

CHEMISTRY

Total time : 120 minutes

C-203

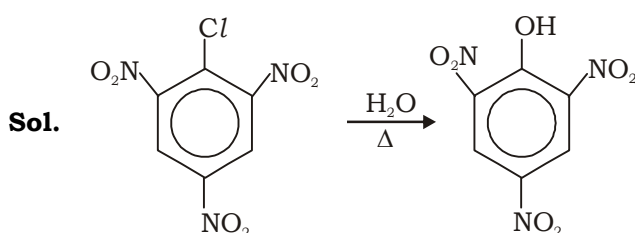
MARKS : 240

There are 80 Multiple Choice Question. Each question has four alternatives, out of which only one is correct.

Marking Scheme +3 for correct answer and -1 for incorrect answer.

1. The compound which undergoes hydrolysis on just warming with water and forms the corresponding hydroxyl derivative is
- (a) 2, 4, 6- trinitrochlorobenzene (b) 2-chloro-1-butene
(c) 2-chloro-2 methylbutane (d) 2,4- dimethoxychlorobenzene

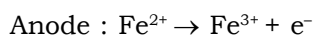
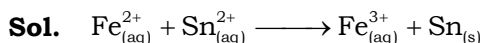
Ans. (a)



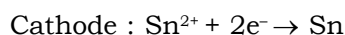
SnAr mechanism. Ring is strongly activated and doesn't require strong nucleophile.

2. The pair of compounds that will not react with each other in an aqueous solution, at room temperature is
- (a) $\text{FeCl}_3, \text{SnCl}_2$ (b) $\text{HgCl}_2, \text{SnCl}_2$ (c) $\text{FeCl}_2, \text{SnCl}_2$ (d) FeCl_3, KI

Ans. (c)



$$E^\circ \text{Fe}^{3+} | \text{Fe}^{2+} = 0.77 \text{ V}$$



$$E^\circ \text{Sn}^{2+} | \text{Sn} = -0.14 \text{ V}$$

$$E^\circ_{\text{cell}} = E^\circ_{\text{cathode}} - E^\circ_{\text{anode}}$$

$$= -0.14 - 0.77 = -0.91 \text{ V}$$

The reaction is non-spontaneous.

3. At 700K, for the reaction $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \ll 2\text{SO}_3(\text{g})$ the K_p is 3.2×10^4 . At the same temperature the K_p for the reaction $\text{SO}_3(\text{g}) \ll \text{SO}_2(\text{g}) + 0.5\text{O}_2(\text{g})$ is
- (a) 3.125×10^{-5} (b) 5.59×10^{-3} (c) 1.79×10^4 (d) 1.79×10^{-2}

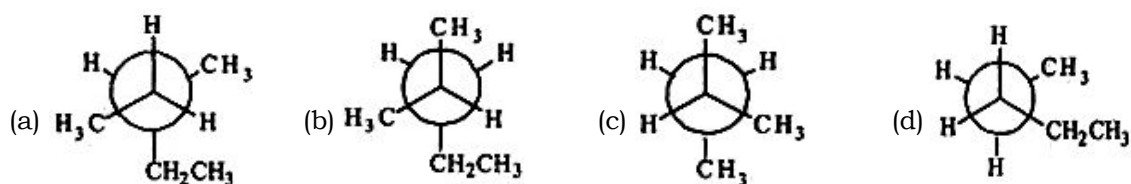
Ans. (b)

Sol. $\sqrt{\frac{1}{K_p}}$

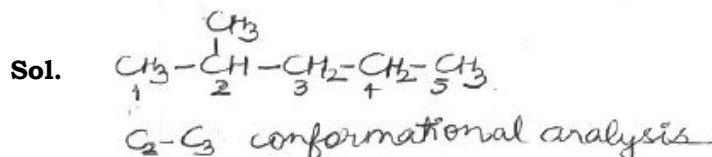
4. Amylose and cellulose are polymers of glucose in which glucose units are joined to each other respectively by linkages of the type
- (a) α, β (b) β, β (c) α, α (d) $\alpha\beta, \beta$

Ans. (a)

5. 2-methylpentane is



Ans. (b)



6. The molecule having the highest dipole moment is

(a) CO_2

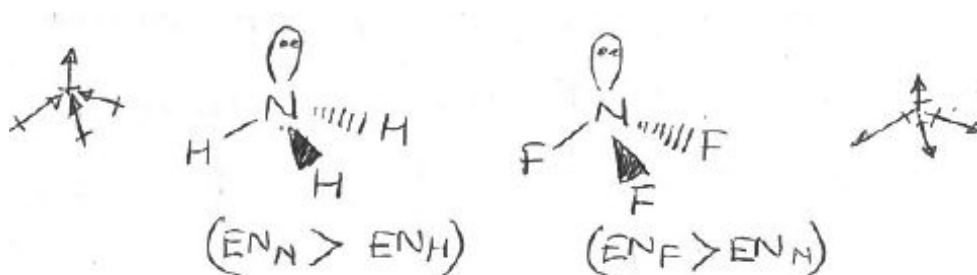
(b) CH_4

(c) NH_3

(d) NF_3

Ans. (c)

Sol. CO_2 & CH_4 have zero dipole moment



7. Two samples A and B of an ideal gas, initially at same temperature and pressure, are compressed from volume V to $V/2$, isothermally for A and adiabatically for B. The final pressure of A will be

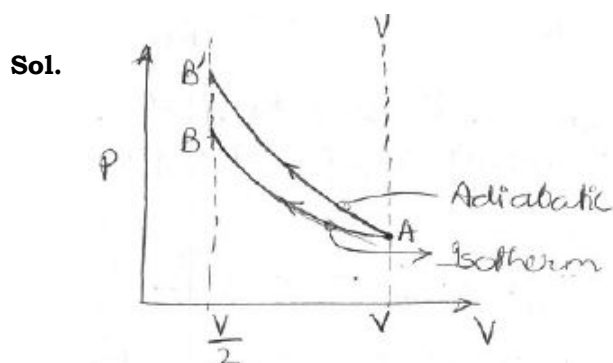
(a) greater than that of B

(b) less than that of B

(c) twice that of B

(d) equal to that at B

Ans. (b)

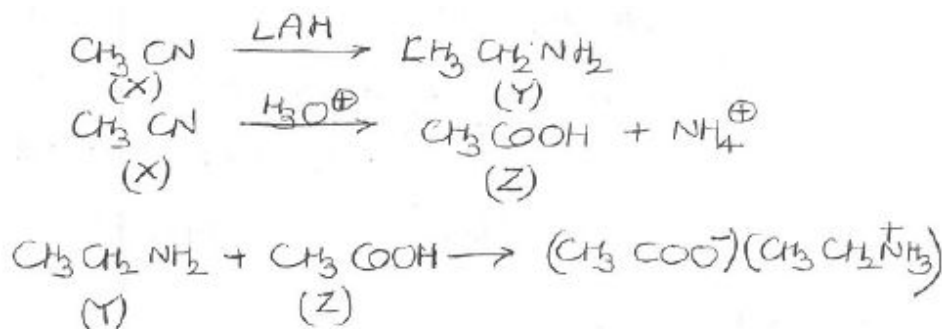


8. A nitrile X is treated with LiAlH_4 to obtain compound Y ($\text{C}_2\text{H}_7\text{N}$). In a separate reaction X is hydrolyzed in an acid medium to obtain Z. The product obtained after mixing Y and Z will be

- (a) $\text{CH}_3\text{CONHCH}_2\text{CH}_3$ (b) $\text{CH}_3\text{CH}_2\text{CONHCH}_2\text{CH}_3$
 (c) $(\text{CH}_3\text{COO}^-)(\text{CH}_3\text{CH}_2\text{NH}_3^+)$ (d) $(\text{CH}_3\text{CH}_2\text{COO}^-)(\text{CH}_3\text{NH}_3^+)$

Ans. (c)

Sol.

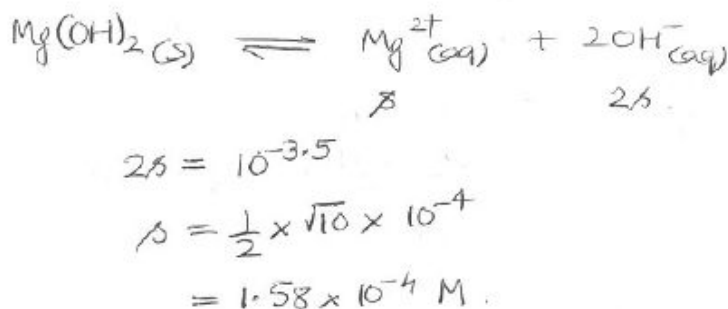


9. pH of a saturated solution of magnesium hydroxide in water at 298K is 10.5. The solubility of the hydroxide in water at 298 K is

- (a) $1.58 \times 10^{-4} \text{ mol L}^{-1}$ (b) $1.58 \times 10^{-11} \text{ mol L}^{-1}$ (c) $3.16 \times 10^{-4} \text{ mol L}^{-1}$ (d) $9.98 \times 10^{-8} \text{ mol L}^{-1}$

Ans. (a)

Sol.



10. The species which has triangular planar geometry is

- (a) NF_3 (b) NO_3^- (c) AlCl_3 (d) SbH_3

Ans. (b)

Sol. N in NO_3^- is sp^2 hybridized

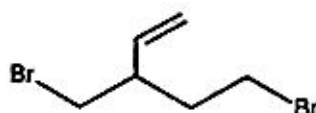
11. The order of acidity in aqueous solution for the following acids is

- (a) $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$ (b) $\text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{Te}$
 (c) $\text{H}_2\text{Te} < \text{H}_2\text{S} < \text{H}_2\text{Se}$ (d) $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{S}$

Ans. (a)

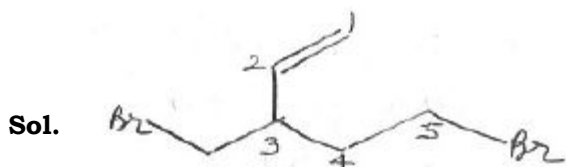
Sol. Bond strength decreases down the group. Therefore, acidic strength increases down the group

12. The IUPAC name of the following compound is

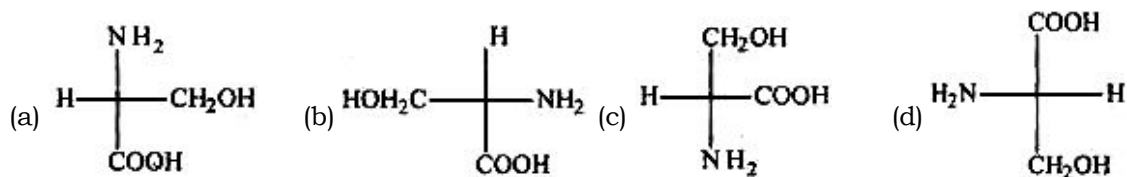


- (a) 5-bromo-3-(bromomethyl)pent-1-ene (b) 3-(1-bromopropyl)-4-bromobut-1-ene
 (c) 1,4-dibromo-3-ethenylbutane (d) 1-bromo-3-(bromomethyl)but-4-ene

Ans. (a)

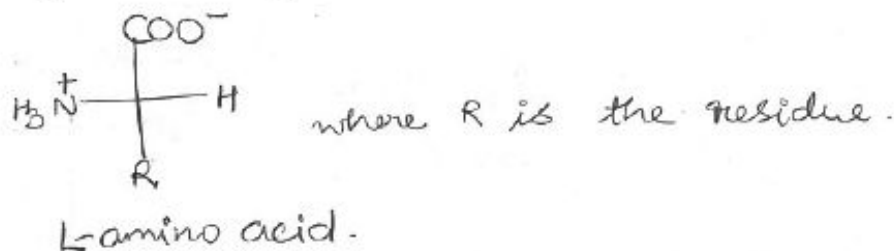


13. Serine ($\text{HOCH}_2\text{CH}(\text{NH}_2)\text{COOH}$) is an essential amino acid. The correct Fischer projection of serine is



Ans. (d)

Sol. Naturally-occurring amino-acids have L-form



14. The complex having zero crystal field stabilization energy is
 (a) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$ (b) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ (c) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ (d) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

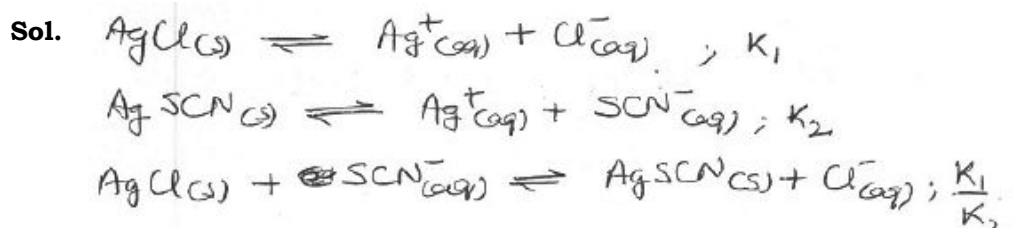
Ans. (b)

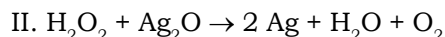
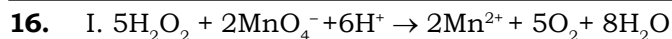
Sol. Fe^{3+} has d^5 configuration in which pairing of electrons won't occur.

15. Solubility products of silver chloride and silver thiocyanate are 1.2×10^{-10} and 7.1×10^{-13} respectively. The equilibrium constant for the reaction $\text{AgCl}(\text{s}) + \text{CNS}^{-1}(\text{aq}) \rightleftharpoons \text{AgCNS}(\text{s}) + \text{Cl}^{-1}(\text{aq})$ is

- (a) 0.0625 (b) 169 (c) 13 (d) 1.40×10^{-4}

Ans. (b)





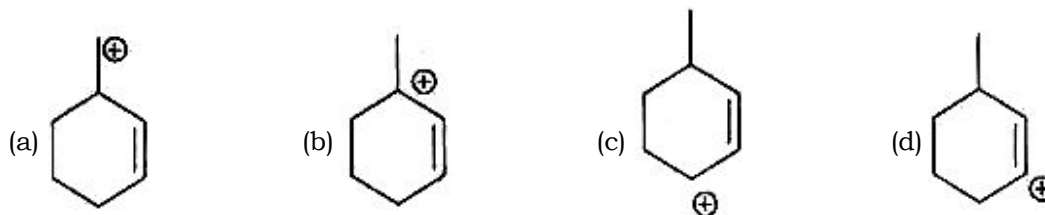
The role of hydrogen peroxide in the above reactions is

- (a) oxidising in I and reducing in II (b) reducing in I and oxidising in II
 (c) reducing in I as well as in II (d) oxidising in I as well as in II

Ans. (c)

Sol. O.N. of oxygen changes from -1 to 0 .

17. The most stable carbocation is



Ans. (b)

Sol. 3° , Resonance stabilized

18. Helium can be singly ionized by losing one electron to become the He^+ cation. Which of the following statements is true concerning this helium cation?

- (a) The line spectrum of this helium cation will resemble the line spectrum of a hydrogen atom
 (b) The line spectrum of this helium cation will resemble the line spectrum of a lithium cation
 (c) The line spectrum of this helium cation will remain the same as for unionized helium.
 (d) The line spectrum of this helium cation will resemble the line spectrum of a hydrogen ion.

Ans. (a)

Sol. Single- e^- system show line spectra

19. Of the following, the ion with the largest size is

- (a) O^{2-} (b) Na^+ (c) F^- (d) Al^{3+}

Ans. (a)

Sol. For isoelectronic species, higher is the e/p ratio, higher the size

20. The colourless salt that gives white precipitate with BaCl_2 in aqueous HCl is

- (a) K_2SO_4 (b) K_2SO_3 (c) KNO_3 (d) KBr

Ans. (a)

Sol. BaSO_4 is white precipitate

21. The heat of formation of ethanol, from the following data is



- (a) -277 kJ/mol (b) -1260.5 kJ/mol (c) -688.5 kJ/mol (d) -3013 kJ/mol

Ans. (a)

Sol.
$$\Delta H_{rxn}^{\circ} = 2 \Delta H_f^{\circ}(\text{CO}_2) + 3 \Delta H_f^{\circ}(\text{H}_2\text{O}) - \Delta H_f^{\circ}(\text{C}_2\text{H}_5\text{OH})$$

$$-1368 = 2(-393) \cdot 5 + 3(-286) - \Delta H_f^{\circ}(\text{C}_2\text{H}_5\text{OH})$$

$$\Delta H_f^{\circ}(\text{C}_2\text{H}_5\text{OH}) = -787 - 858 - (-1368)$$

$$= -277 \text{ kJ/mol}$$

22. Osmotic pressure of a 2% w/v solution of glucose is same as 5% w/v solution of a nonvolatile non-electrolyte solute. The molar mass of the solute is

- (a) 180 (b) 450 (c) 72 (d) 45

Ans. (b)

Sol.
$$\frac{2}{180} = \frac{5}{M}$$

$$M = 450$$

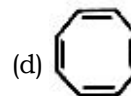
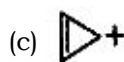
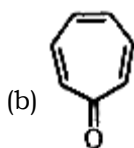
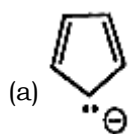
 (concentrations should be same for same osmotic pressure).

23. 50 g of sucrose is hydrolysed to a mixture of glucose and fructose. Sucrose is dextrorotatory, however the mixture formed is laevorotatory. This is because

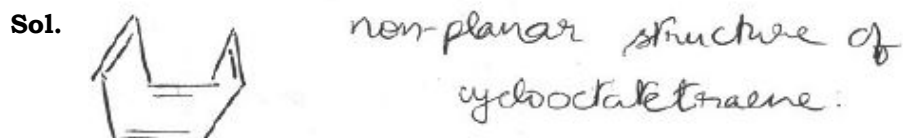
- (a) more amount of β -D-fructose is formed than that of β -D-glucose
 (b) β -D-glucose undergoes inversion of configuration
 (c) β -D-fructose and β -D-glucose undergo inversion to their α -anomers
 (d) laevorotation of β -D-fructose is more than dextrorotation of β -D-glucose.

Ans. (d)

24. Among the following the compound that is not aromatic is



Ans. (d)



25. The magnetic moment of a divalent ion of an element with atomic number 24 in an aqueous solution is

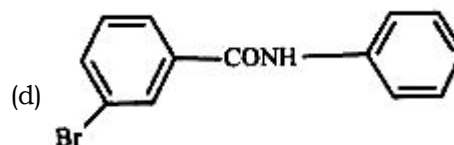
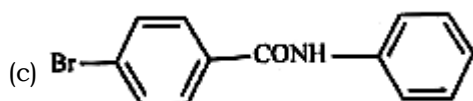
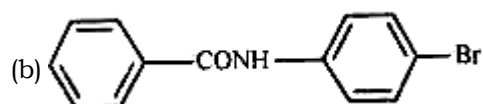
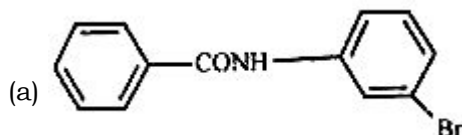
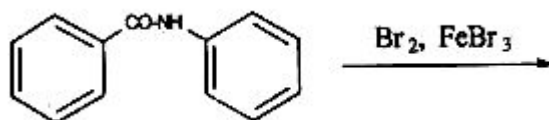
- (a) 4.90 BM (b) 2.45 BM (c) 2.83 BM (d) 1.73 BM

Ans. (a)

Sol. ${}_{24}\text{Cr}^{2+} [\text{Ar}] 4s^0 3d^4$

$$\mu_B = \sqrt{4(4+2)} = \sqrt{24} = 4.90 \text{ BM}$$

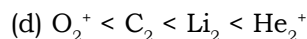
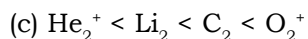
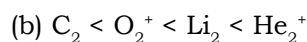
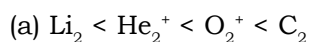
26. The major product of the following reaction is



Ans. (b)

Sol. More activated ring is attacked at o/p position.

27. The correct order of stability for the following species is:



Ans. (c)

Sol.

Species	Bond Order
C_2	2
Li_2	1
He_2^+	0.5
O_2^+	2.5

28. The colligative property used in the determination of molar mass of a polymer is

(a) lowering of the vapour pressure

(b) elevation in the boiling point

(c) depression in the freezing point

(d) osmotic pressure

Ans. (d)

29. From the following the species that are isoelectronic are

(I) NH_3 ,

(II) CH_3^+ ,

(III) NH_2^- ,

(IV) NH_4^+

(a) (I), (II), (III)

(b) (II), (III), (IV)

(c) (I), (II), (IV)

(d) (I), (III), (IV)

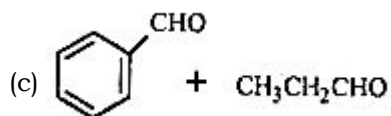
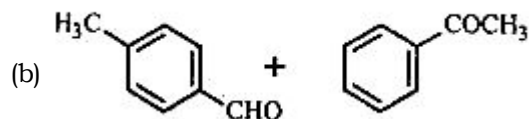
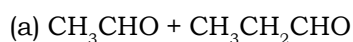
Ans. (d)

Sol. NH_3 (1LP, 3BP)

NH_2^- (2LP, 2BP)

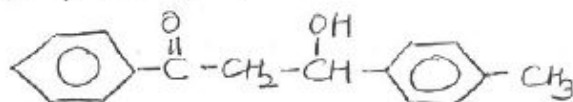
NH_4^+ (4BP)

30. The pair of equimolar compounds that would give a single condensation product when treated with an alkali is



Ans. (b)

Sol. Acetophenone won't undergo aldol condensation due to poor reactivity in self-aldol condensation. Therefore, product is



31. In electrophoresis,

- (a) the colloidal particles migrate in an applied electric field.
 (b) the medium migrates in an applied electric field.
 (c) both colloidal particles and the medium migrate.
 (d) neither the particles nor the medium migrate.

Ans. (a)

Sol. Only the charged colloidal particles move under the influence of external electric field.

32. When a person suffers from typhoid, the metabolic process stimulated in the body to fight against this disease is synthesis of

- (a) Lipid (b) carbohydrate (c) Protein (d) DNA

Ans. (c)

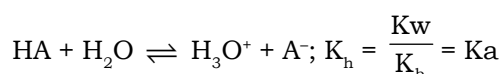
Sol. Antibodies are proteins

33. If a weak base has the dissociation constant, K_b , then the value of the dissociation constant, K_a , of its conjugate acid is given by

- (a) $1/K_b$ (b) K_w/K_b (c) K_b/K_w (d) $K_w K_b$

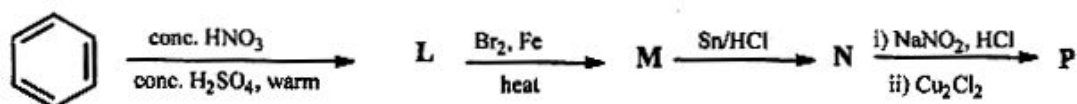
Ans. (b)

Sol. Let HA be the acid & A^- be the conjugate base.



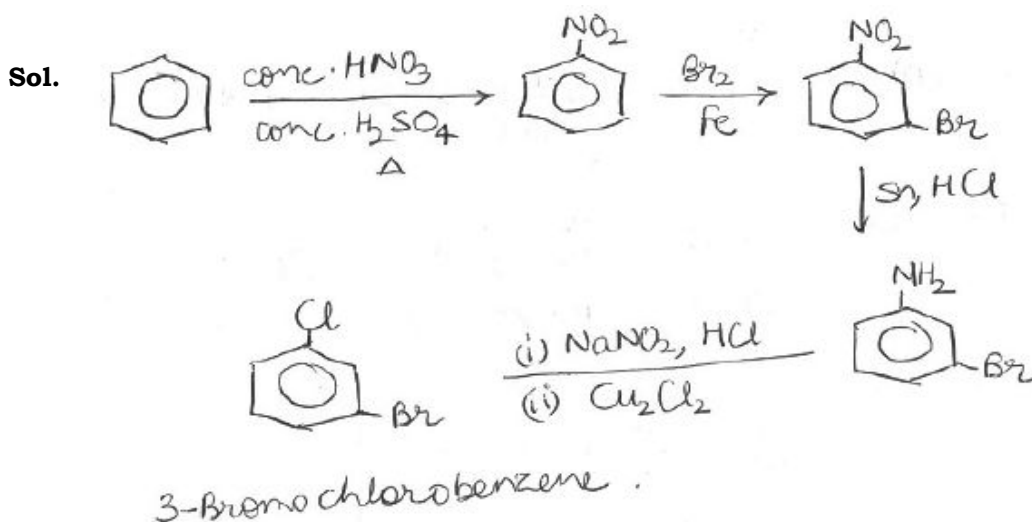
This is the hydrolysis constant & the acid dissociation constant.

34. The product P obtained through the following sequence of reactions is



- (a) 3-chloroaniline
(b) 4-bromochlorobenzene
(c) 3-bromochlorobenzene
(d) 3-bromoaniline

Ans. (c)



35. Real gases behave ideally at

- (a) low pressure and low temperature
(b) high pressure and low temperature
(c) low pressure and high temperature
(d) high pressure and high temperature

Ans. (c)

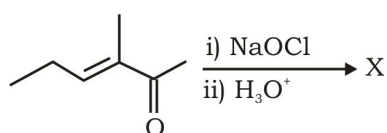
36. In the cyanide extraction process of silver from Argentite ore, the oxidizing and the reducing agents used are respectively

- (a) O_2 and CO
(b) O_2 and Zn dust
(c) HNO_3 and Zn dust
(d) HNO_3 and CO

Ans. (b)

Sol. Macarthur Forrest Process

37. The main product X formed in the following reactions is



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

Ans. (b)

Sol. Iodoform Reaction. It is selective & doesn't oxidize the defenic bonds

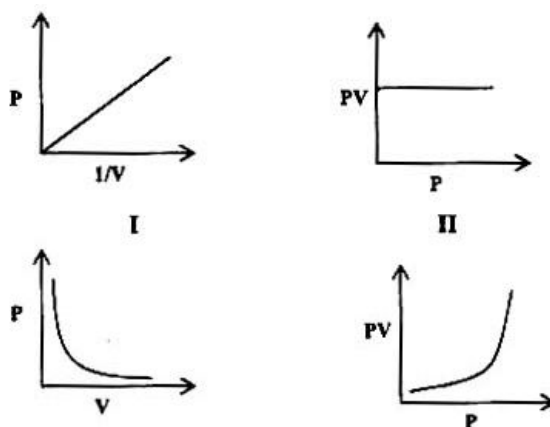
38. Out of the following metal extraction processes, those in which carbon-based reduction methods are not used are

- (I) Sn from SnO_2 (II) Fe from Fe_2O_3
 (III) Al from Al_2O_3 (IV) Mg from $\text{MgCO}_3, \text{CaCO}_3$
 (a) (I) and (IV) (b) (II) and (III) (c) (III) and (IV) (d) (II) and (IV)

Ans. (c)

Sol. Active metals like Al and Mg can't be extracted by carbon-based reduction methods.

39. The Graph that wrongly represents the Boyle's law for an ideal gas is

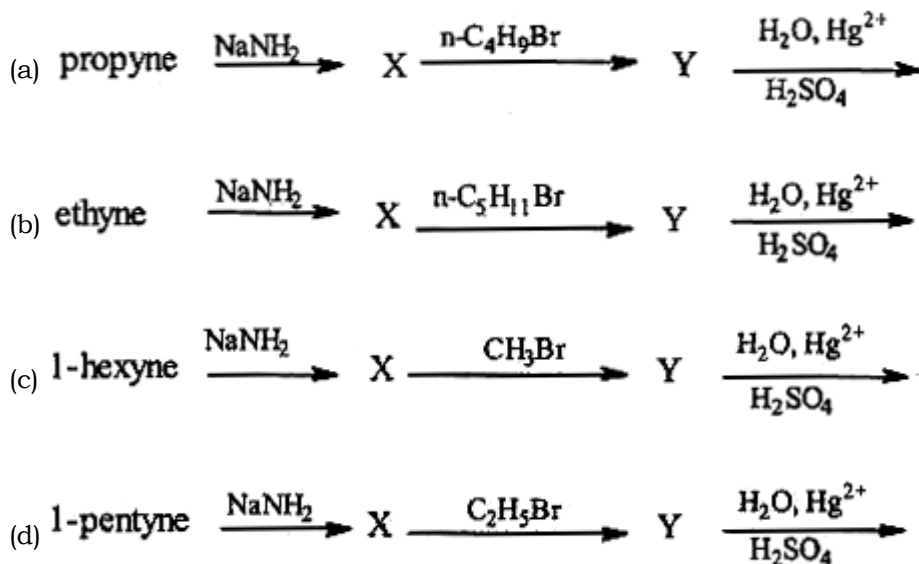


- (a) II (b) I (c) IV (D) III

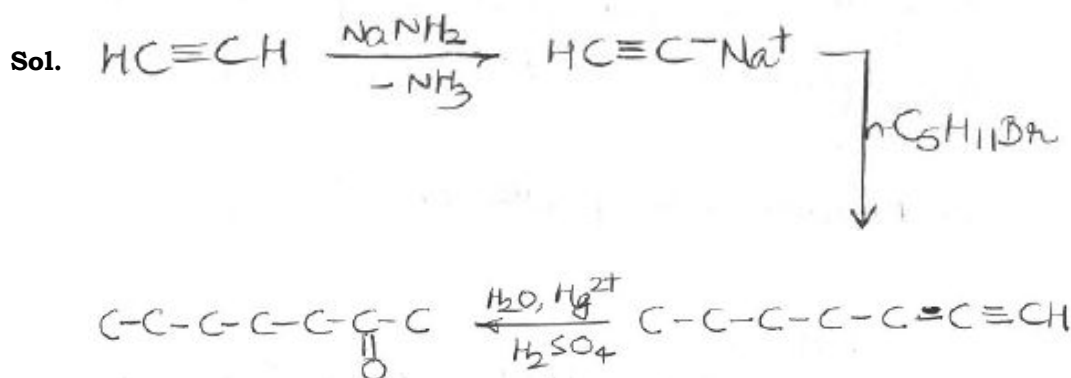
Ans. (c)

Sol. P-V graph is rectangular hyperbola for Boyle's Law.

40. The best sequence of reactions to prepare 2-heptanone is



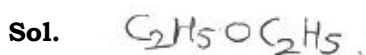
Ans. (b)



41. Approximate numbers of moles of hydrogen atoms in 1.006×10^{23} molecules of diethyl ether are

- (a) 0.16 (b) 6 (c) 1.67 (d) 3

Ans. (c)



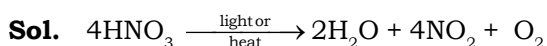
$$\text{No. of H-atoms} = 1.006 \times 10^{23} \times 10$$

$$\text{No. of moles of H-atoms} = \frac{1.006 \times 10^{24}}{6.022 \times 10^{23}} = 1.67$$

42. Upon long standing, concentrated HNO_3

- (a) remains colourless, but gives out NO
 (b) turns yellow brown due to formation of NO_2
 (c) turns yellow brown due to the formation of N_2O_4
 (d) remains colourless, but gives N_2O

Ans. (b)



43. The sugars that are produced on hydrolysis of DNA and RNA are

- (a) epimers (b) two different sugars
 (c) positional isomers (d) diastereomers

Ans. (b)

Sol. DNA: deoxy ribose sugar

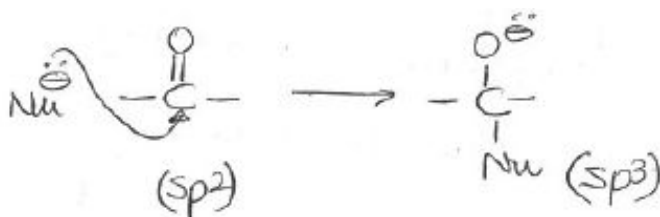
RNA : ribose sugar

44. When a nucleophile attacks a carbonyl group to form an intermediate, the hybridisation of the carbon atom changes from

- (a) sp^3 to sp^2 (b) sp^2 to sp (c) sp to sp^2 (d) sp^2 to sp^3

Ans. (d)

Sol.



45. Aluminium carbide (Al_4C_3) liberates methane on treatment with water. The grams of aluminium carbide required to produce 11.2 L of methane under STP conditions is [Given Al = 27]

(a) 48

(b) 72

(c) 144

(d) 24

Ans. (d)

Sol.



POAC: moles of $\text{CH}_4 = \frac{11.2}{22.4} = 0.5 \text{ mol.}$

moles of $\text{Al}_4\text{C}_3 = x \text{ mol}$

moles of $\text{CH}_4 = 3x = 0.5$

$x = \frac{0.5}{3} \text{ mol.}$

mass of $\text{Al}_4\text{C}_3 = \frac{0.5}{3} (4 \times 27 + 12 \times 12)$
 $= 0.5 (36 + 12) = 24 \text{ g}$

46. The correct statement for crystalline CsI_3 is

(a) it contains Cs^+ , I^- and molecular I_2

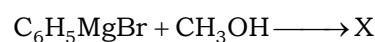
(b) it is covalent compound

(c) it contains Cs^+ and I_3^- (d) it contains Cs^{3+} and I^-

Ans. (c)

Sol. Cs^+ & I_3^- ions

47. The product X formed in the following reaction is



(a) benzene

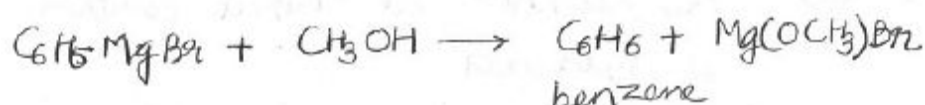
(b) methoxybenzene

(c) phenol

(d) toluene

Ans. (a)

Sol.



48. Ionic salt AX grows in face centered cubic lattice with cell length 'a'. The ratio r_{A^+} / r_{X^-} for this salt will be :

- (a) 0.155 (b) 0.225 (c) 0.414 (d) 0.732

Ans. (c)

Sol. NaCl type lattice

$$\frac{r^+}{r^-} = 0.414$$

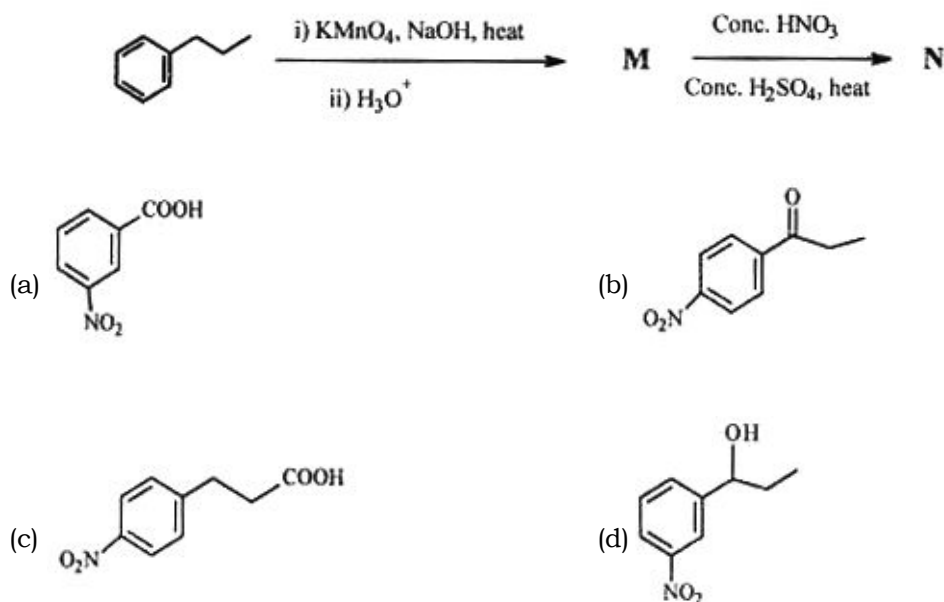
49. The hybridisation of boron in the stable borane having the lowest molecular weight is -

- (a) sp^2 (b) sp^3 (c) sp (d) sp^3d

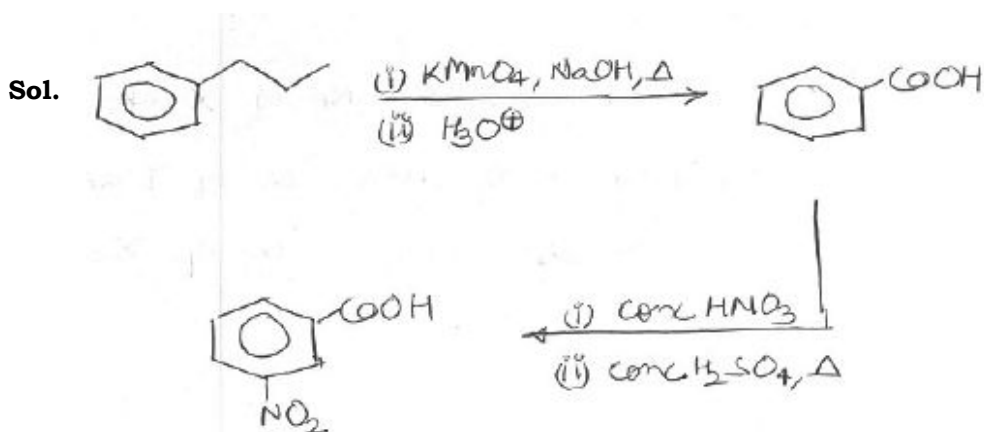
Ans. (b)

Sol. Stable borane of lowest molecular weight B_2H_6

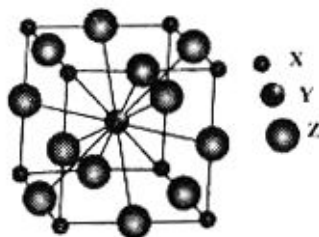
50. The product 'N' of the following reaction is



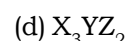
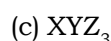
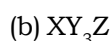
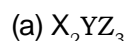
Ans. (a)



54. The unit cell of a compound made up of the three elements X, Y and Z is given below.



The formula of this compound is :



Ans. (c)

Sol. X at corners No. of X atoms = $8 \times \frac{1}{8} = 1$

Y at body centre No. of Y atoms = $1 \times 1 = 1$

Z at edge centres No. of Z atoms = $12 \times \frac{1}{4} = 3$



55. N_2 gas stored in a cylinder, fixed with a movable piston, undergoes adiabatic expansion. The statement that is true for the given situation is

(a) $q = w$

(b) $\Delta U = w$

(c) $\Delta U = 0$

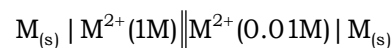
(d) $\Delta U = q$

Ans. (b)

Sol. In adiabatic process, $q = 0$

$$\Rightarrow \Delta U = q$$

56. For the following cell at 25°C the E.M.F. is , (if $E^\circ_{M^{2+}/M} = 0.347 \text{ V}$)



(a) 0.089 V

(b) 0.598 V

(c) 0.251 V

(d) 0.764 V

Ans. (No Answer)

Sol. Concentration Cell, $E_{\text{cell}} = 0$.

$$E_{\text{cell}} = + \frac{0.059}{2} \log \left(\frac{C_{\text{cathode}}}{C_{\text{anode}}} \right)$$

$$C_{\text{cathode}} = 0.01M \quad C_{\text{anode}} = 1M$$

$$E_{\text{cell}} = + \frac{0.059}{2} \log \left(\frac{0.01}{1} \right) = - 0.059 \text{ V}$$

So, the cell won't even work as per the notation, The halves designated will behave in opposite manner and the correct cell notation is $M_{(s)} | M^{2+}(0.01M) || M^{2+}(1M) | M_{(s)}$ with $E_{\text{cell}} = 0.059 \text{ V}$.

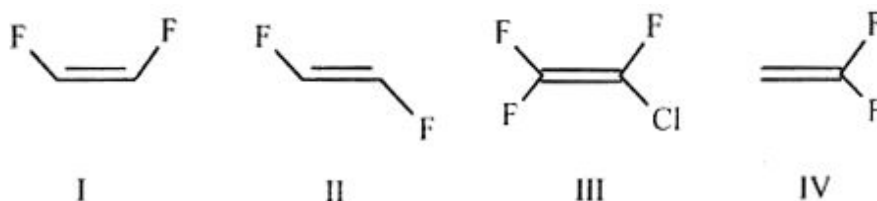
57. Which of the following hydrogen halides react with AgNO_3 to give a precipitate that dissolves in hypo solution ?

- (I) HCl (II) HF (III) HI (IV) HBr
 (a) (III), (I), (II) (b) (I), (III), (IV) (c) (IV), (II), (I) (d) (II), (IV), (III)

Ans. (b)

Sol. AgCl, AgBr and AgI dissolve in hypo solution

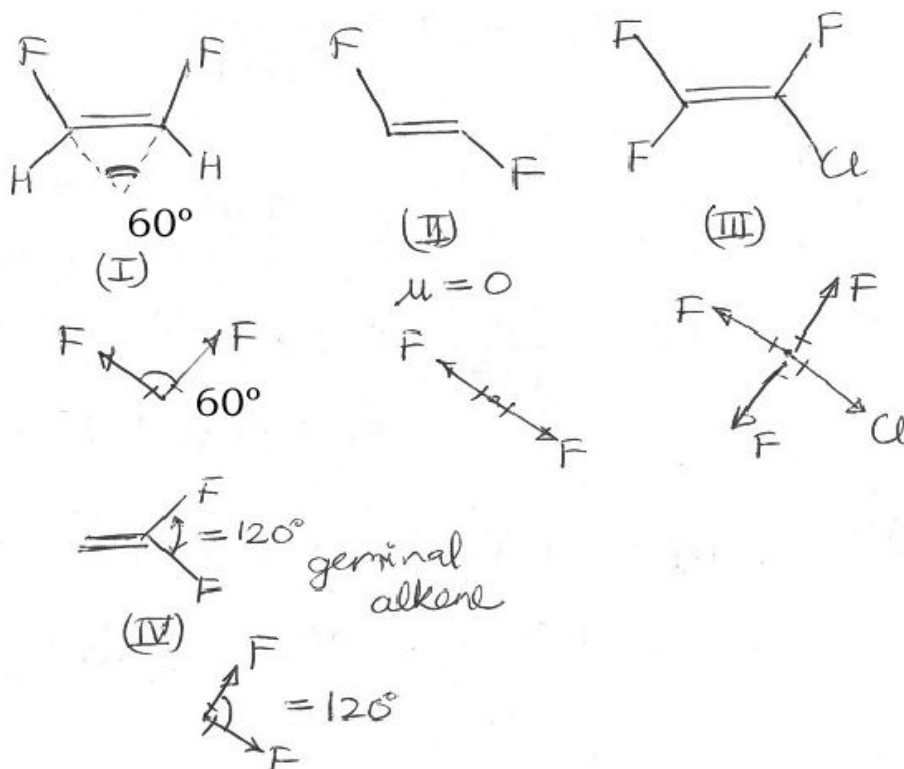
58. The correct order of dipole moment for the following molecules is



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

Ans. (b)

Sol.



59. The compound that is most reactive with alcoholic KOH is

- (a) $\text{CH}_2 = \text{CH} - \text{Br}$ (b) $\text{CH}_3\text{CH}_2\text{Br}$
 (c) $(\text{CH}_3)_2\text{CH} - \text{Br}$ (d) $\text{CH}_3\text{COCH}_2\text{CH}_2\text{Br}$

Ans. (d)

Sol. E2 elimination. CH_3CO group makes the B-H very acidic and activates the compound for elimination.

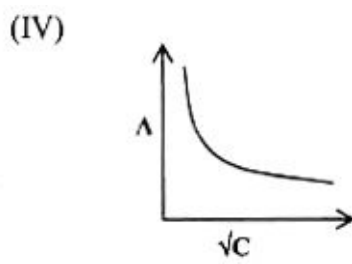
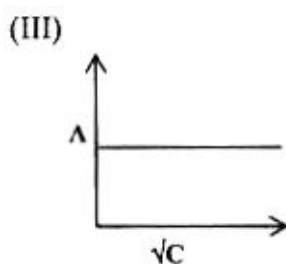
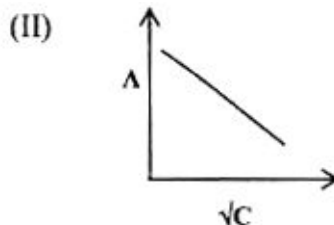
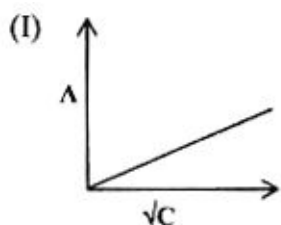
60. The enthalpy of vaporization of benzene is +35.3 kJ/mol at its boiling point of 80°C . The entropy change in the transition of vapour to liquid at its boiling point is

- (a) -100 (b) +100 (c) +342 (d) -342

Ans. (b)

Sol. $\Delta S = \frac{35300 \text{ J}}{353 \text{ K} - \text{mol}} = 100 \frac{\text{J}}{\text{mol} - \text{K}}$

- 61.** For a strong electrolyte, the change in the molar conductance with concentration is represented by



(a) I

(b) II

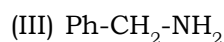
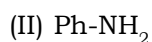
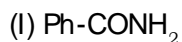
(c) III

(d) IV

Ans. (b)**Sol.** Debye-Huckel Eqn.

$$\Lambda_m = \Lambda_m^\infty - b\sqrt{c}$$

- 62.** The order of basicity is



(a) II > IV > I > III

(b) III > II > IV > I

(c) III > IV > II > I


(d) I > II > IV > III

Ans. (c)

Sol. III : LP is not in resonance.

IV : OCH₃ has +M effect to increase basic strength.

II : LP in resonance

I : Amide, LP in strong resonance with 

- 63.** The specific conductance of 0.01 M solution of the weak monobasic acid is $0.20 \times 10^{-3} \text{ S cm}^{-1}$. The dissociation constant of the acid is :

Given : $\Lambda_{0\text{HA}} = 400 \text{ S cm}^2 \text{ mol}^{-1}$

(a) 5×10^{-2} (b) 2.5×10^{-5} (c) 5×10^{-4} (d) 2.5×10^{-11} **Ans. (b)**

Sol. $K = 0.20 \times 10^{-3} \text{ S cm}^{-1}$, $c = 0.01 \text{ M}$.

$$\Lambda_m = \frac{1000 \times K}{M} = \frac{1000 \times 0.20 \times 10^{-3}}{0.01} = 20 \frac{\text{S cm}^2}{\text{mol}}$$

$$\Lambda_m^\infty = 400 \frac{\text{S cm}^2}{\text{mol}}$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\infty} = \frac{20}{400} = 0.05$$

as $\alpha \ll 0.05$, $\therefore 1 - \alpha \approx 1$

$$K_a = \frac{c\alpha^2}{1-\alpha} = c\alpha^2 = 0.01 (0.05)^2 = 2.5 \times 10^{-5}$$

64. The set of quantum numbers that cannot be allotted to an electron in an atom is

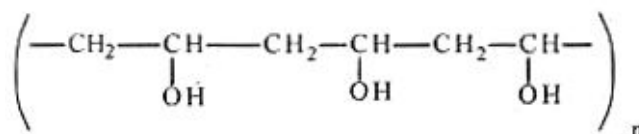
- (a) $n = 3, l = 2, m_l = +2, m_s = -1/2$ (b) $n = 2, l = 0, m_l = +1, m_s = +1/2$
 (c) $n = 1, l = 0, m_l = 0, m_s = +1/2$ (d) $n = 4, l = 3, m_l = 0, m_s = -1/2$

Ans. (b)

Sol. $M_l: -l \text{ to } +l$

For $l = 0, M_l = 0$ only.

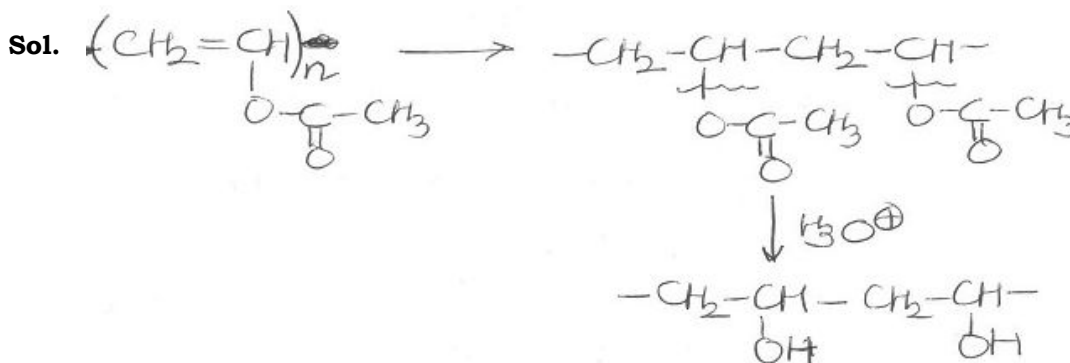
65. Polyvinyl alcohol is an important polymer. The structure is given below



It is prepared by polymerization of

- (a) $\text{CH}_2=\text{CH-OH}$
 (b) $\text{CH}_2=\text{CH-OCOCH}_3$, followed by hydrolysis
 (c) $\text{CH}_2=\text{CH-CN}$, followed by hydrolysis
 (d) $\text{CH}_2=\text{CH-COOCH}_3$, followed by hydrolysis

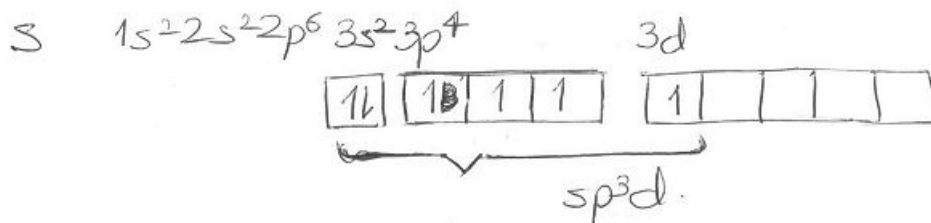
Ans. (b)



66. For SF_4 , the molecular geometry and hybridization of the central atom respectively are
 (a) Square planar, dsp^2 (b) Tetrahedral, sp^3
 (c) Seesaw, sp^3d (d) Square pyramid, sp^3d

Ans. (c)

Sol. $\text{SF}_4 \rightarrow$ see-saw & sp^3d .

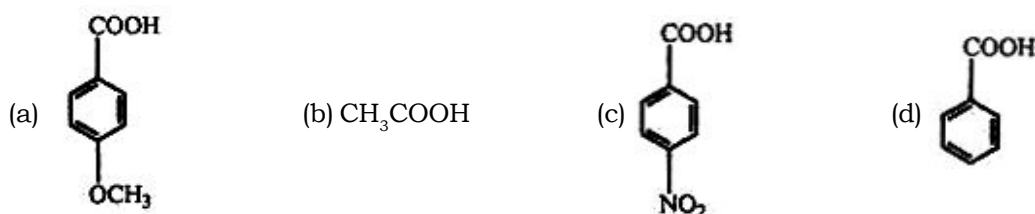


67. If the energy of an electron in the 1st and 2nd energy levels of an H atom are -13.6 eV and -3.4 eV, respectively, the energy required in eV to excite an electron from the 1st to the 2nd energy level is
 (a) 17.0 (b) -17.0 (c) 10.2 (d) -10.2

Ans. (c)

Sol. $\Delta E = E_2 - E_1$
 $= -3.4 - (-13.6) = 10.2$ eV

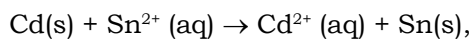
68. The pK_a values of the acids A to D are found to be 4.19, 3.41, 4.46 and 4.76. The acid having pK_a of 3.41 is



Ans. (c)

Sol. Lowest pK_a corresponds to strongest acid. NO_2 is electron withdrawing group.

69. The reaction given below is the cell reaction in a galvanic cell.



Where, $[\text{Cd}^{2+}] = 0.1$ M and $[\text{Sn}^{2+}] = 0.025$ M

Given $E^\circ_{\text{Cd}^{2+}/\text{Cd}} = -0.403$ V $E^\circ_{\text{Sn}^{2+}/\text{Sn}} = -0.136$ V, $F = 96485$ Cmol^{-1}

At 25°C , the free energy change for this reaction is

- (a) -48.05 KJ (b) -54.96 KJ (c) -100.58 KJ (d) -107.46 KJ

Ans. (a)

Sol. $\eta = k [P]^m [Q]^n$

$$\eta_1 = 8 \times 10^{-3} = k (0.2)^m (0.5)^n \quad \text{--- (1)}$$

$$\eta_2 = 3.2 \times 10^{-2} = k (0.4)^m (0.5)^n \quad \text{--- (2)}$$

$$\eta_3 = 4 \times 10^{-3} = k (0.2)^m (0.25)^n \quad \text{--- (3)}$$

$$\text{(2)} \div \text{(1)}$$

$$\frac{32}{8} = \left(\frac{0.4}{0.2}\right)^m \Rightarrow 4 = 2^m \Rightarrow m = 2$$

$$\text{(1)} \div \text{(3)}$$

$$2 = 2^n \Rightarrow n = 1$$

$$\text{Overall order} = m + n = 3$$

73. Absorbance of a chlorophyll solution measured at 660 nm at 25°C using a 1 cm cell was found to be 0.4. The same solution is heated up to 35°C and absorbance is measured once again under the same condition. The observed absorbance will be

- (a) 0.2 (b) 0.4 (c) 0.6 (d) 0.8

Ans. (a)

Sol. According to the temperature coefficient theory, the rate constant and in this case transmittance will get doubled as temperature is increased from 25°C to 35°C. Therefore, absorbance will be halved.

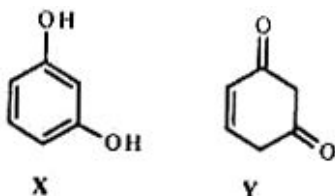
74. The species which is unable to show disproportionation reaction is

- (a) ClO_3^- (b) ClO_4^- (c) ClO_2^- (d) ClO^-

Ans. (b)

Sol. In ClO_4^- , Cl is in its highest oxidation state, i.e. +7.

75. At normal temperature, X and Y are

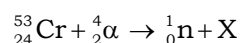


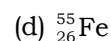
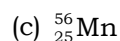
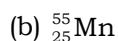
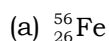
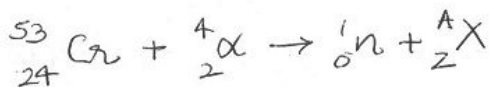
- (a) resonance structures (b) tautomers
 (c) functional isomers (d) positional isomers

Ans. (b)

Sol. Keto-enol tautomers

76. The element X formed in the following nuclear reaction is



**Ans.** (a)**Sol.** Nuclear reaction.

$$24 + 2 = 0 + Z \\ \Rightarrow Z = 26$$

$$53 + 4 = 1 + A \\ \Rightarrow A = 56$$

77. As part of a diagnostic procedure for a thyroid disorder, a patient is given a certain amount of iodine-131. The half life of this radioactive iodine-131 is 8.0 days. The percent fraction of iodine-131 that will remain in the body after 32 days, if there is no elimination of iodine through the body is

(a) 6.25

(b) 0.0625

(c) 2.77

(d) 25

Ans. (b)**Sol.** $t_{1/2} = 8$ days

$$t = 32 \text{ days} = 4t_{1/2} \Rightarrow n = 4$$

$$\text{Fraction Left} = \frac{1}{2^2} = \frac{1}{2^4} = \frac{1}{16}$$

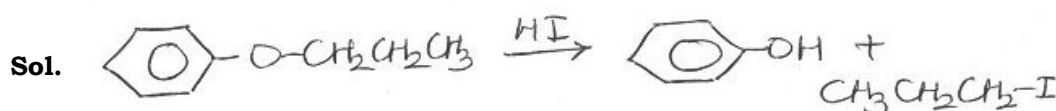
78. 1-Phenoxypropane is treated with excess of conc. HI at 0°C and the mixture of products is treated with thionyl chloride. The products formed are-

(a) n-propanol + Chlorobenzene

(b) Phenol + n-propyl iodide

(c) n-propyl chloride + Chlorobenzene

(d) n-propyl chloride + Phenol

Ans. (b)

79. To a solution containing one mole $\text{MCl}_3 \cdot 4\text{NH}_3$, on addition of excess silver nitrate solution, it was found that two moles of AgCl are precipitated. This observation suggests that the secondary valence of M in this complex is

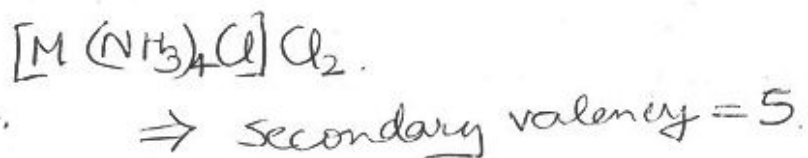
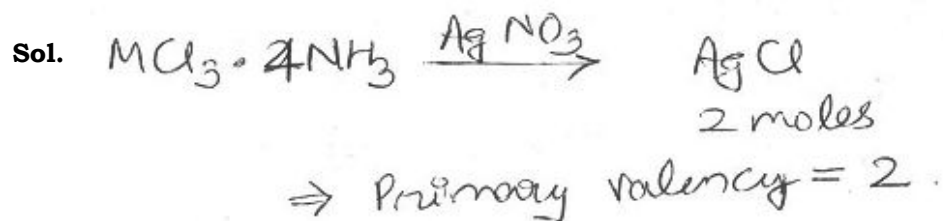
(a) 3

(b) 5

(c) 6

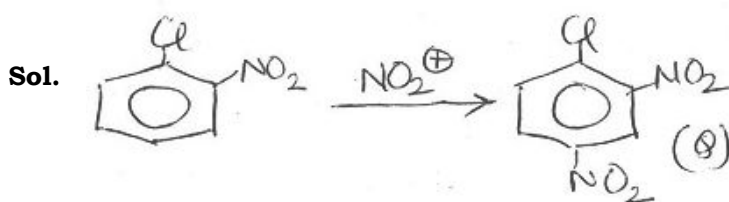
(d) 2

Ans. (b)



80. (i) chlorobenzene is mono-nitrated to M
 (ii) nitrobenzene is mono-chlorinated to N
 (iii) anisole is mono-nitrated to P
 (iv) 2-nitrochlorobenzene is mono-nitrated to Q
 Out of M, N, P and Q the compound that undergoes reaction with aq. NaOH fastest is
 (a) M (b) N (c) P (d) Q

Ans. (d)



Q - Most strongly activated for nucleophilic aromatic substitution.