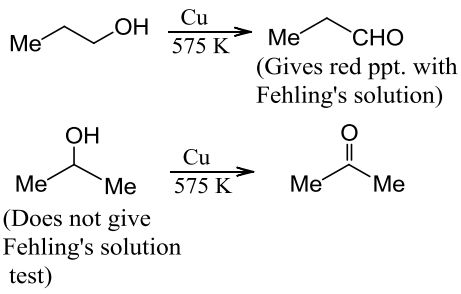


2-Oropanol Acetone

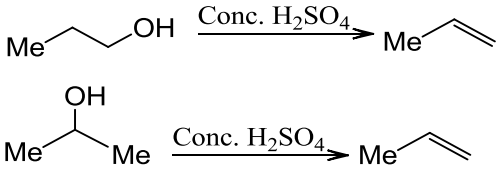
Both the product (propanoic acid) and acetone do not give Fehling''s solution test

b. Same reaction as in (a)

c.



d.

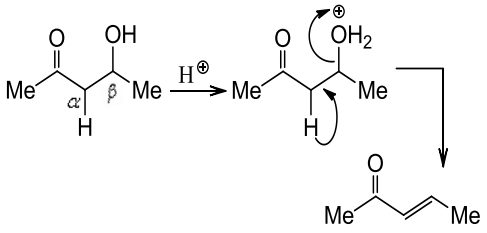


So the answer is (c)

92 **(a)**

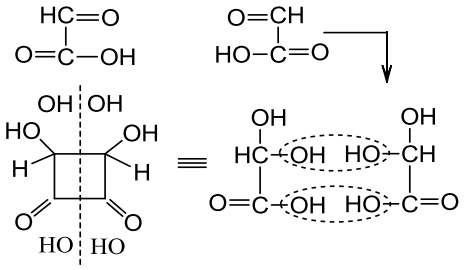
a. It is β-keto alcohol, which is easily dehydrated

d. β-Hydroxy aldehyde or ketones readily undergo dehydration giving α, β -unsaturated carbonyl compounds, due to the easy loss of acidic H atom at α-C atom. The acidic nature of H atom at α-C atom is due to the presence of an $\overline{e}$ -withdrawing carbonyl group



93 **(d)**

Glyoxalic acid is (OHC − COOH). Proceed reverse:



The two (OH) groups must be syn (*cis*) position for periodic oxidation. So the answer is (d)

94 **(c)**

$e^- + MnO_4^{\ominus} \longrightarrow MnO_4^{2-}$

$3e^- + MnO_4^{\ominus} \longrightarrow MnO_2$

$4e^- + 2MnO_4^{\ominus} \longrightarrow Mn_2O_3$

$5e^- + MnO_4^{\ominus} \longrightarrow Mn^{2+}$

95 **(c)**

Eq of $Cr_2O_7^{2-} \equiv$ Eq ofSn^{2+}

$(n = 6)(n = 2)$

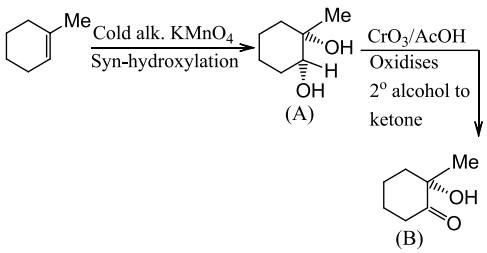
$\frac{1}{6}$ mol $= \frac{1}{2}$ mol

$\frac{1}{3}$ mol of $Cr_2O_7^{2-} = 1$ mol ofSn^{2+}

96 **(d)**

In HNO_2, the oxidation state of N is +3. So it can go to a higher or lower oxidation state

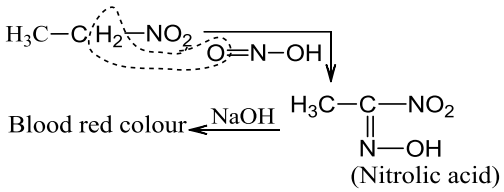
97 **(a)**



So the answer is (a)

98 **(c)**

The 1°(RNO_2) group reacts with HNO_2 ($NaNO_2 + HBr \rightarrow HNO_2 + NaBr$) to give nitrolic acid, which gives blood red colour with NaOH



So the answer is (c)

99 **(a)**

$S_2O_6^{2-}: 2x - 12 = -2 \Rightarrow x = 5$

$SO_3^{2-}: x - 6 = -2 \Rightarrow x = 4$

$S_2O_4^{2-}: 2x - 8 = -2 \Rightarrow x = 3$

100 **(b)**

a. $\left[CO^{+3}(N\overset{0}{H}_3)_5\,Cl^{1-}\right]^{+2}Cl_2^{-1\times 2}$

$NH_3: x+3=0 \Rightarrow x=-3$; oxidation state of N= -3

b. $NH_2OH: x+3-2=0 \Rightarrow x=-1$

Oxidation state of N= -1

c. $(N_2H_5)_2^{+1\times 2}SO_4^{2-}$:

$N_2H_5^{\oplus}: 2x+5=+1 \Rightarrow x=-2$

Oxidation number of N= -2

d. $\overset{+2\times 3}{Mg_3}\,\overset{-3\times 2}{N_2}$: Oxidation state of N = -3

Oxidation state of N in (b) is -2

101 **(a)**

$e^- + Fe^{3+} \longrightarrow Fe^{2+}$(Reduction)

Therefore, $FeCl_3$ acts as an oxidizing agent

102 **(a)**

$H_2S^{2-} \longrightarrow S + 2e^-$ (Oxidation)

SoH_2S is oxidised

$4e^- + SO_2 \longrightarrow S$ (Reduction)

103 **(a)**

S_8: Oxidation number of S=0

$S_2F_2: -2x-2=0 \Rightarrow x=1$; Oxidation number of S=1

$H_2S: 2+x=0 \Rightarrow x=2$; Oxidation number of S=$-2$

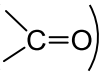
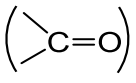
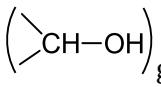
104 **(c)**

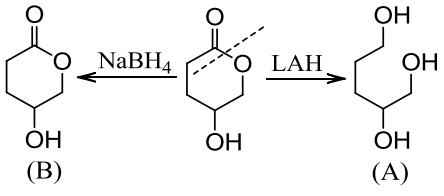
CO_2 has the maximum oxidation state of +4. So it cannot go to higher oxidation state

105 **(a)**

Maximum oxidation number of *P* in all is +5

106 **(c)**

LAH reduces both ester (here cyclic ester) and  group to alcohols, whereas $NaBH_4$reduces only  group to  group. Hence, the answer is (c)

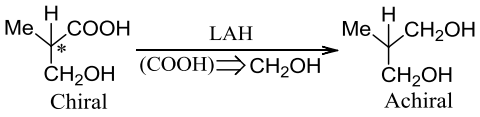


107 **(a)**

It gives pyruvic acid

109 **(a)**

$NaHCO_3$ test shows the presence of the $(-COOH)$group, and from the structures given in the problem, only the compound in (a) on reduction with LAH gives achiral product



The compounds in (b), (c) and (d) with LAH will give chiral products. So the answer is (a)

112 **(c)**

$\overset{+6}{Cr}\,O_4^{2-} \longrightarrow \overset{+6}{Cr_2}\,O_7^{2-}$

Since oxidation state of Cr in both reactant and product is same

113 **(b)**

Reduction II is disproportionation, while I, III, and IV are not

114 **(c)**

Isocyanides are oxidised to isocyanates. So the answer is (c)

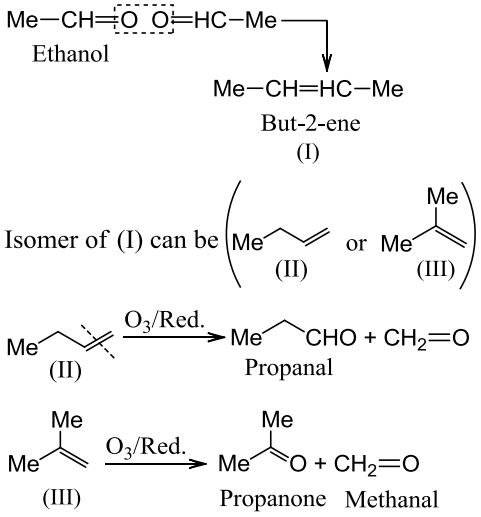
115 **(a)**

$(YBa_2Cu_3O_7)$

$3+(2\times 2)+3x-14=0$

$\therefore\ x=+\frac{7}{3}$

116 **(a)**

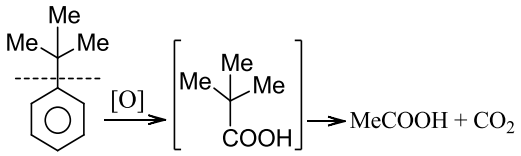


So the answer is (a)

117 **(d)**

Due to (+I) effect of three (Me) groups in *t*-butyl group, the benzene is activated and unstable, so the oxidation of the benzene ring takes place. The oxidation of the side chain containing *t*-butyl group does not take place because it does not

have the benzylic H atom



So the answer is (d)

118 **(b)**

In a basic medium,

$3e^- + MnO_4^{\ominus} \longrightarrow MnO_2$

$I^{\ominus} \longrightarrow IO_3^{\ominus} + 6e^-$

Equivalent of $MnO_4^{\ominus}$ =Equivalent of$I^{\ominus}$

$(n = 3)(n = 6)$

1 Eq = 1 Eq

$\frac{1}{3}$ mol = $\frac{1}{6}$ mol

$\frac{6}{3}$ mol of$MnO_4^{\ominus}$ = 1 mol of $I^{\ominus}$

$\therefore$ 2 mol of $MnO_4^{\ominus}$ = 1 mol of$I^{\ominus}$

119 **(d)**

(a) contains MeCH(OH) group, and (b) and (c) contain (MeCO) group. So the answer is (d)

120 **(a)**

Oxidation state of C in $CO_3^{2-}$is +4, which is maximum. So, it will not be oxidised

121 **(d)**

Haematite is Fe_2O_3, in which oxidation number of iron is III.

Magnetite is Fe_3O_4 which is infact a mixed oxide ($FeO.Fe_2O_3$.), hence iron is present in both II and III oxidation state.

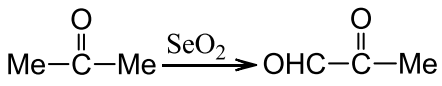
122 **(c)**

$H_2 + Pd + C$ (charcoal) selectively reduces (C ≡ C) to (C=C) bond, benzyl alcohol to toluene, azides to amines, and $(-NO_2)$ to $(-NH_2)$ group. So the answer is (c)

123 **(a)**

Birch reduction reduces one double bond of the benzene ring and gives a product with isolated double bond in which the EDG (e.g., here $(-CH_3)$ group) ends up on a double bond. So the answer is (a)

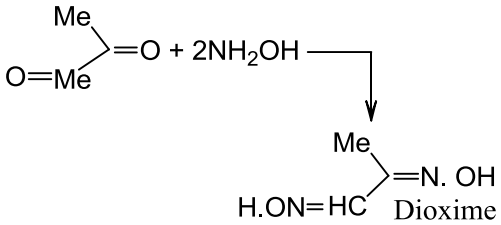
124 **(d)**



In (a), (A) reduces Tollens reagent, since it contains $(-CHO)$ group

In (b), (A) gives iodoform test, since it contains $(MeCO-)$ group

In (c), (A) forms dioxime, since it contains $(-CHO)$ and $\left(\diagdown C{=}O\right)$ groups



In (d), (A) does not give ceric ammonium nitrate test, since this test is given by alcohols and (A) does not contain an alcoholic group. So the answer is (d)

125 **(c)**

$Ba^{2+}(H_2PO_2)_2^{-1\times2}: H_2PO_2^{\ominus}: 2 + x - 4 = -1 \Rightarrow x = +1$

Oxidation state of P = +1

126 **(b)**

Coordination number

=Number of ligands ×denticity

= 3 × 2 (bidendate)

=6

$K_3^{+3}\left[Cr^{+3}(C_2O_4)_3^{-2\times3}\right]^{3-}$ $\therefore$ Oxidation state of Cr = +3

127 **(d)**

$NO_2(x = 4), N_2O_4(x = 4)$

Difference in oxidation state of N = 0

$P_2O_5$and P_4O_{10} (Difference in oxidation state of P is zero)

N_2O $(x = 1)$and $NO(x = 2)$

Difference in oxidation state of N = 1

$SO_2(x = 4)$ and $(SO_3)(x = 6)$

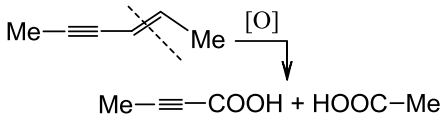
Difference in oxidation state of S = 2

128 **(a)**

The reduction of $ArNO_2$ group under acidic conditions with (Fe + HCl) or (Zn + CH_3COOH) or (Sn + HCl) gives $ArNH_2$ compound. So the answer is (a)

129 **(c)**

CrO_3 oxidises selectively (C = C) bond, not (C ≡ C) bond. So the answer is (c)

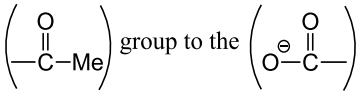


130 **(a)**

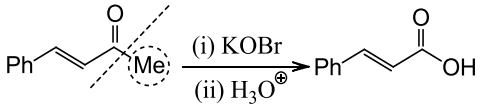
In MPV reduction, the catalyst is aluminium isoprop-oxide $(Me_2CH-O-)_3Al$ and solvent is isopropanol (Me_2CH— OH). So, the answer is (a)

131 **(b)**

In (a), acidic $KMnO_4$ would oxidise both the (C = C) bond and keto group. In (b), KOBr (Haloform reaction) would convert the

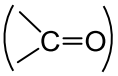


group, without affecting the (C=C) bond.



In (c), SeO_2/MeCOOH would oxidise the active methyl group to (−CHO) group.In (d), Jones reagent (H_2CrO_4 +aqueous acetone) will not react, so the answer is (b)

132 **(c)**

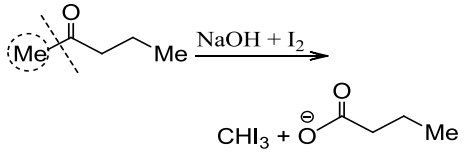
Wolff–Kishner reduction converts  group to ($-CH_2-$), and simultaneously dehydrohalogenates to alkene. So the answer is (c)

133 **(c)**

Br_2 is disproportionated in basic medium as

$3Br_2 + 3Na_2CO_3 \longrightarrow 5NaBr + NaBrO_3 + 3CO_2$

134 **(c)**



(it contains (ME − CO−) group and gives positive iodoform test)

135 **(b)**

$NO_2^{\ominus} + H_2O \longrightarrow NO_3^{\ominus} + 2H^{\oplus} + 2e^-$

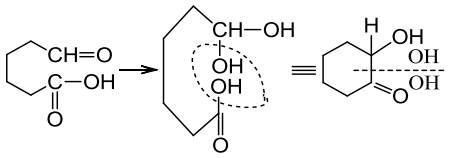
Balance charge on both sides

137 **(c)**

Oxidation state of C in $CO_2$is+4, which is maximum. So it does not undergo oxidation, and hence, it is not a reducing agent

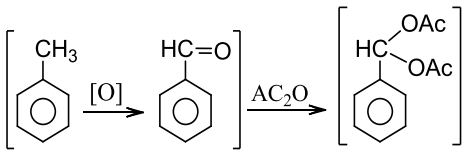
139 **(c)**

Proceed reverse:



So the answer is (c)

140 **(b)**



Intermediate compound

Hence, the answer is (b)

141 **(a)**

Statement is self-explanatory

143 **(c)**

(a) and (b) are disproportionation reactions

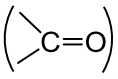
(c) is an oxidation reaction

$2H^{\ominus} \longrightarrow H_2 + 2e^-$

144 **(c)**

Etard reaction oxidises only terminal alkyl group ($-CH_3$) group to (−CHO) group. So the answer is (c)

145 **(d)**

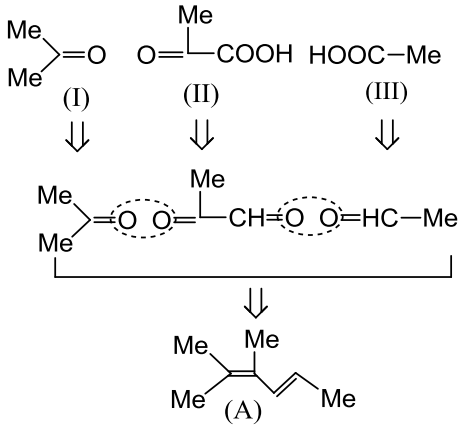
All the reagents convert  group to ($-CH_2-$) group. So the answer is (d)

146 **(c)**

LAH reduces $ArNO_2$ to (Ar − N = N − Ar) but does not reduce ArX (converts only 1°and 2° RX to RH and 3°RX to alkene). So the answer is (c)

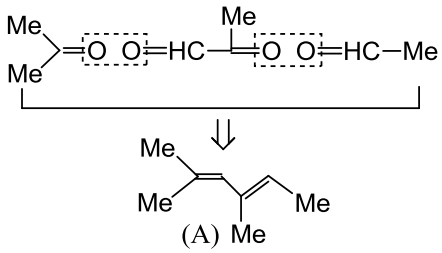
147 **(c)**

Proceed reverse: With O_3/H_2O, oxidative ozonolysis takes place



Product in (b).

Since bi-functional compound (II) is unsymmetrical, it can combine in different manners to give another compound (A)



Product in (a).

So the answer is (c)

148 **(c)**

(A)⇒HI + P reduces epoxides to alkanes

(B) ⇒LAH reduces expoxides to two different alcohols by cleaving the group from either side

149 **(a)**

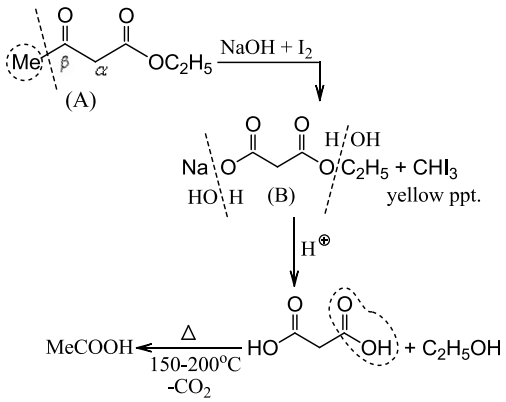
Pr_6O_{11}:

$6x - 22 = 0$

$\therefore x = \frac{22}{6}$

150 **(b)**

(A) must contain (MeCO−) group to give iodoform test. The reaction (C) to CH_3COOH shows that (C) must be β-keto acid because on heating it easily undergoes decarboxylation, (or) (C) must be a dibasic acid. On heating it also loses CO_2. Therefore, (C) must be a dibasic acid because after iodoformreaction, (A) is converted to sodium salt of acid. So the answer is (b)



So answer is (b)

151 **(a)**

The isolated double bonds are not reduced by Birch reduction. So the answer is (a)

152 **(d)**

Red P + HI reduces both alcohols and acids to alkanes. So the answer is (d)

153 **(b)**

The reduction of $ArNO_2$ group under neutral conditions with (Zn dust $+NH_4Cl$) or ($Al - Hg + H_2O$)gives hydroxylamine compound. So the answer is (b)

154 **(a)**

$K \longrightarrow K^{\oplus} + e^-$ (oxidation,acts as reducing agent)

$e^- + O_2 \longrightarrow O_2^{1-}$ (reduction,acts as oxidizing agent)

155 **(a)**

a. Oxidation states of Ca and C are +2 and +4, respectively, in both reactant and product: hence, not redox,

b.$4e^- + O_2 \longrightarrow 2O^{2-}$ (Reduction)

$H_2 \longrightarrow 2H^{\oplus} + 2e^-$ (Oxidation)

Hence, redox

c. $Na \longrightarrow Na^{\oplus} + e^-$ (Oxidation)

$2H^{\oplus} + 2e^- \longrightarrow H_2$ (Reduction)

Hence, redox

d. $e^- + Mn^{3+} \longrightarrow Mn^{2+}$ (Reduction)

$2Cl^{\ominus} \longrightarrow Cl_2 + 2e^-$(Oxidation)

Hence, redox

156 **(b)**

(i) (H_2 + Ni) converts (−CHO) group to ($-CH_2OH$) group. (ii) (H_2 + Ni) at high pressure also reduces double bond of benzene ring along with reduction of (−CHO) group to ($-CH_2OH$)

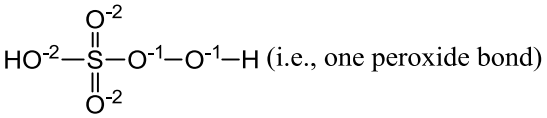
group. (iii) Birch reduction (Na + liq. NH_3 + C_2H_5OH) reduces one double bond of benzene ring to give product with isolated double bond in which EWG (in problem $(-CHO)$ group) ends up allylic to both double bonds. So the answer is (b)

157 **(a)**

$Cr^0(CO^0)_6$ Oxidation State Of $Cr = 0$

158 **(b)**

H_2SO_5 is



Oxidation state of $S = +6$

159 **(a)**

LAH and $NaBH_4$ both reduce azides (CH_3N_3) to 1°amine, so the answer is (a)

160 **(b)**

$BaO_2 + H_2SO_4(dil) \longrightarrow BaSO_4 + H_2O_2$

Oxidation state of O in $H_2O_2 = -1$

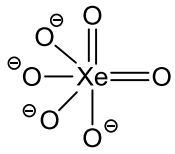
Oxidation state of O in $BaSO_4 = -2$

161 **(d)**

The phenols are not reduced by Birch reduction, whereas ArX gives the product containing isolated double bond without halogens. So the answer is (d)

162 **(a)**

No Peroxide bond in $[XeO_6]^{4-}$. Structure is



163 **(a)**

$(6e^- + Cr_2O_7^{2-} \longrightarrow 2Cr^{3+})$

$Sn^{2+} \longrightarrow Sn^{4+} + 2e^-$

Equivalent of $Cr_2O_7^{2-}$ =Equivalent of Sn^{2+}

$(n = 6)\ \ (n = 2)$

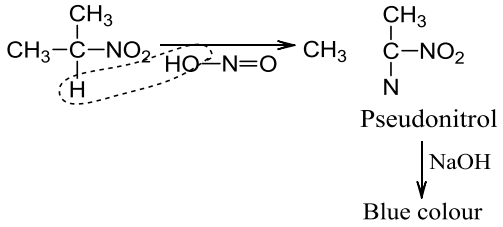
$\Rightarrow 1\ Eq = 1\ Eq$

$\frac{1}{6}\ mol = \frac{1}{2}\ mol$

$\frac{1}{3}\ mol\ of\ Cr_2O_7^{2-} = 1\ mol\ of\ Sn^{2+}$

164 **(c)**

The $2°\ (RNO_2)$ group reacts with $HNO_2(2NaNO_2 + H_2SO_4 \rightarrow 2HNO_2 + 2Na_2SO_4)$to give pseudonitrole, which gives blue colour with NaOH



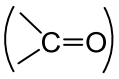
So the answer is (c)

166 **(c)**

It is a disproportionation reaction, so Cl_2 undergoes both oxidation and reduction

167 **(a)**

Wolff–Kishner reduction

$(NH_2NH_2 + glycol + \overset{\ominus}{O}H)$ converts  group to $(-CH_2)$ group without dehydrating alcohols to alkene. So the answer is (a)

168 **(d)**

$8Al \longrightarrow 8Al^{3+} + 24e^-$

$9Fe^{8/3+} + 24e^- \longrightarrow 9Fe$

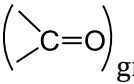
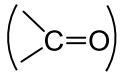
169 **(b)**

$6e^- + Cr_2O_7^{2-} \longrightarrow 2Cr^{3+}(n = 6)$

$2S_2O_3^{2-} \longrightarrow S_4O_6^{2-} + 2e^-\ (n = 2)$

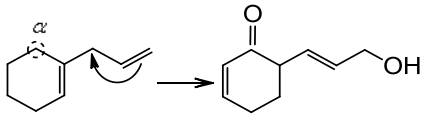
$\therefore$ Equivalent weight of$K_2Cr_2O_7 = M/6$

170 **(b)**

LAB reduces both  group and epoxide ring to alcohols, but $NaBH_4$ reduces only  group to2°alcohol. So the answer is (b)

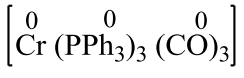
171 **(c)**

In cycloalkenes (unsubstituted), the ring methylene group at α-position to double bond is oxidised to (C==O) group, and simultaneously the terminal double bond is oxidised to 1°alcoholic group along with allylic migration of the double bond



So the answer is (c)

172 **(c)**



Oxidation state of Cr=0

173 **(a)**

More the steric hinderance, lesser is the periodic

oxidation. So the answer is (a)

174 **(a)**

$\overset{0}{Fe}(\overset{0}{CO})_5$

Oxidation state of Fe = 0

175 **(b)**

PbO_2 is a powerful oxidizing agent and liberates O_2 when treated with acids

$PbO_2 + 2HNO_3 \longrightarrow Pb(NO_3)_2 + H_2O + \frac{1}{2}O_2$

$PbO_2 + 4HCl \longrightarrow PbCl_2 + 2H_2O + Cl_2$

176 **(a)**

$\left.\begin{matrix} Fe^{2+} \longrightarrow Fe^{3+} + e^- \\ C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^- \end{matrix}\right] n = 3$

Equivalent weight of $FeC_2O_4 = \frac{M}{3}$

179 **(c)**

SO_2 is an oxidizing agent

$4e^- + SO_2 \longrightarrow S$

Equivalent of $SO_2 = \frac{64}{4} = 16$

180 **(a)**

Self explanatory

181 **(a)**

The balanced equation is

$2MnO_4^{\ominus} + 5C_2O_4^{2-} + 16H^{\oplus} \longrightarrow 2Mn^{2+} + 10\ CO_2 + 8H_2O$

182 **(c)**

1. Neutralisation
2. It is the change of an element in one form (Oxidation state= 0) to another form
3. Redox reaction
4. Physical change

183 **(c)**

It gives phenol

184 **(b)**

$Fe_{0.94}O: x \times 0.94 - 2 = 0$

$x = \frac{2}{0.94} = \frac{200}{94}$

Oxidation state of $O = \frac{200}{94}$

185 **(c)**

$ClO^{\ominus} \longrightarrow ClO_3^{\ominus} + 4e^-$ (oxidation)

$x - 2 = -1 \quad x - 6 = -1$

$x = +1 \quad x = 5$

$2e^- + ClO^{\ominus} \longrightarrow Cl^{\ominus}$ (reducation)

$x = 1 \qquad x = -1$

Hence, disproportionation

186 **(a)**

$H_4IO_6^{\ominus}; 4 + x - 12 = -1$

$\Rightarrow x = 7$

Oxidation state of I=+7

187 **(d)**

In (A), MnO_2 does not react with 1°or 2° alcohols. It oxidises only allylic or benzylic alcoholic group

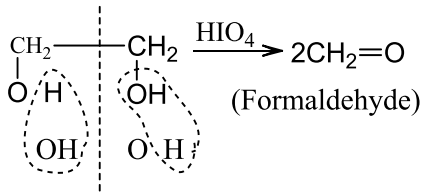
In (B), PCC oxidises 1°ROH to aldehyde without affecting the (C = C) bond. So the answer is (d)

188 **(d)**

3°(RNO_2) group does not react with HNO_2($NaNO_2 + HCl \rightarrow\ HNO_2 + NaCl$), since it does not contain α-H atoms. So the answer is (d)

189 **(d)**

a.

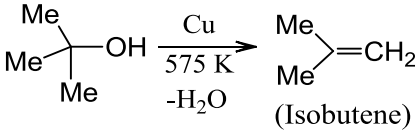


b.$K_2Cr_2O_7$ in acid has a bright orange colour when it oxidises an alcohol; it is reduced to blue-green due to the formation of Cr^{3+}

$CH_3CH_2OH + Cr_2O_7^{2-} \rightarrow CH_3COOH + 2Cr^{3+}$

(Orange) (Blue-green)

c.



d.The ethyl alcohol (C_2H_5OH) is denatured by the addition of poisonous substances such as CH_3OHor acetone or pyridine or $CuSO_4$. This is called methylated spirit or denatured spirit

So, the statement (d) is incorrect

190 **(d)**

In (a) $\left(\overset{\alpha}{Me-CH(Ph)-OH}\right)$ contains $\left(MeCH(OH)-\right)$

contains $\left(\begin{matrix} MeCH-OH \\ | \end{matrix}\right)$group, so it will give iodoforrn test

In (b), (PhCOMe) contains (MeCO−) group, so it will give iodoform test

In (c), C_2H_5Br under basic condition in iodoform test first is converted into (C_2H_5OH), which

contains $\begin{pmatrix} \text{MeCH OH} \\ | \end{pmatrix}$ group. So it will give iodoform test

In (d), $(MeCO)_2O$ is an anhydride and does not give Iodoform test. So the answer is (d)

191 **(d)**

LAH reduces (CHO) group to (CH_2OH) and also reduces double bond when Ph group is attached to β-position of double bond, whereas $NaBH_4$reduces only $(-CHO)$ group to (CH_2OH) group. So the answer is (d)

192 **(a)**

The balanced equation is

$14H^{\oplus} + 6e^- + Cr_2O_7^{2-} \longrightarrow 2Cr^{3+} + 7H_2O$

$6H_2O + 3SO_2 \longrightarrow 3SO_4^{2-} + 6e^- + 12H^{\oplus}$

$Cr_2O_7^{2-} + 2H^{\oplus} + 3SO_2 \longrightarrow 2Cr^{3+} + 3SO_4^{2-} + H_2O$

Or

$K_2Cr_2O_7 + H_2SO_4 + 3SO_2 \longrightarrow Cr_2(SO_4)_3 + K_2SO_4 + H_2O$

$\therefore x = 1, y = 3, z = 1$

193 **(c)**

Liebermann's nitroso reaction is given by phenol, 2°amine, and compounds containing nitroso $(-N = O)$ group. So the answer is (c)

194 **(c)**

Since 3° alcohols are not oxidised by (chromic anhydride $+H_2SO_4$) or $(Cr_2O_7^{2-} + H_2SO_4)$, so nochange of Cr^{6+}toCr^{3+}. Hence, no change of colour.

$K_2Cr_2O_7$ in acid has a bright orange colour when it oxidises an alcohol; it is reduced to blue-green due to the formation of Cr^{3+}

$CH_3CH_2OH + Cr_2O_7^{2-} \rightarrow CH_3COOH + 2Cr^{3+}$

(Orange) (Blue-green)

195 **(a)**

$Fe(s) \longrightarrow Fe^{2+} + 2e^-$(Oxidation)

$O_2 + 4H^{\oplus} + 4e^- \longrightarrow 2H_2O$ (Reduction)

Atmospheric oxidation:

$2Fe^{2+} + 2H_2O + \frac{1}{2}O_2 \longrightarrow Fe_2O_3 + 4H^{\oplus}$

Rust is $Fe_2O_3x\ H_2O$

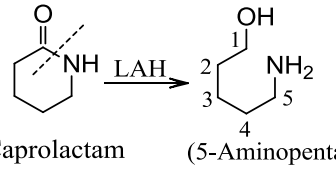
Corrosion or rusting occurs in the presence of water and air

196 **(d)**

Oxidation numbers of S inS^{2-}, SO_3^{2-}, SO_4^{2-}, and $S_2O_3^{2-}$are$-2, +4, +6,$ and$+2$ respectively

1. Difference in oxidation number of $N = 0$
2. Difference in oxidation number of $S = 2$
3. Difference in oxidation number of $S = 6$
4. Difference in oxidation number of $S = 8$

197 **(b)**



Caprolactam (5-Aminopentan-1-ol)

Hence the answer is (b)

198 **(b)**

b.ROH (aliphatic alcohol) on reaction with $(HNO_3 + H_2SO_4)$ gives $R - O - NO_2$. So (a) is incorrect and (b) is correct

c.LAH reduces $(-CHO)$ group to alcohol without affecting the $(C = C)$ bond

Note*: *LAH reduces the* $(C = C)$*bond only when Ph group isattachedto the* $\beta -$ *position of the* $(C = C)$ *bond)

So, the statement (c) is wrong

d.Ethers are obtained (Williamson synthesis) when 1°RX reacts with 3° alkoxide. In the problem, 3° RX reacts with 1°alkoxide. So alkene will be obtained. So, the statement (d) is wrong, and consequently the answer is (b)

199 **(c)**

In an aqueous medium, Li is the strongest reducing agent, since the high negative enthalpy of hydration compensates high IE_1

200 **(a)**

Intermolecular redox reaction and redox reactions are same.

a. Oxidation states of Ca and C are $+2$ and $+4$, respectively, in both reactant and product: hence, not redox,

b. $4e^- + O_2 \longrightarrow 2O^{2-}$ (Reduction)

$H_2 \longrightarrow 2H^{\oplus} + 2e^-$ (Oxidation)

Hence, redox

c. $Na \longrightarrow Na^{\oplus} + e^-$ (Oxidation)

$2H^{\oplus} + 2e^- \longrightarrow H_2$ (Reduction)

Hence, redox

d. $e^- + Mn^{3+} \longrightarrow Mn^{2+}$ (Reduction)

$2Cl^{\ominus} \longrightarrow Cl_2 + 2e^-$(Oxidation)

Hence, redox

201 **(a)**

$\left[\overset{+1}{Fe}(\overset{0}{H_2O})_5\overset{+1}{NO}\right]^{2+} SO_4^{2-}$

Oxidation state of Fe=+1

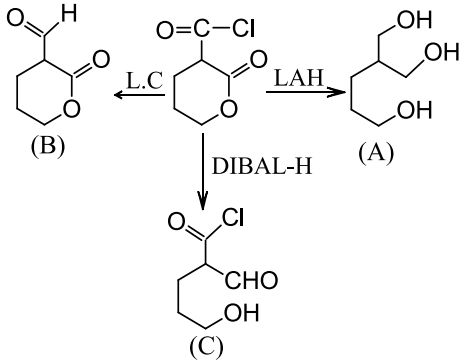
202 **(c)**

SO_4^{2-}cannot be oxidized since the oxidation state (+6) of S is highest

203 **(a)**

i. LAH/EtOH reduces both (RCOCl) and ester (here cyclic ester) to alcohols

(ii) Lindlar''s catalyst (H_2+ Poisoned Pd) reduces only (RCOCl) to aldehydes not esters (iii) DIBAL-H reduces ester to aldehyde and alcohol not (RCOCl) group

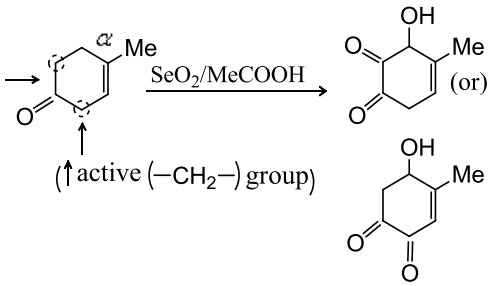


204 **(c)**

CH_2O: $x + 2 - 2 = 0 \Rightarrow x = 0$

205 **(c)**

SeO_2/MeCOOH oxidises active methylene group to (C=O) group and simultaneously hydroxylates the α-position of the substituted end of a double bond in cyclic compound



So the answer is (c)

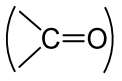
206 **(d)**

LAH reduces $ArNO_2$ to $(Ar - N = N - Ar)$ but does not reduce ArX (converts only 1°and 2° RX to RH and 3°RX to alkene)

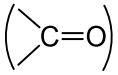
209 **(a,d)**

a. $NaBH_4$only reduces $(-CHO)$ group to alcohol but does not reduce $(-NO_2)$ group; hence it is the correct answer

b. The $(-NO_2)$ group is not reduced to $(-NH_2)$ group with $NaBH_4$. So it is the wronganswer

c. LAH reduces  group to 2°alcohol andalso (RNO_2) group to $(R - NH_2)$ group and $(ArNO_2)$ group to $(Ar - N = N - Ar)$. So it is the wrong answer

d. It is the correct answer because $ArNO_2$ has been reduced to $Ar - N = N - Ar$, and simtiltaneously

 to 2° alcohol

So the answers are (a) and (d)

210 **(a,c)**

a. The $MnO_4^{2-}$is reduced to Mn^{2+} so it must also be oxidized to Mn^{7+} ($MnO_4^{\ominus}$) since $H^{\oplus}$ is already in its maximum oxidation state

$5MnO_4^{2-} + 8H^{\oplus} \longrightarrow Mn^{2+} + 4MnO_4^{\ominus} + 4H_2O$

c. NO_2 disporportionates to NO and $NO_3^{\ominus}$ (Oxidation state of N is +5)

$3NO_2 + H_2O \longrightarrow NO + 2NO_3^{\ominus} + 2H^{\oplus}$

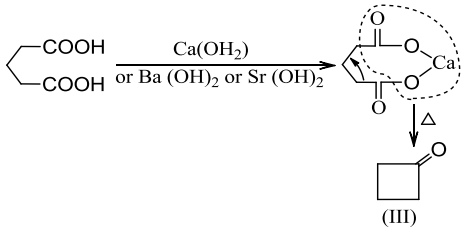
211 **(a,c,d)**

A ⇒The oxidation of (C=C) to acids can be carried out by either of the following: (i) acidic $KMnO_4$

(ii) ozonolysis followed by hydrolysis (O_3/H_2O),

(iii) ozonolysis followed by oxidation with Ag_2O, H_2O_2 peracid, or $KMnO_4/NaIO_4$

B ⇒ (II) is converted to Ca, Ba, or Sr salt by reacting with their hydroxides which on dry distillation or heating gives cyclic ketone with one C atom less than in II



C⇒The  group can be converted to $(-CH_2-)$ by either of the following:

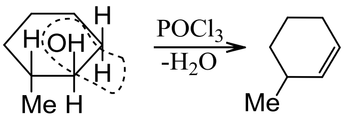
i. Clemmensen''''''''''''''''''''''''''''''''s reduction ($Zn-Hg/HCl$),

ii. Wolff–Kishner reduction $(NH_2NH_2 + \overset{\ominus}{O}H)$, or

iii. $HI + P$

So the answers are (a), (c), and (d)

214 **(b,c)**
During the elimination reaction, two eliminating groups should be in anti-position, so less substituted alkene (Hofmann product) is formed



So, statement (a) is wrong but (b) is correct
c. HI + P reduces aldehyde to alkane, so the product is correct
d. MnO_2 oxidises selectively allylic or benzylic hydroxyl group. So (A) does not have any allylic or benzylic hydroxyl group. Hence, no reaction occurs. Thus, wrong product. So the answers are (b) and (c)

215 **(a,b,c,d)**
All statements are self-explanatory

216 **(a,c)**

a.
$$\left.\begin{array}{r} H_2S_2O_7: 2+2x-14=0 \Rightarrow x=6 \\ Na_2S_4O_6: 2+4x-12=0 \Rightarrow x=2.5 \\ Na_2S_2O_3: 2+2x-6=0 \Rightarrow x=2 \\ S_8 \quad : 8x=0 \Rightarrow x=0 \end{array}\right]$$

Oxidation state of S

c. H_2SO_5 (Peroxo linkage)

Oxidation state of $S = +6$

$H_2SO_3: 2 + x - 6 = 0$

Oxidation state of $S = +4$

$SCl_2: x - 2 = 0$

Oxidation state of $S = +2$

$H_2S: 2 + x = 0$

Oxidation state of $S = -2$

217 **(a,b,c)**
(a) Oxidation state of K is +1 in both reactant and product

In (b), Oxidation state of Cr(+6) does not change

In (c),Oxidation statesof Ca and C and O do not change

In (d), the H_2O_2 which disproportionate is both oxidising and a reducing agent

218 **(a,c,d)**
Reduction potential of $F_2 > Cl_2 > Br_2 > I_2$
So F_2 can displace $Cl^{\ominus}$, $Br^{\ominus}$, and $I^{\ominus}$ but not vice versa
Similarly, Cl_2 can displace $Br^{\ominus}$ and $I^{\ominus}$ but not vice versa and Br_2 can displace only $I^{\ominus}$ but not vice versa
In (a), Fe (not Fe^{2+}) is a better reducing agent than $I^{\ominus}$

219 **(a,b,c,d)**
PbO_2 is a powerful oxidizing agent and liberates O_2 with acids

$$PbO_2 + 4HCl \longrightarrow PbCl_2 + 2H_2O + Cl_2$$

$$PbO_2 + 2HNO_3 \longrightarrow Pb(NO_3)_2 + H_2O + \frac{1}{2}O_2$$

$$Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + 4H_2O + Cl_2$$

$$Pb_3O_4 + 4HNO_3 \longrightarrow Pb(NO_3)_2 + PbO_2 + 2H_2O$$

221 **(a,b,c,d)**
a. $CrO_3/MeCOOH$, selectively oxidises $(C = O)$ bond, so the product is correct

b. Jones reagent (H_2CrO_4+ aqueous acetone)) oxidises 1°and 2° alcohols to aldehydes and ketones, respectively, but does not oxidise (C=C) bond; so the product is correct

MnO_2 oxidises only allylic or benzylic hydroxyl groups, so no reaction takes place

c. $SeO_2/MeCOOH$ selectively hydroxylate allylic position, and simultaneously converts active methylene group to $(-CHO)$ group, so the product is correct

d. The ring (B) containing EWG (e.g., $(-NO_2)$ group) is stable and therefore does not undergo oxidation, while ring (A) is oxidised

The ring (B) containing EDG (e.g., $(-NH_2)$ group)is unstable and undergoes oxidation. So both the products are correct

So the answers are (a), (b), (c), and (d)

222 **(a,d)**

Since I_2 is reduced to $I^{\ominus}$, so H_2O_2 must be oxidized to O_2. (Oxidation state of O is zero)

$$H_2O_2 + I_2 \longrightarrow 2I^{\ominus} + O_2 + 2H^{\oplus}$$

Sn^{2+} is oxidized to Sn^{4+}, soH_2O_2 must be reduced to H_2O. (Oxidation state of O is -2)

$$2H^{\oplus} + H_2O_2 + Sn^{2+} \longrightarrow Sn^{4+} + 2H_2O$$

226 **(a,b,c,d)**

$CH_2O: x + 2 - 2 = 0 \Rightarrow x = 0$; Oxidation state of $C = 0$

$CH_2Cl_2: x + 2 - 2 = 0 \Rightarrow x = 0$

Oxidation state of $C = 0$

$C_6H_{12}O_6: 6x + 12 - 12 = 0 \Rightarrow x = 0$

Oxidation state of $C = 0$

$C_{12}H_{22}O_{11}: 12x + 22 - 22 = 0 \Rightarrow x = 0$

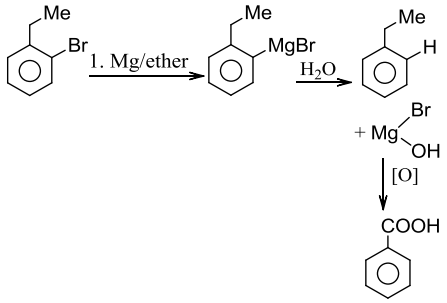
Oxidation state of $C = 0$

227 **(a,c)**

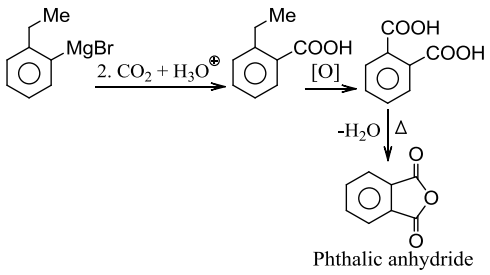
Statements are self-explanatory

228 **(b,c)**

a. It is the correct answer.

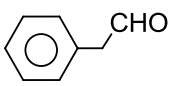


b. It is the wrong answer.



Phthalic anhydride

c. It is the wrong answer. Etard reaction partially oxidises terminal $(-CH_3)$ group to $(-CHO)$ group.So the answer should be



d. It is the correct answer

CrO_3 + acetic anhydride followed by the hydrolysis also oxidises terminal $(-CH_3)$ group to $(-CHO)$ group

So the wrong statements are (b) and (c)

229 **(c,d)**

c. $2e^- + ClO^{\ominus} \longrightarrow Cl^{\ominus}$ (Reduction)

$x - 2 = -1 \quad x = -1$

$x = +1$

$ClO^{\ominus} \longrightarrow ClO_3^{\ominus} + 4e^-$(Oxidation)

$x = 1 \quad x = 5$

d.In $HCuCl_2$, Cu is in $+1$ oxidation state which disproportionate to Cu^{2+} and Cu^0

232 **(a,c,d)**

Hydroxyl amines also give positive Tollens test as shown in reaction; so it is the correct reaction

It is a wrong reaction, since aromatic aldehydes are not oxidised by Fehling's solution

It is a correct reaction, since α-hydroxy ketones are oxidised by T.R. as shown in the reaction

It is a correct reaction, since formic acid (HCOOH) is oxidised by T.R. and F.S. to CO_2

So the answers are (a), (c), and (d)

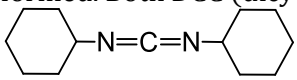
233 **(a,b)**

In (a),$MnO_4^{\ominus} \longrightarrow MnO_2$ occurs only in basic medium

In (b), $Cr(OH)_2 \longrightarrow Cr(OH)_3$ occurs only in basic medium. (c) and (d) occur only in acidic medium

234 **(b,c)**

Alcohols are dehydrated to alkene with concentrated H_2SO_4at $160 - 170°C$.At 10°C, dialkylsulphate is formed and at 140°C, ether is formed. Both DCC (dicyclo hexyl carbodiimide



andP_2O_5 can be used for the dehydration of alcohols to alkene. So the answers are (b) and (c)

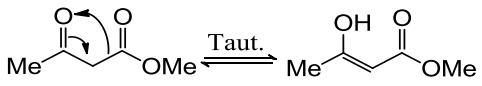
237 **(d)**

$COOH: x - 4 + 1 = 0 \Rightarrow x = 3$

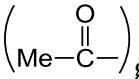
Oxidation state of C in COOH $= +3$

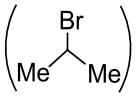
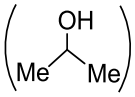
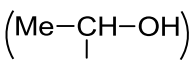
238 **(a)**

4. Methyl acetoacetate exists in enolic form



It does not give haloform reaction

5. It contains  group and gives haloform reaction

6. Under basic condition  is converted  and then it gives haloform reaction due to the presence  group

7. α-Hydroxy ketone also gives haloforrn reaction. So, (a) does not give haloform reaction and the answer is (a)

239 **(c,d)**

In both (c) and (d), the oxidation numbers of the various elements in the molecule do not change

240 **(b,c,d)**

a. In Cu_2O and Cu_2S, the oxidation state of Cu is $+1$. So they are reduced to Cu^0.

$(Cu^{1+} + e^- \longrightarrow Cu^0)$

242 **(a,b,d)**

The reactions in (a), (b), and (d) are wrong, but the reaction (c) is correct

In (a), in the end the colour is blood red

In (b), in the end the colour is blue

In (d), RX with $AgNO_2$ gives RNO_2 (nitro alkane) and not $R - O - N = O$ (alkyl nitrite)

$Me_3C - I \xrightarrow{AgNO_2} Me_3C - NO_2$

So the wrong reactions are (a), (b) and (d)

243 **(b,c,d)**

(b),(c) and (d) are redox reactions

In (a), there in no change n the oxidiation state $(+6)$ of Cr

244 **(b,d)**

Fehling's and Benedict's solutions oxidise HCOOH to CO_2 and aliphatic aldehyde to acid but not aromatic aldehyde (PhCHO) (phenyl methanal)

So the answers are (b) and (d)

250 **(a,b)**

$NaCNBH_3$ selectively reduces imines to give 1°or 2° amines. So the answers are (a) and (b)

251 **(b,c)**

$2S_2O_3^{2-} \longrightarrow S_4O_6^{2-} + 2e^-$ (Oxidation)

$I_2 + 2e^- \longrightarrow 2I^{\ominus}$ (Reduction)

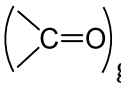
254 **(b,c)**

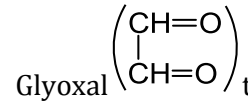
The lowest oxidation state is given by the group number -8 except metals

255 **(a,c,d)**

Two$(-OH)$ groups are at adjacent and syn (cis) positions. So it undergoes periodic oxidation

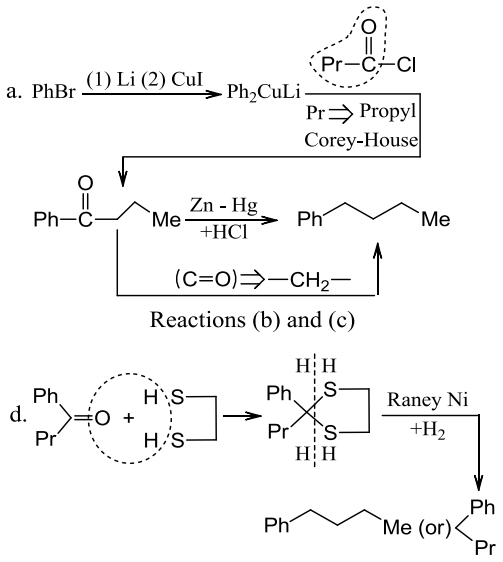
Although two $(-OH)$ groups are at adjacent position but in anti $(trans)$ position, so it does not undergo periodic oxidation

two  groups are in adjacent position, so it undergoes periodic oxidation

Glyoxal  two $(-CHO)$ groups are in adjacent position so it undergoes periodic oxidation

So the answers are (a), (c), and (d)

258 **(a,b,c,d)**



So the correct answers are (a), (b), (c), and (d)

261 **(a,b,d)**

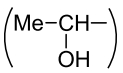
The average oxidation state is taken if both oxidation state are positive or negative including zero

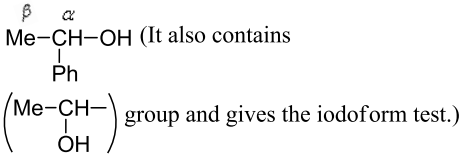
265 **(d)**

Statements (a), (b), and (c) are correct, but statement (d) is wrong. Hence, the answer is (d)

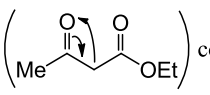
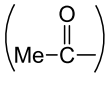
267 **(a,b,d)**

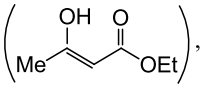
Methanol is also called carbinol

a. Me−CH(OH)− (It contains  group and gives the Iodoform test.)

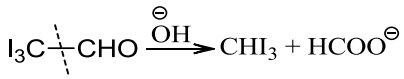
b. 

c. Although AAE (acetoacetic ester)

 contains  group, due to its existence in enolic form

 , it does not give the iodoform test.

d.(I_3C-CHO), this is one of the intermediate products formed in the iodofom reaction, so it gives iodoform test



So the answers are (a), (b), and (d)

269 **(a,c)**

In tailing of Hg, it loses its meniscus and sticks to glass, due to solubility of Hg_2O in Hg, when Hg gets oxidised to Hg_2^{2+} by O_3. It is removed byH_2O_2

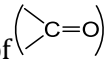
$2Hg + O_3 \longrightarrow Hg_2O + O_2$

$Hg_2O + H_2O_2 \longrightarrow 2Hg + H_2O + O_2$

272 **(b,c)**

H_2 + Pd + C (charcoal) reduces (C ≡ C) to (C=C), ($-NO_2$) to ($-NH_2$) benzyl alcohol ($PhCh_2OH$) to toluene ($PhCH_3$), and azides ($RN_3$to RNH_2). So, it does not react with ketone and (C=C) bond. Hence, the answers are (a) and (c)

273 **(c,d)**

A ⇒ The protection of  group by  (because it gives a six-membered ring). If the protection of  group is carried out by  it would give a five-membered ring (cyclic ketal)

B ⇒ Ester is converted to (ROH + R'OH). It can be carried out by LAH/ether, H_3O^+or by B_2H_6/THF

C ⇒ 1°Alcohol is converted to aldehyde and is carried out by PCC or by Jones reagent (H_2CrO_4 + aq. acetone)

D ⇒ Aldehyde is converted to alkane by Clemmensen's (Zn − Hg/HCl) or by Wolff- Kishner reduction ($PhNHNH_2$ + glycol + KOH)

E ⇒ Cyclic ketal is hydrolysed to give back ketone. So the answers are (c) and (d)

276 **(b,c,d)**

b. $S^{2-} \longrightarrow S + 2e^-$ (Oxidised)

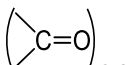
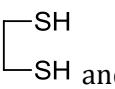
$3e^- + NO_3^{\ominus} \longrightarrow NO$ (N is reduced and HNO_3 is oxidizing agent)

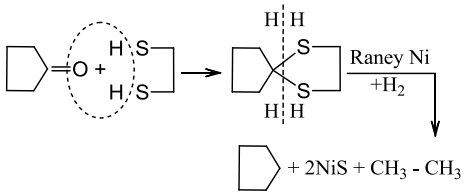
277 **(a,b,c,d)**

The element in a molecule having its oxidation state in the middle (i.e., greater than minimum and less than maximum) can be used as an oxidizing agent and a reducing agent both

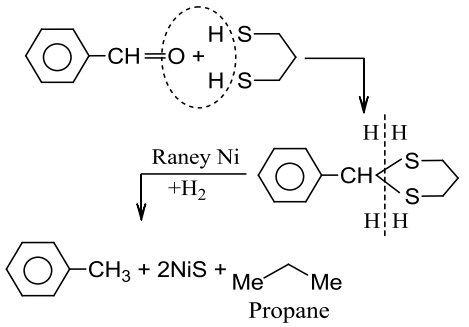
278 **(a,b,c,d)**

All the reactions are correct

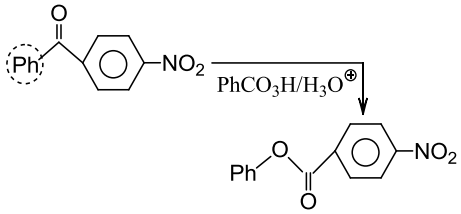
a. The protection of  group by  and then desulphurisation with (Raney Ni+H_2)



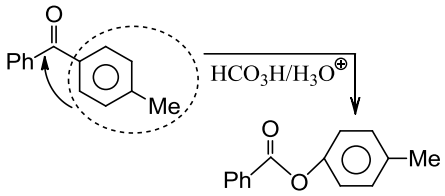
b. The protection of (−CHO) group by  and then desulphurisation with (Raney Ni+H_2)



c. It is an example of Baeyer-Villiger oxidation, in which the migrating power of Ph−> *p*-nitrophenyl



d. It is also an example of Baeyer-Villiger oxidation in which the migrating power of*p*-tolyl. (Me-C6H4-) >Ph



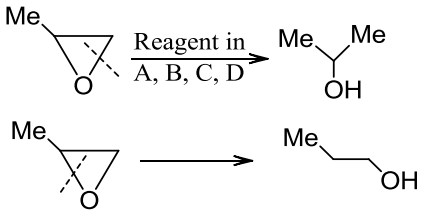
So the correct answers are (a, b, c, and d)

280 **(a,b,d)**
Same explanation as in answer of question 21 above

281 **(a,b,c)**
Statements (a), (b), and (c) are correct, but statement (d) is incorrect, although HCOOH + PCl_5 gives H−C(=O)−Cl (Formyl chloride) but it is unstable and does not exist

283 **(a,b,c,d)**
All the statements are explanations in themselves

285 **(a,d)**
All reagents in (A), (B), (C), and (D) react with epoxides to give the desired products



The reagents in (E), (F), and (G) do not react with epoxides

286 **(b,c,d)**
All the statements are explanations in themselves

288 **(a,b)**
(I)⇒Dilute HNO_3 oxidises only one (Me −) group to (−COOH) group

(II) ⇒EWG, e.g., ($-NO_2$) group makes the benzene ring stable, so either acidic $KMnO_4$or acidic $K_2Cr_2O_7$can be used to oxidise the (Me−) group to (−COOH) group

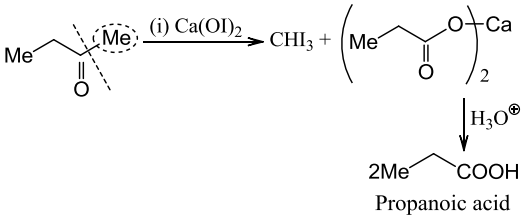
(III) ⇒ (−I) effect of Cl makes the benzene ring stable, so oxidising agent such as alkaline $KMnO_4$or acidic $K_2Cr_2O_7$can be used to oxidiset h e (Me—) group to (COOH)

(IV) ⇒ EDG (+R) effect) of (−OH) group makes the benzene ring unstable, so either (−OH) has to be protected by tosylation using TsCl and then oxidation of (Me−) group to (−COOH) group by acidic $KMnO_4$is carried out followed by hydrolysis or by using a very mild O.A. such as

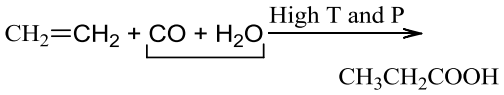
$PbO_2/\overset{\ominus}{O}H, H_3O^{\oplus}$. So the answers are (a) and (b)

289 **(a,b,c,d)**
All are the correct reactions

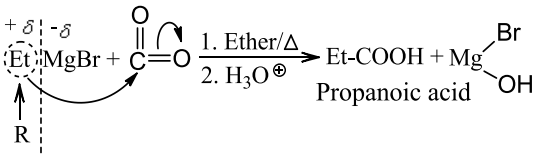
a. It is the correct reaction



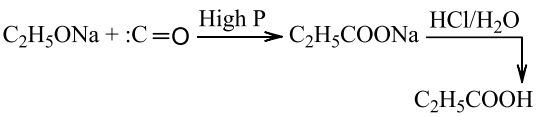
b. It is the correct reaction



c. It is the correct reaction. CO_2 is called dry ice



d.



So the answers are (a), (b), (c), and (d)

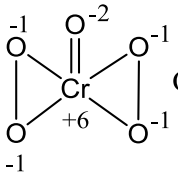
290 **(a,b,c,d)**

All statements are self –explanatory

294 **(b,c)**

1. $Fe^{+2}(Cr_2O_4)^{2-}$: Oxidation state of $Cr = +3$

b. $K^{\oplus}[CrO_3Cl]^{\ominus}$: Oxidation state of $Cr = +6$

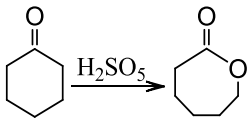
c.  Oxidation state of $Cr = +6$.

(Two peroxo linkage)

d. $[Cr(OH)_4]^{\ominus}$: Oxidation state of $Cr = +3$

296 **(a,b,d)**

a.



b. The migrating power of $Me_3C->$ Ph., so the product is correct

c. The product is wrong because here the (Ph) group has migrated but the migrating power of $Me_3C->$ Ph

d.The migrating power of Ph > H, so the product is correct. Hence, the answers are (a), (b), and (d)

299 **(a,c)**

$NaBH_4$reducesonly the $(-CHO)$ group to $(-CH_2OH)$ group but does not reduce $(C = C)$ bond

H_2/Pt reduces both the $(-CHO)$ group to $(-CH_2OH)$ group and the $(C = C)$ to$(C - C)$ bond

$H_2/Pd/C$ reduces only the $(C = C)$ to $(C - C)$ bond

So the answers are (a) and (c)

302 **(a,c,d)**

In this reaction, C_2H_5OH is changing to CHI_3

$\overset{+2+1\ -1\times3}{(\text{i.e. } CH\ \ I\ \ )}$ and $HCOO^{\ominus}$ ion

$$\underset{2x+5-2+1=0}{C_2H_5OH} \longrightarrow \underset{x+1=3}{CH^{3+}} + \underset{1+x-4=1}{HCOO^{\ominus}}$$

$$2x = -4 \qquad x = 2 \qquad x = 2$$

$$4 - (-4) = 8e^{\ominus}$$

$\therefore C_2H_5OH \longrightarrow CH^{3+} + HCOO^{\ominus} + 8e^{\ominus}$

Balance O and H in basic medium

Balancing of O atom by adding H_2O to LHS

$C_2H_5OH \longrightarrow CH^{3+} + HCOO^{\ominus} + 8e^{\ominus}$

Balancing of H atom by adding $6H_2O$ to RHS and simultaneously add $6\,\overset{\ominus}{OH}$ to LHS

$$C_2H_5OH + H_2O + 6\,\overset{\ominus}{OH} \longrightarrow CH^{3+} + HCOO^{\ominus} + 6H_2O + 8e^{\ominus} \quad ...(i)$$

It is a balanced equation. Similarly, balance the reduction reaction

$2e^- + I_2 \rightarrow 2I^{\ominus}$ ...(ii)

Multiply equation (ii) by 4 and add equation (i) and (ii)

$$C_2H_5OH + \cancel{H_2O} + 6\,\overset{\ominus}{OH} \longrightarrow CH^{3+} + HCOO^{\ominus} + 6H_2O + \cancel{8e^{\ominus}}$$

$$8e^{\ominus} + 4I_2 \longrightarrow 8I^{\ominus}$$

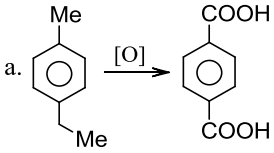
$$C_2H_5OH + 6\,\overset{\ominus}{OH} \longrightarrow CH^{3+} + HCOO^{\ominus}\ 5H_2O + 8I^{\ominus}$$

CH^{3+} is combined with $3I^{\ominus}$ to form CHI_3

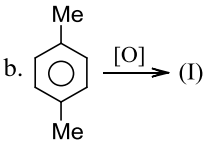
So net balanced equation is:

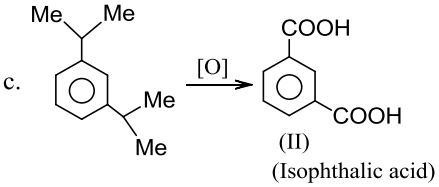
$$C_2H_5OH + 6\,\overset{\ominus}{OH} \longrightarrow CHI_3 + HCOO^{\ominus} + 5I^{\ominus} + 5H_2O$$

303 **(a,b)**

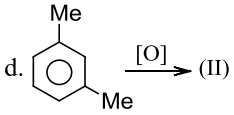


(I) (Terephthalic acid)





(II) (Isophthalic acid)



So the correct answers are (a) and (b)

306 **(a,b)**

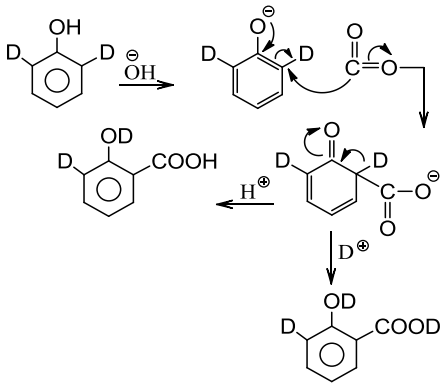
The direct conversion of ester to (RCHO + R'OH) can be carried out either by $NaAlH_4$or by DIBAL-H. So the answers are (a) and (b)

308 **(a,b,c,d)**

Statement are self–explanatory

313 **(a,b,d)**

a. It is an example of Kolbe''s reaction



So both the products are correct

b. ($SnCl_2$ + HCl) selectively reduces ($-NO_2$) group *ortho*to (Me−) (EDG) group, but (NH_4SH) selectively reduces ($-NO_2$) group *para*to (Me−) (EDG) group. So both the products are correct

c. Due to (+I) effect of three (Me−) groups; the benzene the ring is activated and is unstable. So, the oxidation of benzene ring takes place, while due to the absence of benzylic H atom in t-butyl group, the oxidation of side chain does not take place. So the products (II) and (III) are correct, but product (I) is wrong. So the answer (c) is wrong

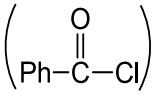
d. In acidic medium (Sn + HCl), the ($-NO_2$) group is reduced to ($-NH_2$) group. So product (I) is correct. In neutral medium (Zn + NH_4Cl or Al − Hg (H_2O), (NO_2) group is reduced to (NHOH) group. So product (II) is correct

In basic medium with Na_3AsO_3 + OH ($-NO_2$) group is converted to azoxy group, so product (III) is correct. Hence, the answers are (a), (b), and (d)

314 **(a,b,c,d)**

All the reactions are correct

a. Lindlar''s catalyst converts



group to (PhCHO)

b. Lithium aluminum *t*-butoxide also converts (PhCOClgroup to (PhCHO)

c. DIBAL-H converts PhC ≡ N to PhCHO

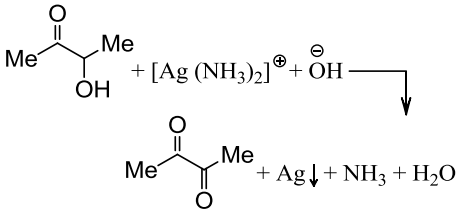
d.PCC or Collins reagent converts 1°alcohol to aldehyde, i.e., Ph CH_2OH to PhCHO

So the answers are (a), (b), (c), and (d)

315 **(a,b)**

a. Compound (I) contains

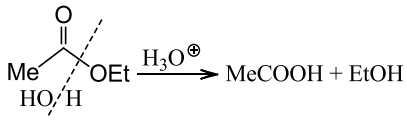
group and hence gives iodoform test. It also contains 1° alcoholic group and hence gives white turbidity on heating with Lucas reagent (anhydrous $ZnCl_2$: conc. HCl = 1:1). Compound (II) reduces Tollens reagent, although it does not contain (−CHO) group but T.R. test is also given by α-hydroxy ketones



So the statement (a) is correct

b. Compound (III) is an aldehyde, so it gives

positive T.R. test but it does not give haloform reaction with NaOBr or ($NaOH + B_2$), since it does not contain ($CH_3 - CHO$) group. So the statement (b) is also correct



(IV)

c.

But the answer given is $C_2H_5COOH + MeOH$. So statement (c) is wrong

d. Compound (V) on heating cannot decarboxylate, but with soda lime it can decarboxylate to give propane. Only acids containing β-keto groups can easily undergo decarboxylation on heating

So the statement (d) is wrong

Hence, the answers are (a) and (b)

316 **(a,b,c,d)**

$4KO_2 + 2H_2O \longrightarrow 4KOH + 3O_2$

[Hydrolysis, disproportionation and redox]

$4KOH + 4CO_2 \longrightarrow 4KHCO_3$(Acid-base reaction)

317 **(a,b,d)**

The highest oxidation state is given by the group number except F and O

318 **(a,b,c)**

(a), (b), and (c) are autoredox or disproportionation reaction

319 **(a,b)**

a. Phenol is also called carbolic acid

Benzoic acid is more acidic than phenol. So the acid reacts with $NaHCO_3$ to give CO_2 (g), while phenol does not react

b. Acids give buff-coloured precipitate with neutral $FeCl_3$, while phenol gives violet colouration with neutral $FeCl_3$ solution, e.g.,

$3PhCOOH + FeCl_3 \rightarrow (PhCOO)_3Fe + 3HCl$

(Ferric benzoate)

(Buff coloured ppt.)

$3PhOH + FeCl_3 \rightarrow (PhO)_3\,Fe + 3HCl$

(Ferric Phenoxide)

(Violet colouration)

c. Both acid and phenol react with aqueous NaOH to give their corresponding salts

$PhCOOH + NaOH \rightarrow PhCOONa$

$PhOH + NaOH \rightarrow PhONa$

d. Both acid and phenol react with NH_3

$PhCOOH + NH_3 \rightarrow PhCONH_2$(Benzamide)

$+H_2O$

$PhOH + NH_3 \rightarrow PhNH_2$ (Aniline) $+H_2O$

So the answers are (a) and (b)

321 **(c)**

$2KI + CuSO_4 \longrightarrow CuI_2 + K_2SO_4$

$2CuI_2 \longrightarrow Cu_2I_2 + I_2$

$I_2 + 2Na_2S_2O_3 \longrightarrow Na_2S_4O_6 + 2NaI$

322 **(a)**

Oxidation number of N CO=0 (zero) as it a neutral ligand.

Oxidation number of Ni in $[Ni(CO)_4]$ is also zero.

323 **(a)**

$2CrO_4^{2-} \xrightarrow{H^+} Cr_2O_7^{2-}$ Cr in +6 state.

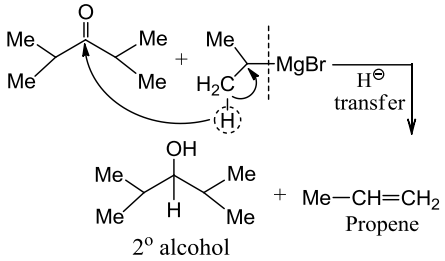
Yellow orange

Cr in +6 state.

324 **(c)**

Potassium dichromate react with alcohol and the reduction of potassium dichromate takes place and dichromate (orange red) changes to Cr^{3+} (green).

325 **(a)**



Here, the G.R. acts as a reducing agent because the reaction takes place *via* hydride ion ($H^{\ominus}$) transfer to ketone and G.R. itself is converted to alkene

Both statements are true, so the answer is (a)

326 **(c)**

The electrons liberated during oxidation of

species are used by I_2 to get itself reduced.

327 **(a)**

The equivalent point is nearly same but not exactly same to end point. However for all practical purposes the two are taken same.

328 **(b)**

Assertion: $Fe_3O_4 \equiv (\overset{+2}{FeO} \cdot \overset{+3}{Fe_2O_3})$

The oxidation states of Fe in FeO and Fe_2O_3 are $+2$ and $+3$

$$Fe^{2+} + MnO_4^{\ominus} \longrightarrow Fe^{3+} + Mn^{2+}$$

Reason: (Pink) (Colourless)

Both (A) and (R) are correct, and (R) is not the correct explanation for (A)

329 **(e)**

Correct (A) : The reaction occurs in a basic medium

Correct (R) :$MnO_4^{\ominus}$ is reduced to MnO_2 in a mild basic medium or neutral medium whereas in an acidic medium $MnO_4^{\ominus}$ is reduced to$Mn^{2+}$and in a strong basic medium, it is reduced to MnO_4^{2-}

330 **(c)**

(A) Is correct and (R) is incorrect

Correct (R): The drying agent gets wet during the process, since water must go into it. In redox reaction, the oxidant is reduced; the reducing agent is oxidized. The electrons are transferred in a manner similar to the water in drying analogy

331 **(b)**

Both (A) and (R) are correct; but (R) is not the correct explanation for (A). SO_2 can act both as an oxidizing agent and a reducing agent, but in this reaction, SO_2 is an oxidising agent and H_2S is a reducing agent

$SO_2 + 2H_2S \longrightarrow S + 2H_2O$

$S^{2-} \longrightarrow S + 2e^-$ (Oxidation) (Reducing agent)

$4e^- + SO_2 \longrightarrow S$ (reduction) (Oxidising agent)

332 **(c)**

One mole of $KMnO_4$ shows a change of N electrons.

333 **(c)**

The explanation is correct reason for statement.

334 **(a)**

Assertion: $\overset{+8}{XeO_6}^{4-} + 2\overset{-1}{F}^{\ominus} + 6H^{\oplus} \longrightarrow \overset{+6}{XeO_3} + \overset{0}{F_2} + 3H_2O$

Reason: The oxidation number of Xe deceases from $+8$ to $+6$ in XeO_3 while that of F increases from -1 to zero. Therefore, XeO_6^{4-} is reduced while $F^{\ominus}$ is oxidized Hence,XeO_6^{4-} is a stronger oxidant thanF_2

335 **(c)**

The explanation is correct reason for statement.

336 **(a)**

Both (A) and (R) are correct, and (R) is the correct explanation for (A)

$Sn + 2HCl \longrightarrow SnCl_2 + H_2$

The oxidation potential of $Sn/SN^{2+}$is greater than the oxidation potential of$H_2/2H^{\oplus}$. Hence, Sn is a better reducing agent thanH_2

337 **(e)**

Correct (A):F_2 does not undergo disproportionation reaction

Correct (R):F_2shows only an oxidation of -1

338 **(c)**

Statement 1 is true, but statement 2 is false because Benedict's solution is ammoniacal $CuSO_4$ solution containing sodium citrate

339 **(d)**

Correct (A):SO_2 can act both as an oxidizing and a reducing agent. O_3 can act only as an oxidant

Reason: The oxidation number of O in O_3 is zero.It can only decrease from zero to

-1 or-2 but cannot increase to $+2$. Therefore, it can act as an oxidant only. In SO_2 the oxidation number of S is $+4$. It can have a minimum oxidation number of -2 and maximum of $+6$. Its oxidation number either decreases or increases, and hence, it can act both as an oxidizing and a reducing agent

340 **(c)**

The explanation is correct reason

$2O^- \longrightarrow O_2^0 + 2e$

$O^- + e \longrightarrow O^{2-}$

341 **(d)**

Each atom in an elemental from is assigned an oxidation number of zero. For example, hydrogen atom in H_2 and oxygen atom in O_2 or O_3, carbon in diamond and graphite, all have oxidation number equal to zero.

342 **(c)**
The explanation is correct reason for statement.

343 **(a)**
Both the statements are true

344 **(a)**
Both the statements are true and statement 2 is the correct explanation of statement I

345 **(c)**
The explanation is correct reason of the statement.

346 **(a)**
Both (A) and (R) are correct, and (R) is the correct explanation for (A) since the oxidation number of N in HNO_3 is maximum (+5): therefore, it can only decrease. Hence,HNO_3 acts as an oxidising agent

In HNO_2,the Oxidation number of N is +3, so it can increase by losing electrons or can decrease by accepting electrons. Therefore, HNO_2 acts both as an oxidizing as well as reducing agent

347 **(c)**
N in NH_4^+ is in -3 oxidation state and in NO_2^- it is in +3 oxidation state.

348 **(d)**
Correct (A):$PbCl_2$ is more stable than $PbCl_4$ or$Pb^{2+}$is more stable than Pb^{4+}(due to the inert pair effect)

$2e^- + Pb^{4+} \longrightarrow Pb^{2+}$ (Reduction) (Oxidising agent)

349 **(a)**
The reactant (A) is *trans*.Oxymercuration and demercuration take place by anti-mechanism, so the product (B) would be racemic [*trans* reactant (with two same group) + anti (*trans*) mechanism of reagent →Racemic product]. Both the statements 1 and 2 are true, so the answer is (a)

350 **(c)**
$KMnO_4$ is reduced to MnO_2 by oxalic acid. The redox change is catalyzed by Mn^{2+} ions *i. e.*, auto-catalysis.

351 **(d)**
Both statement and explanation are correct but explanation is not reason for statement.

352 **(e)**
Correct (A):

H_2O_2 acts both as an oxidizing and a reducing agent

$\left(H_2O_2 \longrightarrow O_2 + 2H^{\oplus} + 2e^-\right)$

(Oxidation;acts as a reducing agent)

$(2e^- + 2H^{\oplus} + H_2O_2 \longrightarrow 2H_2O)$

(Reduction;acts as oxidizing agent)

In H_2O_2, the oxidation number of O is -1. O can have a minimum oxidation number of -2 and a maximum oxidation numbers of zero. The oxidation number can either decrease from -1 to -2 or can increase from -1 to zero

Correct (R)

All peroxides can act either as an oxidizing agent or as a reducing agent or both

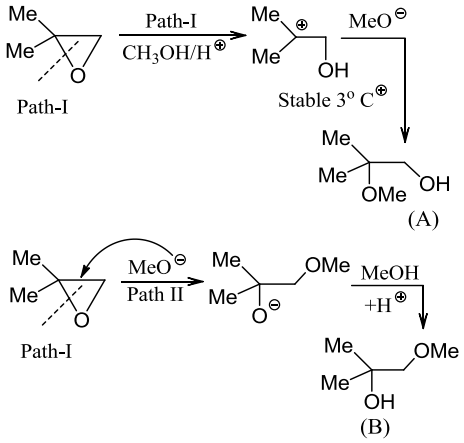
353 **(a)**
Both (A) and (R) are correct, and (R) is the correct explanation for (A)

In $KMnO_4$, the oxidation state Mn is +7. (highest oxidation state) and is reduced toMn^{2+}, whereas in$K_2Cr_2O_7$, the oxidation state of Cr is +6 (highest oxidation state) and is reduced to Cr^{3+}

$Mn^{2+}$is more stable than Cr^{3+}. Hence, $KMnO_4$ is a stronger oxidizing agent than $K_2Cr_2O_7$

354 **(c)**
Equivalent = Mole × Valence factor.

355 **(d)**
In acidic medium, the reaction proceeds *via* the formation of stable carbonium and takes place by SN^1 mechanism. In basic medium, the reaction proceeds *via*SN^2 mechanism and the nucleophile $MeO^{\ominus}$ attacks at the less hindered side



Both the statement are false,so the answer is (d)

356 **(c)**

Oxidation number of N is changed according to compounds

(-1 to +5) N has five types of oxides as NO_2, NO, N_2O_3, N_2O_4 and N_2O_5. All have different oxidation states in different compounds.

357 **(c)**

Explanation is correct reason for statement

358 **(c)**

Haloform reaction is given only by aldehydes (containing $(CH_3 - CHO)$ group), ketones (containing $(Me - CO-)$ group), and alcohols (containing $(CH_3 - CH(OH) -)$ group), not by acids. So acetic acid does not give haloform reaction

In acetic acid $(CH_3 - COOH)$, α-hydrogen atoms are present. Hence, statement I is correct but statement II is incorrect. So the answer is (c)

359 **(c)**

The reduction of $(C \equiv C)$ to $(C=C)$ takes place by anti-addition of hydrogen with $(Na + \text{lig. } NH_3 + EtOH)$, so the product formed is (B). Statement 1 is true. But statement 2 is false, since the mechanism of the reaction proceeds as follows.

Radical anion →Vinylic radical →Vinylic anion → product

Statement 1 is true and statement 2 is false. So the answer is (c)

360 **(c)**

$5e + Mn^{7+} \longrightarrow Mn^{2+}$(Acidic)

$3e + Mn^{7+} \longrightarrow Mn^{4+}$(Alkaline or Neutral)

$1e + Mn^{7+} \longrightarrow Mn^{6+}$(Neutral or Alkaline)

361 **(d)**

The reason is that the sum of ox.no. of elements in a molecule is equal to zero.

362 **(a)**

+7

$$2\,MnO_4^-(aq) + Br^-(aq) + H_2O(l) \rightarrow$$

$$+4 \qquad +5$$

$$MnO_2(aq) + BrO_3^-(aq) + 2OH^-(aq)$$

Oxidation number is changes as -1 to + 5 (so loss of $6e^-$).

363 **(c)**

Explanation is correct reason for statement.

364 **(c)**

$(As^{3+})_2 \longrightarrow 2As^{5+} + 4e$

$(S^{2-})_3 \longrightarrow 3S^{6+} + 24e$

$[As_2S_3 \longrightarrow 2As^{5+} + 3S^{6+} + 28e] \times 3$

$[3e + N^{5+} \longrightarrow N^{2+}] \times 28$

365 **(c)**

One mole of $K_2Cr_2O_7$ shows a change of six N electrons.

366 **(c)**

The explanation is correct reason of the statement.

367 **(d)**

Correct (**A**):F_2 is a stronger oxidizing agent than O_2. Since reduction potential of $F_2/2F^{\ominus}$ is greater than the reduction potential of$O_2/2O^{2-}$. Moreover, F_2 oxidises

H_2O to O_2

$$2F_2(g) + 2H_2O(l) \longrightarrow 4H^{\oplus}(aq) + 4F^{\ominus}(aq) + O_2(g)$$

368 **(c)**

Schiff's or Fehling's or Benedict's solutions are weak oxidising agents, hence they oxidise only aliphatic aldehydes, but benzaldehyde (PhCHO) is an aromatic aldehyde. So, statement 1 is true but statement 2 is false

369 **(a)**

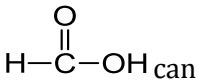
In general, oxidation is the loss of electrons and the reactant like, magnesium that loses electrons acts as a reductant or reducing agent.

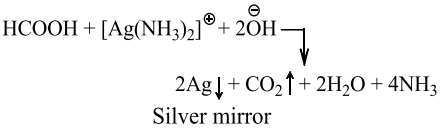
370 **(b)**

Both the statements are true but statement 2 is not the correct explanation of statement 1; so the answer is (b).

The correct explanation would be that

O


can be considered to contain both an aldehyde ($-CH=O$) and a carboxyl group ($-COOH$). Therefore, formic acid behaves as a reducing agent.



371 **(a)**

Both (A) and (R) are correct and (R) is the correct explanation for (A)

$I_2 + Fe \longrightarrow Fe^{2+} + 2I^{\ominus}$

$I^{\ominus} + Fe^{2+} \longrightarrow$No reaction

The oxidation potential of $Fe/Fe^{2+}$is greater than the oxidation potential of $2I^{\ominus}/I_2$

372 **(a)**

3-Phenylprop-2-en-1-al — 3-Phenylpropan-1-ol

Since LAH reduces $(-CHO)$ group to $(-CH_2OH)$ group and (C=C) bond when (Ph) group is attached to the β-position of the (C=C) bond, so both the statements are true and the answer is (a)

373 **(c)**

Correct (R):Cl_2 is an oxidizing agent while SO_2 is a reducing agent

374 **(c)**

(**a → r**) $BiO_3 + NaOH + NaOCl \longrightarrow NaBiO_3 + NaCl + H_2O$

(**b → s**) $MnO + PhO_2 + HNO_3 \longrightarrow HMnO_4 + Pb(NO_3)_2 + H_2O$

(**c → p**) $Na_2TeO_3 + NaI + HCl \longrightarrow NaCl + Te + H_2O + I_2$

(**d → t**) $K_3[Fe(CN)_6] + Cr_2O_3 + KOH \longrightarrow K_4[Fe(CN)_6] + K_2CrO_4 + H_2O$

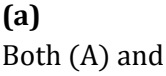
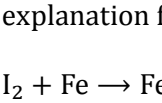
(**e → q**) $CoCl_2 + Na_2O_2 + NaOH + H_2O \longrightarrow Co(OH)_3 + NaCl$

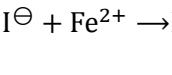
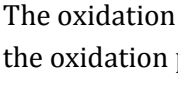
376 **(a)**

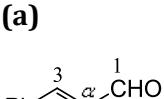
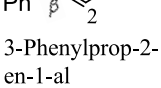
(a → r)(C = C) and (C = O) bonds can be reduced by catalytic hydrogenation. But selective reduction with 1 mol of H_2/Pd will reduce the (C = C) bond and not the (C = O) bond because the reactivity of (C = C) bond is greater than that of the (C = O) bond in catalytic hydrogenation

(b → p) Hydrogenation with Raney Ni converts both the (C = C) bond to the (C − C) bond and the (C = O) bond to the ($CH_2 - OH$) group

(c → s)$NaBH_4$+ MeOH selectively reduces the (C = O) group to alcohols. Also, it does not reduce (C = C) bond

(d → q) The reduction with $NaBH_4$ or LAH takes $H^{\ominus}$ion and adds to C atom of (C = O) group to give  and another $H^{\oplus}$comes from the solvent H_2O to give 

If $NaBD_4/H_2O$ is used, the  group is converted to  .So the answer is (q)

(e →t) If $NaBH_4/D_2O$ is used, the  group is converted to  group. Same explanation as in (D). So the answer is (t)

378 **(b)**

(**a → p**)$2Cu \longrightarrow 2Cu^{2+} + 4e^{-}$] Oxidation

$2Cu + 4HNO_3 \longrightarrow 2Cu(NO_3)_2 + 4e^{-} + 4H^{\oplus}$ ...(i)

$e^{-} + HNO_3 \longrightarrow NO_2$
$3e^{-} + HNO_3 \longrightarrow NO$] Reduction

$4e^{-} + 2HNO_3 \longrightarrow NO_2 + NO$ ...(ii)

Adding equation (i) and (ii), we get

$2Cu + 6HNO_3 \longrightarrow 2Cu(NO_3)_2 + NO + NO_2 + 4H^{\oplus}$

x and y are 2 and 6

(**b → q**) $BaCrO_4 + KI + HCl \longrightarrow BaCl_2 + I_2 + KCl + CrCl_3 + H_2O$

$2I^{\ominus} \longrightarrow I_2 + 2e^{-}$] × 3 (Oxidation)

$3e^{-} + CrO_4^{2-} \longrightarrow Cr^{+3}$] × 2 (reduction)

$6I^{\ominus} + 2CrO_4^{2-} \longrightarrow 3I_2 + 2Cr^{3+}$

x and y are 6 and 2

(**c → r**) $As_2S_3 + HNO_3 \longrightarrow H_3AsO_4 + H_2SO_4 + NO$

x and y are 3 and 28

(**d → s**)$3e^{-} + p \longrightarrow PH_3$ (Reduction)

$3P \longrightarrow 3H_2PO_2^{\oplus} + 3e^{-}$ (Oxidation)

$4P \longrightarrow PH_3 + 3H_2PO_2^{\oplus}$

x and y are 1 and 3

$8I^{\ominus} \longrightarrow 4I_2 + 8e^-$] (Oxidation)

$8H^{\oplus} + 8e^- + SO_4^{2-} \longrightarrow S^{2-} + 4H_2O$] (Reduction)

$8H^{\oplus} + 8I^{\ominus} + SO_4^{2-} \longrightarrow 4I_2 + S^{2-} + 4H_2O$

(**e → t**)

Or

Adding $2H^{\oplus}$ and $8K^{\oplus}$ to both sides, we get

$8KI + H_2SO_4 + 8H^{\oplus} \longrightarrow 4I_2 + H_2S + 4H_2O + 8K^{\oplus}$

Now adding $4SO_4^{2-}$ to both sides, we get

$8KI + H_2SO_4 + 4H_2SO_4 \longrightarrow 4I_2 + H_2S + 4H_2O + 4K_2SO_4$

Or

$8KI + 5H_2SO_4 \longrightarrow 4I_2 + H_2S + 4H_2O + 4K_2SO_4$

x and y are 8 and 5

379 **(a)**

(**a → r**) $2e^- + I_2 \longrightarrow 2I^{\ominus}$ (Reduction and acts as an oxidant)

$I_2 \longrightarrow 2IO_3^{\ominus} + 10e^-$ (Oxidation and acts as a reductant)

$2x = 0 \quad 2x - 12 = -2$

$2x = 10$

SoI_2 acts both as an oxidant and a reductant

(**b → p**) No change in the oxidation number of either of the conjugate pairs

$Ba^{2+} + Cl_2^{2-} \longrightarrow Ba^{2+}SO_4^{2-}$

$Na_2^{2+}SO_4 \longrightarrow 2NaCl$

(None is an oxidant or a reductant)

(**c → s**) In a conjugate pair, the oxidant has a higher oxidation number

For $AlCl_3$: $Al^{3+} + 3e^- \longrightarrow Al^0$

(Reduction and acts as an oxidant)

For Na: $Na \longrightarrow Na^{\oplus} + e^-$

(Oxidation and acts as an reductant)

(**d → q**) For SO_2: $4e^- + SO_2 \longrightarrow S^0$

(Reduction and acts as an oxidant)

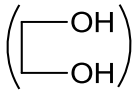
For H_2S: $S^{2-} \longrightarrow S^0 + 2e^-$

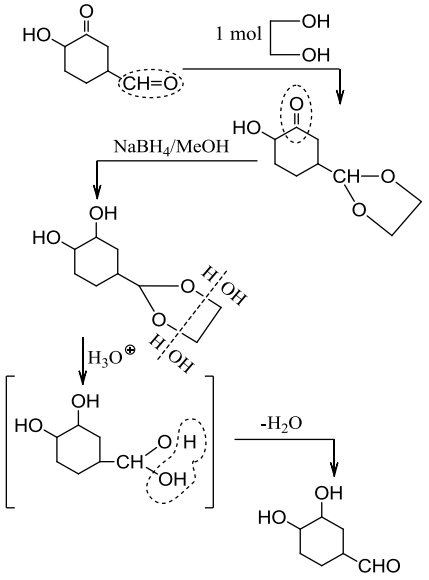
(Oxidation and acts as a reductant)

380 **(b)**

(a→s) Aldehydes are more reactive than ketones. So with 1 mol of LAH/ether, the aldehyde group will reduce first. So the answer is (s)

(b →p) $NaBH_4$/MeOH (the number of moles not mentioned, so complete reduction) would reduce both the aldehydes and ketones to alcohols. So the answer is (p)

(c → q) Aldehydes are more reactive than ketones, so (−CHO) is protected first with 1 mol of glycol  , and their reduction of ketones with $NaBH_4$/MeOH takes place, and finally on hydrolysis the (−CHO)group is obtained back, e.g.,



(d →t) Clemmensen reduction. (Zn − Hg/HCl) converts the (C = O) group to the ($-CH_2-$) group, and simultaneously the dehydration of alcohol to alkene also takes place in acidic condition. So the answer is (t)

(e →r) Wolff-Kishner reduction ($PhNHNH_2$ + glycol + KOH) converts the (C = O) group to the (CH_2) group. So the answer is (r)

381 **(d)**

(a→ r) Clemmenson reduction (Zn − Hg/HCl) converts the (C = O) group to ($-CH_2-$), and simultaneously dehydration of alcohol to alkene also takes place since the conditions are acidic. So the answer is (r)

(b → p) Wolff-Kishner reduction ($PhNHNH_2 + glycol + \overset{\ominus}{O}H$) converts the (C = O)group to ($-CH_2-$) group, and simultaneously dehydrohalogenation of RX to alkene also takes place since the conditions are basic. So the answer is (p)

(c→ s) LAH/ether reduces both the (C = O) group to alcohol and the 2° RX to RH. So the answer is (s)

(d → t) The introduction of the (OH) group at *p*-position in phenol is carried out by Elbs persulphate oxidation ($K_2S_2O_8 + \overset{\ominus}{O}H/H_3O^{\oplus}$). So the answer is (t)

(e → q) The conversion of the (−CHO) group to (−OH) group is carried out by Dakin reaction $(H_2O_2 + \overset{\ominus}{O}H/H_3O^{\oplus})$. So the answer is (q)

382 **(b)**

(a→q) $Mn^{2+} \longrightarrow Mn^{4+} + 2e^-$ (Oxidation)

$2e^- + H_2O_2 \longrightarrow 2H_2O$ (Reduction)

(b→r) $\overset{0}{3K} \longrightarrow 3K^{\oplus} + 3e^-$ (Oxidation)

$3e^- + Al^{3+} \longrightarrow Al$ (Reduction)

(c→p) $3Fe \longrightarrow Fe_3O_4 + 8e^-$ (Oxidation)

$3x = 0 \quad 3x - 8 = 0$

$3x = 8$

$8e^- + 4H_2O \longrightarrow 4H_2$(Reduction)

$8x - 8 = 0 \quad 8x = 0$

$8x = 8$

(d→s) $3H_2S + 6e^-$

$2 + x = 0 \quad x = 0$

$x = -2$

$6e^- + 2NO_3 \longrightarrow 2NO$

$x - 6 = -1 \quad x - 2 = 0$

$x = 5 \quad x = 2$

383 **(c)**

(a → r) LAH/ether reduces 1° and 2° RX to RH, but 3°RX to alkene. It does not reduce aryl halide (ArX). So the answer is (r)

(b →s, t) The catalytic hydrogenation and reduction with $HI + P$ reduces 1°, 2°, 3°RX, and ArX to $R - H$. So the answers are (S, t)

(c → p) $NaBH_4$/EtOH reduces 2° and 3° RX to RH and not ArX. So, the answer is (p)

(d →q) Ph_3SnH reduces 1°, 2°, 3°RX to RH and not ArX. So the answer is (q)

385 **(d)**

Oxidation state of X = -2 $\Rightarrow \overset{+2\ -2}{AX}$

Oxidation state of O = -2 $\Rightarrow \overset{-2\ +2}{OY}$

Oxidation state of X = -2, $\Rightarrow \overset{-2\times2\ +4}{X_2B}$

$\therefore \overset{+2\ -2}{AX} + BY + H_2O \longrightarrow \overset{+1\ -1}{HA} + \overset{-2,+2}{OY} + \overset{+2\times2+4}{X_2B}$

$e^- + A^{2+} \longrightarrow A^{1-}$ (reduction)

$\overset{+a\ -a}{BY} \longrightarrow B^{4+} + Y^{2+}$ (oxidation)

Therefore, B or Y or both might have been oxidised

386 **(d)**

a. $Cr_2O_7^{2-}$ (orange red) oxidises SO_2 to SO_4^{2-} and is itself reduced to Cr^{+3}(green)

$\underset{\text{(Orange)}}{Cr_2O_7^{2-}} + 3H^{\oplus} + 3SO_2 \longrightarrow \underset{\text{(Green)}}{2Cr^{3+}} + 3SO_4^{2-} + 4H_2O$

b. Both reacts together

$\overset{+2}{HgCl_2} + \overset{+2}{SnCl_2} \longrightarrow \underset{\text{(White ppt)}}{\overset{+1}{Hg_2Cl_2}\downarrow} + \overset{+4}{SnCl_4}$

$\overset{+1}{Hg_2Cl_2} + \overset{+2}{SnCl_2} \longrightarrow \underset{\text{(Grey)}}{2Hg\downarrow} + \overset{+4}{SnCl_4}$

$\overset{0}{Fe} + \underset{\text{(Blue)}}{\overset{+2\ 2}{CuSO_4}} \longrightarrow Fe^{2+} + \overset{0}{Cu}$

d. $[CuCl_4]^{2-}$ is formed but $[CuI_4]^{2-}$ is not

$I^{\ominus}$ ion reduces Cu^{2+} to $\overset{+1}{CuI}$ and itself undergoes oxidation to form I_2. However, $Cl^{\ominus}$ does not reduce Cu^{2+}

387 **(a)**

Carbon in diamond is in elemental state, so the oxidation state of C in diamond is zero

388 **(d)**

$\overset{+1\times4}{K_4}\left[\overset{+2}{Fe} \overset{+1\times6}{(CN)_6}\right]^{-4}$ Oxidation state of Fe is +2

$Fe^{2+} \longrightarrow Fe^{3+} + e^-$

$6(CN)^{\ominus} \longrightarrow 6CO_2 + 12e^-$

$6(x - 3 = -1) 6(x - 4 = 0)$

$6(x = 2) \qquad 6(x = 4)$

$6(CN)^{\ominus} \longrightarrow 6NO_3^{\ominus} + 48e^-$

$\begin{pmatrix}\text{Oxidation number} \\ \text{of N} = -3\end{pmatrix} \begin{matrix}6(x - 6 = -1) \\ 6(x = 5)\end{matrix}$

$[Fe^{+2}(CN)_6]^{4-} \longrightarrow Fe^{+3} + 6CO_2 + 6NO_3^{\ominus} + 61e^-$

389 **(a,c)**

$3e^- + Mn^{7+} \longrightarrow Mn^{4+}$(Reduction)

$2O^{2-} \longrightarrow O_2 + 4e^-$ (Oxidation)

Hence, it is an intramolecular redox reaction

It is an oxidation reaction in which Fe^{2+} is oxidized to Fe^{3+} and $CN^{\ominus}$ is oxidized to CO_2

and $NO_3^{\ominus}$

It is an intramolecular redox reaction

$2e^- + Hg^{2+} \longrightarrow Hg$(Reduction)

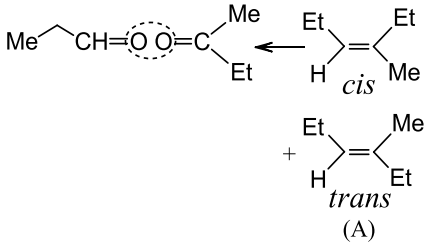
$2O^{2-} \longrightarrow O_2 + 4e^-$(Oxidation)

It is a disproportionation reaction

390 **(d)**

$$\text{DU in A} = \frac{(2n_C + 2) - n_H}{2} = \frac{(2 \times 7 + 2) - 14}{2} = 1°$$

1DU in (A) means it contains one (C = C) bond.
(B) is an aldehyde with three C atoms,since it gives positive Tollens test
Therefore, the structure of (B) is $MeCH_2CHO$. (C) is a ketone with four C atoms sine the total number of C atoms in(A) is seven and it should be $MeCOCH_2CH_3$. (It Gives positive iodoform test.)Therefore, structure of (A):



(A)

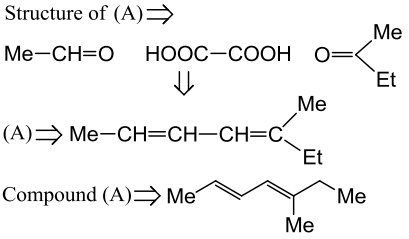
(A) can show two isomers,*cis*and '*trans*

391 **(a)**

(2DU in A). It may have either two (C==C) or one (C ≡ C) bond. Formation of three compounds on oxidation of (A) shows that it contains two (C = C) bonds. (B) reduces ammoniacal $AgNO_3$ solution and gives iodofrom test
Therefore, (B) is an aldehyde and it is $(CH_3 - CHO)$ (two-C- atom aldehyde)
(C) is acetone containing $\left(CH_3-\overset{\overset{O}{\|}}{C}-\right)$ group (since it gives iodoform test)
(D) is two –C dibasic acid since it gives CO_2, CO, and H_2O with conc. H_2SO_4. So (D) may be oxalic acid $(HOOC - COOH)$ (two C atoms). Total C atoms in (C) must be four (A)

$(C_8H_{14}) \Rightarrow$ CH_3CHO (two C atoms) + $(CH_3COCH_2CH_3)$ (four C atoms) + (HOOC - COOH) (two C atoms)
(B) (C)

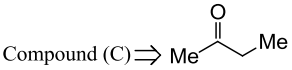
Structure of (A) $\Rightarrow$



Compound (A) $\Rightarrow$

Compound (B) $\Rightarrow$ Me—CH=O

Compound (C) $\Rightarrow$



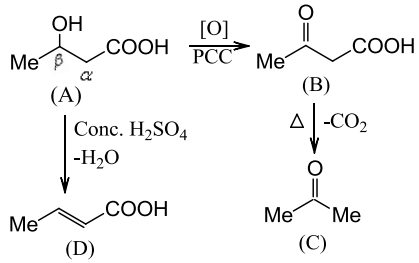
Compound (D) $\Rightarrow$

$$HOOC-COOH \xrightarrow{\text{Conc. } H_2SO_4} CO_2 + CO + H_2O$$

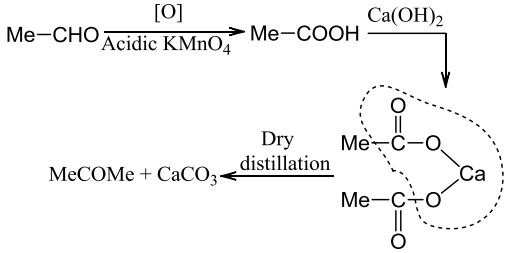
392 **(a)**

$$\text{DU in A} = \frac{(2n_C + 2) - n_H}{2} = \frac{(2 \times 4 + 2) - 8}{2} = 1°$$

(Due to $(-COOH)$ group)
Compound (B) is unstable and loses CO_2, it shows (B) must contain β-keto acid, which accounts for three oxygen atoms in (A) and (B)
(A) Must contain β-hydroxy acid which on oxidation with PCC gives (B) (β-keto acid).
Therefore, structure of (A) ⇒



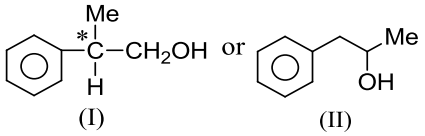
Conversion of MeCHO to MeCOMe (Acetone):



393 **(c)**

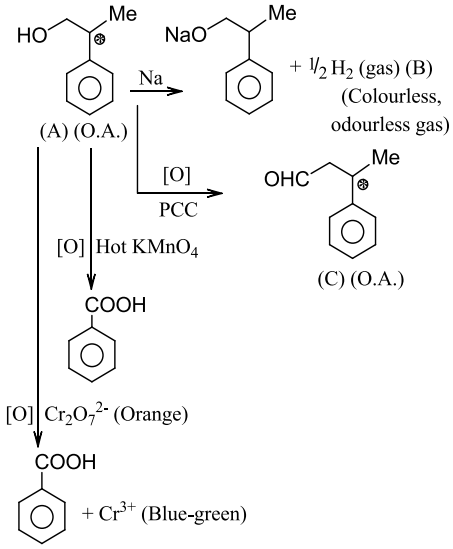
$$\text{DU in A} = \frac{(2n_C + 2) - n_H}{2} = \frac{(2 \times 9 + 2) - 12}{2} = 4°$$

(It shows benzene ring which is also confirmed by the oxidation of (A) to benzoic acid (PhCOOH)
i. Reaction of Na with (A) shows that it contains $(-OH)$ group
(A) is chiral, so the possible structures of (A) can be

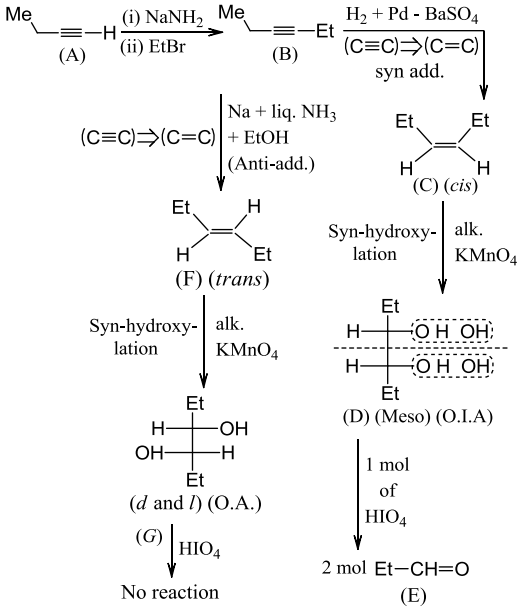


(I) (II)

(II) will give iodoform test. But compound (A) does not give iodoform test. So the structure of (A) is (I)



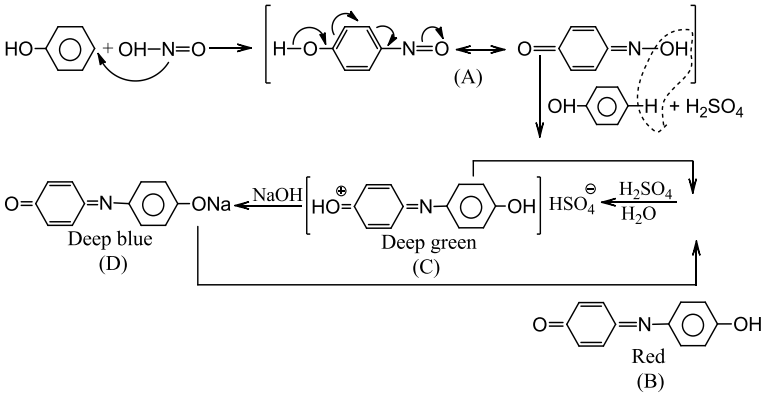
394 **(a)**



(Since two (−OH) groups are in anti position, for periodic cleavage, two (−OH) must be in *syn* (or *cis*) position)

397 **(d)**

It is an example of Liebermann's nitroso reaction (test for nitroso group or test for phenol.)

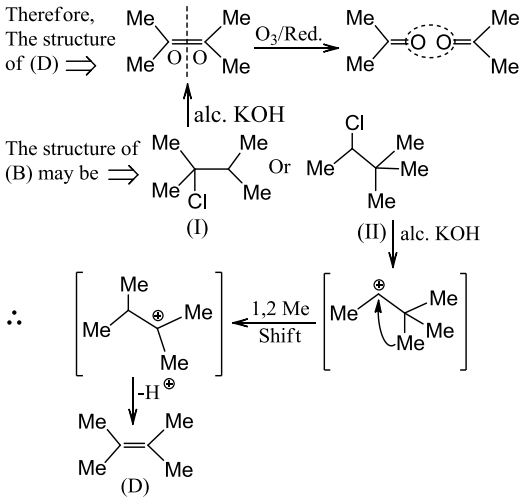


399 **(a)**

1 DU in (A) shows that (A) contains one (C = C) bond. The position of the (C = C) bond has to be located. The number of C atoms in (A), (B), (C) and (D) would be six.

(D) on ozonolysis gives only one compound (E). It means that two moles of (E) containing three C atoms have formed

Three-C ketone which gives iodoform test can be only acetone (MeCOMe). (It cannot be an aldehyde sine it gives a positive Tollens test)



400 **(b)**

$(N^{2-})_2 \longrightarrow N_2^0 + 4e$

$Br^{5+} + 6e \longrightarrow Br^-$

401 **(a)**

The reactions are :

$2(Cu^{2+}) + 2e \longrightarrow (Cu^+)_2, E = \frac{M}{1}$

$2(I^{-1}) \longrightarrow I_2 + 2e, E_{I^-} = \frac{M}{1}$

$2(S^{2+})_2 \longrightarrow (S^{5/2+})_4 + 2e, E_{Na_2S_2O_3} = \frac{M}{1}$

Meq. of

$CuSO_4$ = Meq. of $Na_2S_2O_3$ = Meq. of I_2 liberated

$10 \times 0.02 \times 1 = V \times 0.1 \times 1$

$\therefore\ V = 2$ mL.

402 **(b)**

$CrO_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$

403 **(a)**

$Ca(OCl)Cl \longrightarrow Ca^{2+} + \bar{O}Cl + Cl^-$

(Bleaching Powder)

Thus, bleaching powder contains OCl^- *i. e.* part of oxoacid

HOCl and Cl^- *i. e.*, part of HCl.

Oxidation no. of Cl in oxoacid = +1.

Thus, oxide of Cl with same ox.no. is Cl_2O

$\therefore$ Anhydride of oxoacid (HOCl) is Cl_2O

408 **(3)**

Balance the equation

$15H_2O + 3CN^{\ominus} \longrightarrow 3CO_2 + 3NO_3^{\ominus} + 3OH^{\oplus} + 30e^-$

$\therefore$ Number of e^-'s $= \frac{30}{10} = 3$

410 **(10)**

The zero oxidation state of the underlined element is in (b), (c), and (e)

a. +4 **b**. 0 **c**. 0 **d**. +6 **e**. 0.

The sum of the oxidation state of all the underlined elements is 4 + 0 + 0 + 6 + 0 = 10

413 **(3)**

Species which are neither oxidising agent nor reducing agent are

b. $F^{\ominus}$ **d**. $Na^{\oplus}$ **g**.$Cl^{\ominus}$

414 **(2)**

The +5 oxidation state of the underlined element is in (a) and (c)

420 **(3)**

Balance the equation by any method

$4Zn + 10\ HNO_3 \longrightarrow 4\ Zn(NO_3)_2 + 3H_2O + NH_4NO_3$

$\therefore a + b + c = 4 + 3 + 1 = 8$

422 **(3)**

The zero oxidation state of the underlined element is in (b), (c), and (e)

a. +4 **b**. 0 **c**. 0 **d**. +6 **e**. 0

423 **(3)**

The +3 oxidation state of the underlined element is in (b), (g), and (h)

a. +5 **b**. +3 **c**. +5 **d**. +1**e**. +8 **f**. +2 **g**. +3 **h**. +3

424 **(6)**

Species which are very good oxidising agents are

a.F_2**e**.$MnO_4^{\ominus}$**h**. Ce^{4+}**i**.$Cr_2O_7^{2-}$**j**.CrO_4^{2-}**f**.HNO_3

425 **(4)**

The maximum oxidation state is the group number. The minimum oxidation state for metals is zero; for non-metals it is equal to the group number minus 8. The maximum and the minimum oxidation states are

a. +5, 0 **b**. +6, −2**c**. +7, 0 **d**. +4, 0 **e**. +3, 0

438 **(3)**

Species which are very good reducing agents are

5. Na **f**. $I^{\ominus}$**i**.Fe^{2+}