Chemistry 03

Time Allowed: 3 hours **Maximum Marks: 70**

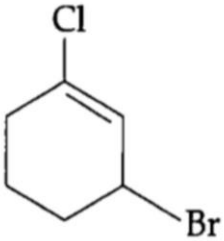
General Instructions:

Read the following instructions carefully.

1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed.**

Section A

1. The IUPAC name of the compound shown below is: **[1]**



a) 6-bromo-2-chlorocyclohexene
b) 3-bromo-1-chlorocyclohexene
c) 2-bromo-6-chlorocyclohex-1-ene
d) 1-bromo-3-chlorocyclohexene

2. Cheilosis is caused by deficiency of **[1]**

a) Vitamin B_6
b) Vitamin B_2
c) Vitamin C
d) Vitamin B_{12}

3. The correct IUPAC name of $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}} - CH_2CH_3$ is **[1]**

a) 2-Methylbutan-2-ol
b) 3-Methylbutan-3-ol
c) 2,2-Dimethylpropanol
d) tert-butyl alcohol

4. $CH_3 - C \equiv CH \xrightarrow[1\%HgSO_4]{40\%H_2SO_4} A \xrightarrow{\text{Isomerisation}} CH_3 - \underset{\underset{O}{\|}}{C} - CH_3$ **[1]**

The structure of A and type of isomerism in the above reaction are respectively.

a) Prop-2-en-2-ol, geometrical isomerism
b) Prop–1–en–2–ol, metamerism
c) Prop-1-en-2-ol, tautomerism
d) Prop-1-en-1-ol, tautomerism

5. For the reaction A + 3B $\rightarrow$ 2C + 2D, the concentration of A changes from 0.150 M to 0.0135 M in 1 min. The rate of formation of C in mol/L/s is: **[1]**

a) 5×10^{5}
b) 3×10^{-5}
c) 5×10^{-5}
d) 2.5×10^{-5}

6. Match the items of column I with appropriate entries of column II. **[1]**

Column I	Column II
(a) K_b	(i) Elevation in boiling point
(b) K_f	(ii) Van't Hoff factor
(c) i	(iii) Cryoscopic constant
(d) $\triangle T_b$	(iv) Ebullioscopic constant

a) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)
b) (a) - (ii), (b) - (i), (c) - (iii), (d) - (iv)
c) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
d) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

7. Ethylidene chloride is a/an _____. **[1]**

a) vic-dihalide
b) vinylic halide
c) gem-dihalide
d) allylic halide

8. Haemoglobin and chlorophyll contain: **[1]**

a) Fe and Mg
b) Fe and Mn
c) Fe and Co
d) Mg and Fe

9. For the reaction 3A $\rightarrow$ 2B, rate of reaction $-\frac{d[A]}{dt}$ is equal to **[1]**

a) $\frac{+1}{3}\frac{d[B]}{dt}$
b) $\frac{+2}{3}\frac{d[B]}{dt}$
c) $\frac{+1}{2}\frac{d[B]}{dt}$
d) $\frac{+3}{2}\frac{d[B]}{dt}$

10. Which of the following reagents would one choose to transform CH_3COCl into acetone? **[1]**

a) CH_3MgBr
b) $(CH_3)_2Cd$
c) $(CH_3O)_2Mg$
d) CH_3Cl

11. Lucas reagent is? **[1]**

a) anhydrous $PdCl_2$ and conc.HCl.
b) anhydrous $AlCl_3$ and conc.HCl.
c) anhydrous CaC_2 and conc. HCl.
d) anhydrous $ZnCl_2$ and conc. HCl.

12. Amide which gives propanamine by Hoffmann bromamide is: **[1]**

a) Pentanamide
b) Hexanamide
c) Butanamine
d) Propanamine

13. **Assertion (A):** Vitamin C cannot be stored in our body. **[1]**

Reason (R): Vitamin C is fat soluble and is excreted from the body in urine.

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

c) Assertion (A) is true, but Reason (R) is false.

d) Assertion (A) is false, but Reason (R) is true.

14. **Assertion (A):** Oximes are less acidic than hydroxyl amine. **[1]**

Reason (R): Oximes of aldehydes and ketones show geometrical isomerism.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** Alkylbenzene is not prepared by Friedel-Crafts alkylation of benzene. **[1]**

Reason (R): Alkyl halides are less reactive than acyl halides.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** $(CH_3)_3C\text{-}O\text{-}CH_3$ gives $(CH_3)_3C\text{-}I$ and CH_3OH on treatment with HI. **[1]**

Reason (R): The reaction occurs by S_N1 mechanism.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

17. Write the formula of the following complexes: **[2]**

i. Hexaammine platinum (IV) chloride.

ii. Dichloro tetrammine cobalt (III) ion.

18. Give reasons for the following: **[2]**

a. The only oxidation state shown by Scandium is +3.

b. $[Ti(H_2O)_6]^{4+}$ is colourless.

c. MnO is basic while Mn_2O_7 is acidic.

19. **Answer the following:** **[2]**

(a) The rate of a reaction is given by rate = k $[N_2O_5]$. In this equation what does k stand for? **[1]**

(b) Is it possible to determine or predict the rate law theoretically by merely looking at the equation? **[1]**

20. If the density of some lake water is 1.25 g mL^{-1} and contains 92 g of Na^+ ions per kg of water, calculate the molarity of Na^+ ions in the lake. **[2]**

OR

a. Differentiate between Ideal solution and Non-ideal solution.

b. 30 g of urea is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.

21. Convert Toluene to m-Nitrobenzoic acid. **[2]**

Section C

22. Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging. **[3]**

23. The first order rate constant for the decomposition of ethyl iodide by the reaction **[3]**

$C_2H_5I(g) \rightarrow C_2H_4(g) + HI(g)$

at 600 K is 1.60×10^{-2} s^{-1}. Its energy of activation is 209 kJ/mol. Calculate the rate constant of the reaction at 700 K.

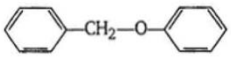
24. Write the mechanism of hydration of ethene to yield ethanol. **[3]**

OR

Give the major products that are formed by heating each of the following ethers with HI.

i. $CH_3 - CH_2 - \overset{CH_3}{\overset{|}{C}}H - CH_2 - O - CH_2 - CH_3$

ii. $CH_3 - CH_2 - CH_2 - O - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}} - CH_2 - CH_3$

iii. 

25. An organic compound A, which has a characteristic odour, on treatment with con.NaOH forms two compounds B and C. Compound B has molecular formula C_7H_8O which on oxidation gives back A. Compound C is the sodium salt of an acid. C, when heated with soda lime yields an aromatic hydrocarbon D. Deduce the structures of A, B, C and D. **[3]**

26. How much copper is deposited on the cathode of an electrolytic cell if a current of 5 ampere is passed through a solution of copper sulphate for 45 minutes? **[3]**

27. How the following conversions can be carried out? **[3]**

i. 2-Bromopropane to 1-bromopropane

ii. Chloroethane to butane

iii. Benzene to diphenyl

28. Silver is deposited on a metallic vessel by passing a current of 0.2 amps. for 3 hrs. Calculate the weight of silver deposited. (At mass of silver = 108 amu,1 F = 96500 C)? **[3]**

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

The f-block consists of elements in which 4f and 5f orbitals are progressively filled. They are placed in a separate panel at the bottom of the periodic table. The names transition metals and inner transition metals are often used to refer to the elements of d-and f-blocks respectively. The d–block occupies the large middle section of the periodic table flanked between s and p blocks in the periodic table. In general, the electronic configuration of the outer orbitals of these elements is $(n - 1)d^{1-10}ns^{1-2}$. The electronic configurations of outer orbitals of Zn, Cd, Hg and Cn are represented by the general formula $(n - 1)d^{10}ns^2$. The transition metals and their compounds also exhibit catalytic property and paramagnetic behaviour. Transition metal also forms an alloy. An alloy is a

blend of metals prepared by mixing the components. Alloys may be homogeneous solid solutions in which the atoms of one metal are distributed randomly among the atoms of the other.

i. Transition metals form alloys. Justify? (1)

ii. Why do transition elements exhibit higher enthalpies of atomization? (1)

iii. Transition metals and many of their compounds show paramagnetic behaviour. Give reason. (2)

OR

Transition metals and their many compounds act as good catalyst. Give reason. (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The solutions which boil at a constant temperature like a pure liquid and possess the same composition in liquid, as well as vapour state are called azeotropes. The components of azeotropes cannot be separated by fractional distillation. Only non-ideal solutions form azeotropes. Solutions with negative deviation form maximum boiling azeotrope and the solutions with positive deviation form minimum boiling azeotrope. The boiling point of azeotrope is never equal to the boiling points of any of the components of the azeotrope.

i. The azeotropic solutions of two miscible liquids show what type of deviation from Raoult's law? (1)

ii. The azeotropic mixture of water & HCI boils at $108.5^{\circ}C$. What type of deviation is shown by the solution? Does this solution behave as ideal or non-ideal? (1)

iii. Do ideal solutions form azeotropes? (2)

OR

Out of pure liquid and azeotrope showing positive deviation, Which one has a higher boiling point? (2)

Section E

31. **Attempt any five of the following:** **[5]**

(a) Aldopentoses named ribose and 2-deoxyribose are found in nucleic acids. What is their relative configuration? **[1]**

(b) What are the three components of nucleic acids? **[1]**

(c) Name the sugar present in milk. How many monosaccharide units are present in it? What are such oligosaccharides called? **[1]**

(d) Is nucleotide and nucleoside the same? What are their roles? **[1]**

(e) Why cannot vitamin C be stored in our body? **[1]**

(f) During curdling of milk, what happens to sugar present in it? **[1]**

(g) Account for the following: **[1]**

a. There are 5 -OH groups in glucose.

b. Glucose is a reducing sugar

32. List various types of isomerism possible for coordination compounds, giving an example of each. **[5]**

OR

Explain with two examples each of the following: Coordination entity, ligand coordination number, coordination polyhedron, homoleptic and heteroleptic.

33. An organic compound **A** with molecular formula C_7H_7NO reacts with Br_2/aq. KOH to give compound **B**, which upon reaction with $NaNO_2$ and HCl at 0^oC gives **C**. Compound **C** on heating with CH_3CH_2OH gives a hydrocarbon **D**. Compound **B** on further reaction with Br_2 water gives white precipitate of compound **E**. Identify the compound A, B, C, D and E; also justify your answer by giving relevant chemical equations. **[5]**

OR

i. Write one chemical reaction for each

a. Carbylamine reaction

b. Acetylation reaction

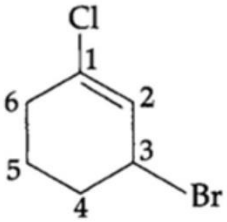
ii. Write structure of N,N-ethylmethylethanamide

SOLUTIONS

Section A

1. **(b)** 3-bromo-1-chlorocyclohexene

Explanation:



IUPAC name: 3-bromo 1-chlorocyclohexene

2. **(b)** Vitamin B_2

Explanation: Deficiency of Vitamin B_2 (Riboflavin) results in Cheilosis (fissuring at corners of mouth and lips).

3. **(a)** 2-Methylbutan-2-ol

Explanation: The correct IUPAC name of $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}} - CH_2CH_3$ is 2-Methylbutan-2-ol

4. **(c)** Prop-1-en-2-ol, tautomerism

Explanation: $CH_3 - C \equiv CH \xrightarrow[1\%HgSO_4]{40\%H_2SO_4} \underset{\underset{(A)}{Prop-1-en-2-ol}}{CH_3 - \overset{\overset{OH}{|}}{C} = CH_2} \xrightarrow{Isomerisation} \underset{Acetone}{CH_3 - \overset{\overset{O}{||}}{C} - CH_3}$

Prop-1-en-2-ol (A) acetone are tautomers.

5. **(c)** 5×10^{-5}

Explanation: $rate = -\frac{d[A]}{dt} = -\frac{1}{3}\frac{d[B]}{dt} = +\frac{1}{2}\frac{d[C]}{dt} = +\frac{1}{2}\frac{d[D]}{dt}$

$\Rightarrow \frac{d[A]}{dt} = -\frac{1}{2}\frac{d[C]}{dt}$

$\Rightarrow \frac{d[C]}{dt} = 2\frac{d[A]}{dt} = -\frac{2\times(0.0135-0.0150)}{1\times60} = 5 \times 10^{-5}\ mol\ L^{-1}s^{-1}$

rate = 5×10^{-5} mol L^{-1} s^{-1}

6. **(d)** (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

Explanation: (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

7. **(c)** gem-dihalide

Explanation: Gem-dihalides are dihaloalkanes that have two halogen atoms of the same type attached to the same carbon atom in a molecule. The common naming system of gem-dihalides (geminal halide) is alkylidene dihalides. Ethylidene dichloride thus is a gem-dihalide. The chemical formula of ethylidene dichloride is $C_3H_6Cl_2$.

8. **(a)** Fe and Mg

Explanation: Haemoglobin contains Fe and Chlorophyll contains Mg.

9. **(d)** $\frac{+3}{2}\frac{d[B]}{dt}$

Explanation: $\frac{+3}{2}\frac{d[B]}{dt}$

10.

(b) $(CH_3)_2Cd$

Explanation: $(CH_3)_2Cd$

11.

(d) anhydrous $ZnCl_2$ and conc. HCl.

Explanation: "Lucas' reagent" is a solution of anhydrous zinc chloride in concentrated hydrochloric acid.

12.

(c) Butanamine

Explanation: In the **Hoffmann bromamide reaction**, the amine formed has one carbon less than that present in the amide.

$RCONH_2 + Br_2 + 4NaOH \rightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$

13.

(c) Assertion (A) is true, but Reason (R) is false.

Explanation: In a tetrapeptide, there are four amino acids connected by three peptide bonds

14.

(d) A is false but R is true.

Explanation: Oximes are more acidic because, there is a delocalisation of π electrons (i.e. resonance) and it stabilises it and its conjugate acid. But no such resonance exists in hydroxyl amine base (NH_2O^-).

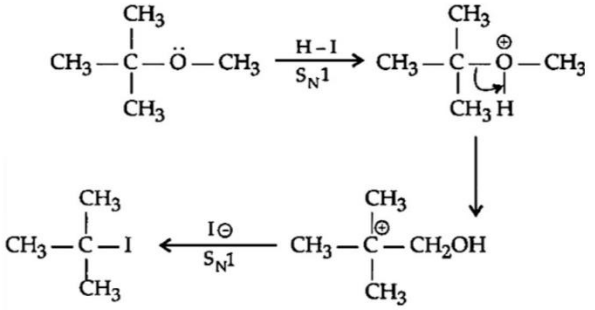
15.

(c) A is true but R is false.

Explanation: Alkyl halides give polyalkylation products.

16. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: $(CH_3)_3C\text{-}O\text{-}CH_3$ gives $(CH_3)_3C\text{-}I$ and CH_3OH on treatment with HI. The reaction occurs by S_N1 mechanism.



Section B

17. 1. $[Pt(NH_3)_6]Cl_4$

2. $[CoCl_2(NH_3)_4]^+$

18. a. At + 3 oxidation state, Stable d^0 is obtained

b. Absence of unpaired electron / no d-d transition occurs

c. MnO has Mn in +2 Oxidation State

Mn_2O_7 has Mn in +7 Oxidation State. Higher the Oxidation State, Higher is the acidic character.

19. Answer the following:

(i) 'k' stands for rate constant of a reaction.

(ii) The rate law is experimentally determined. It cannot be predicted by merely looking at the balanced chemical equation.

20. Molar mass of $Na = 23\ g\ mol^{-1}$

No. of moles of $Na^+ = \frac{92g}{23 gmol^{-1}} = 4 mole$

$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$

$V = \frac{\text{Mass}}{\text{density}} = \frac{1000}{1.25}(g)$

$V = 800ml$

$\text{Molarity} = \frac{\text{Number of moles}}{\text{Volume (ml)}} \times 1000$

$\text{Molarity} = \frac{4 \times 1000}{800} = 5 \text{ moles}$

OR

a.

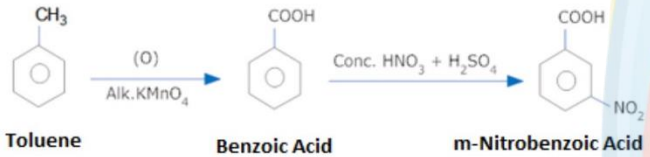
Ideal Solution	Non-ideal solution
The solution obeys Raoult's law at all concentrations.	The solution does not obey Raoult's law.
ΔV mixing = 0 and ΔH_{mixing} = 0	$\Delta V_{mixing} \neq 0$ and $\Delta H_{mixing} \neq 0$

b. $\frac{P_A^0 - P_A}{P_{A^o}^o} = \frac{\frac{W_B}{M_B}}{\frac{W_B}{M_B} + \frac{W_A}{M_A}}$

$1 - \frac{P_A}{23{\cdot}8} = \frac{\frac{30}{60}}{\frac{846}{18}}$ or $1 - \frac{P_A}{23{\cdot}8} = \frac{\frac{30}{60}}{\frac{846}{18} + \frac{30}{60}}$

$P_A = \frac{46.5}{47} \times 23.8 = 23.5$ mm Hg or vapour pressure of the solution $P_A = \frac{47}{47.5} \times 23.8 = 23.5$ mm Hg

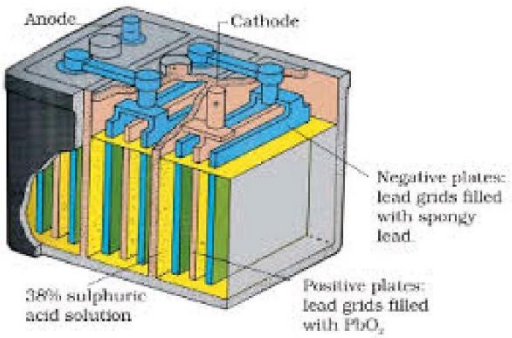
21.



Toluene — Benzoic Acid — m-Nitrobenzoic Acid

Section C

22. A lead storage battery consists of a lead anode, a grid of lead packed with lead dioxide (PbO_2) as cathode and a 38% solution of sulphuric acid (H_2SO_4) as an electrolyte.



When the battery is in use, the following cell reactions take place:

At anode: $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

At cathode: $PbSO_4(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \rightarrow PbSO_4(s) + 2H_2O(l)$

The overall cell reaction is given by,

$Pb(s) + PbO_2(s) + 2H_2SO_4(aq) \rightarrow 2PbSO_4(s) + 2H_2O(l)$

When battery is charging, the reverse of all these reactions takes place.

Hence, on charging, $PbSO_4(s)$ present at the anode and cathode is converted into Pb and PbO_2, respectively. Sulphuric acid (H_2SO_4) reconstitute in the reaction. The reaction may written as:

$$2PbO_2(s) + 2H_2O(l) \xrightarrow{charging} Pb(s) + PbO_2\ (s) + 2H_2SO_4$$

23. Here $T_1 = 600K$

$T_2 = 700K$

$E_a = 209KJ/mol$

$= 209000Jmol^{-1}$

$k_1 = 1.60 \times 10^{-5}s^{-1}$

$k_2 = ?$

Using the formula

$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$

$\log k_2 - \log k_1 = \frac{E_a}{2.303R}\left[\frac{700-600}{600\times700}\right]$

$\log k_2 - \log 1.60 \times 10^{-5} = \frac{209000}{2.303\times8.314}\left[\frac{100}{600\times700}\right]$

$\log k_2 = \log 1.60 \times 10^{-5} + 2.599$

$\log k_2 = -4.796 + 2.599$

= - 2.197

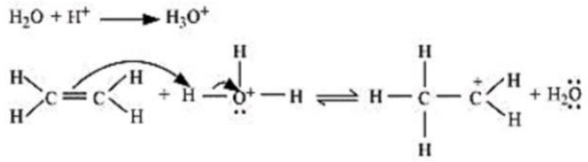
k_2 = anti log (-2.197)

$= 6.36 \times 10^{-3} s^{-1}$

24. The mechanism of hydration of ethene to form ethanol involves three steps.

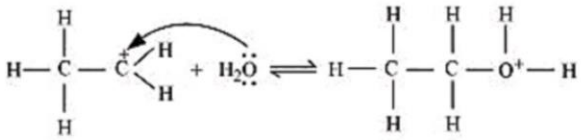
Step 1:

Protonation of ethene to form carbocation by electrophilic attack of H_3O^+:



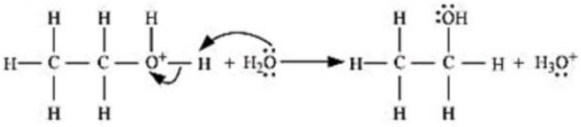
Step 2:

Nucleophilic attack of water on carbocation:



Step 3:

Deprotonation to form ethanol:



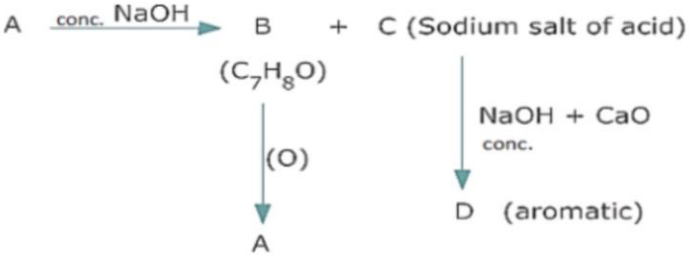
OR

i. $CH_3 - CH_2 - \overset{CH_3}{\overset{|}{C}}H - CH_2 - O - CH_2 - CH_3 + HI \rightarrow CH_3CH_2\overset{CH_3}{\overset{|}{C}}HCH_2OH + CH_3CH_2I$

ii. $CH_3 - CH_2 - CH_2 - O - \overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}} - CH_2 - CH_3 + HI \rightarrow CH_3CH_2CH_2OH + CH_3CH_2 - \overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}} - I$

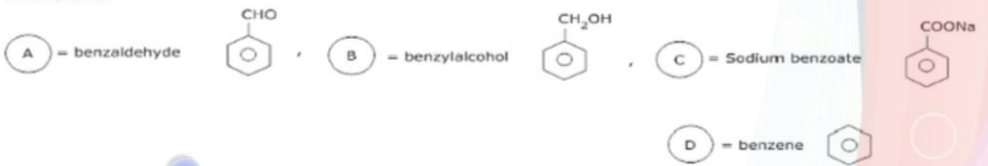
iii. 

25. This is Cannizzaro Reaction

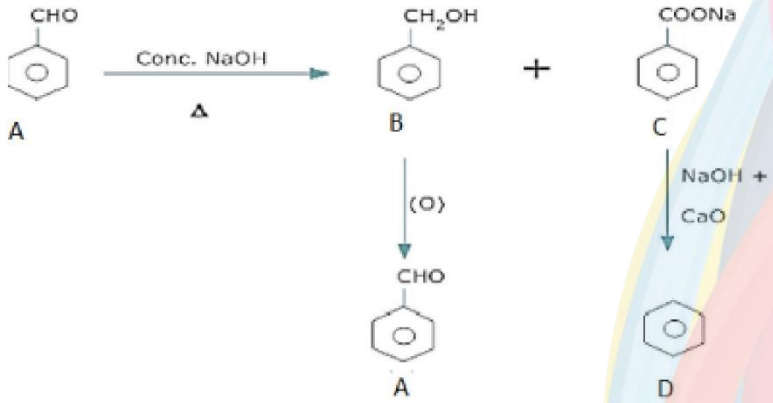


The molecular formula of (B) and characteristic odour of (A) suggests that (A) is an aromatic aldehyde, C_6H_5CHO and (B) is alcohol, $C_6H_5CH_2OH$. As (C) is a sodium salt of an acid & gives hydrocarbon (D) on heating with soda lime, (C) is sodium benzoate and (D) is benzene. In this reaction, Benzaldehyde undergoes self oxidation and reduction(disproportionation).

Therefore:-



Reaction are:-



26. We know that

[Cu = 63.5g mol^{-1}, 1F = 96500C mol^{-1}]

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

$m = Z \times I \times t$

$= \frac{63.5}{2\times 96500} \times 5amp \times 45 \times 60$

$= \frac{857250}{193000} = 4.44g$

27. Following conversion is carried out:

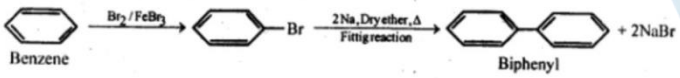
i. 2-Bromopropane to 1-bromopropane

$$\underset{2-Bromoprpane}{CH_3-\underset{Br}{CH}-CH_3} \xrightarrow[Dehydroha\log enation]{KOH(alc),\Delta} CH_3CH=CH_2 \xrightarrow[Peroxide\ effect]{HBr/Peroxide} \underset{1-Bronopropane}{CH_3CH_2CH_2Br}$$

ii. Chloroethane to butane

$$\underset{Chloroethane}{2CH_3CH_2-Cl} + 2Na \xrightarrow[Wurtz\ reaction]{Dry\ ether} \underset{Bu\tan e}{CH_3CH_2-CH_2CH_3} + 2NaCl$$

iii. Benzene to diphenyl



28. By Faraday's first law of electrolysis.

w = ZIt.

Substituting I = 0.2 A, t = 3×60×60 sec, Z= 108/(1×96500)

⇒ w = 2.417 g.

2.417 g of silver is deposited.

Section D

29. i. The transition metals are quite similar in size and, therefore, the atoms of one metal can substitute the atoms of other metal in its crystal lattice. Thus, on cooling a mixture solution of two or more transition metals, solid alloys are formed.

ii. The high enthalpies of atomization are due to a large number of unpaired electrons in their atoms. Therefore, they have stronger interatomic interactions and hence, stronger bonding between atoms.

iii. Transition elements and many of their compounds are paramagnetic, i.e., they are weakly attracted by a magnetic field. This is due to the presence of unpaired electrons in atoms, ions or molecules. The paramagnetic character increases as the number of unpaired electrons increases.

OR

a. The ability of transition metal ion to pass easily from one oxidation state to another and thus providing a new path to reaction with lower activation energy.

b. The surface of transition metal acts as very good adsorbent and thus provides increased concentration of reactants on their surface causing the reaction to occur.

30. i. The azeotropic solutions of two miscible liquids may show positive or negative deviation from Raoult's law.

ii. The solution is a non-ideal solution and shows a negative deviation from Raoult's law.

iii. No, ideal solutions don't form azeotropes. Only the non-ideal solution form azeotrope.

OR

The boiling point of a pure liquid is higher as compared to azeotrope showing positive deviation.

Section E

31. Attempt any five of the following:

(i) Both the aldopentoses(ribose and 2-deoxyribose) have D-configuration.

(ii) The three components of nucleic acid are base, sugar and phosphate group..

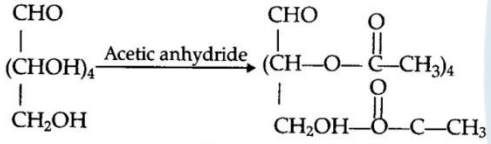
(iii)Lactose is present in milk as sugar. Two monosaccharide units (i.e., glucose and galactose) are present in it. Such oligosaccharides are called disaccharides.

(iv)The main difference between nucleotide and nucleoside lies in their chemical composition. Nucleotide consists of phosphate group, a sugar and a nitrogenous base. Nucleoside consists of sugar and a base without the phosphate group. Nucleotides are the major causes of cancer and nucleosides are same as nucleotides only with the addition of phosphate groups.

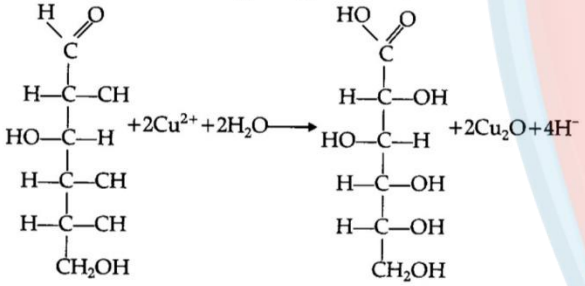
(v) Vitamin C cannot be stored in our body because it is water soluble. As a result, it is readily excreted in the urine.

(vi)The milk sugar lactose is converted into lactic acid by the bacteria during curdling of milk.

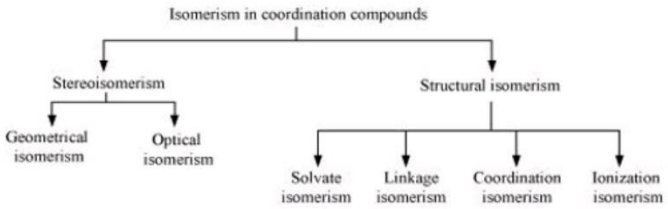
(vii) a. Acetylation of glucose with acetic anhydride gives glucose pentaacetate which confirms the presence of five -OH groups. Since, it exists as a stable compound, five -OH groups should be attached to different carbon atoms.



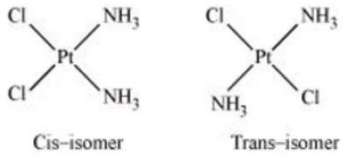
b. Glucose reduces Fehling's reagent. Thus, it is considered as reducing sugar.



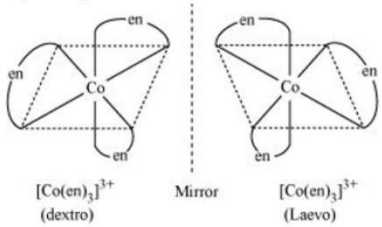
32.



i. Geometric isomerism: This type of isomerism is common in heteroleptic complexes. It arises due to the different possible geometric arrangements of the ligands. For example:



ii. Optical isomerism: This type of isomerism arises in chiral molecules. Isomers are mirror images of each other and are non-superimposable.



iii. Linkage isomerism: This type of isomerism is found in complexes that contain ambidentate ligands. For example: $[Co(NH_3)_5(NO_2)]Cl_2$ and $[Co(NH_3)_5(ONO)Cl_2$

Yellow form Red form

iv. Coordination isomerism:

This type of isomerism arises when the ligands are interchanged between cationic and anionic entities of different metal ions

present in the complex.

$[Co(NH_3)_5ONO]^{2+}$ and $[Co(NH_3)_5NO_2]^{2+}$

v. Ionization isomerism:

This type of isomerism arises when a counter ion replaces a ligand within the coordination sphere. Thus, complexes that have the same composition, but furnish different ions when dissolved in water are called ionization isomers. For e.g., $Co(NH_3)_5SO_4Br$, and $Co(NH_3)_5BrSO_4$

vi. Solvate isomerism:

Solvate isomers differ by whether or not the solvent molecule is directly bonded to the metal ion or merely present as a free solvent molecule in the crystal lattice.

$[Cr(H_2O)_6]\ Cl_3\ [Cr(H_2O)_5Cl]Cl_2.H_2O[Cr(H_2O)_5Cl_2\ Cl.2H_2O$

Violet Blue-green Dark green

OR

Coordination entity: This entity usually constitutes a central metal atom or ion, to which are attached a fixed number of other atoms or ions or groups by coordinate bonds. Examples are $[Ni(CO)_4]$, $[COCl_3(NH_3)_3]$, etc.

Ligands: It is an ion having at least one lone pair of electrons and capable of forming a coordinate bond with central atom / ion in the coordination entity.

Examples are : Cl^-, $(OH)^-$, $(CN)^-$etc.

Coordinate number: The total number of coordinate bonds with which central atom/ ion is linked to ligands in the coordination entity is called coordination number of central atom / ion.

Coordination polyhedron : The spatial arrangement of the ligands which are directly attached to the central atom / ion defines a coordination polyhedron about the central atom.

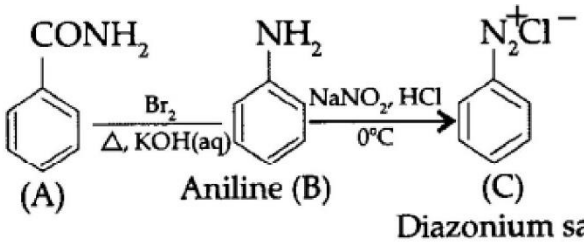
Examples are: $[Co(NH_3)_6]^{3+}$is octahedral,

$[Ni(CO)_4]$is tetrahedral.

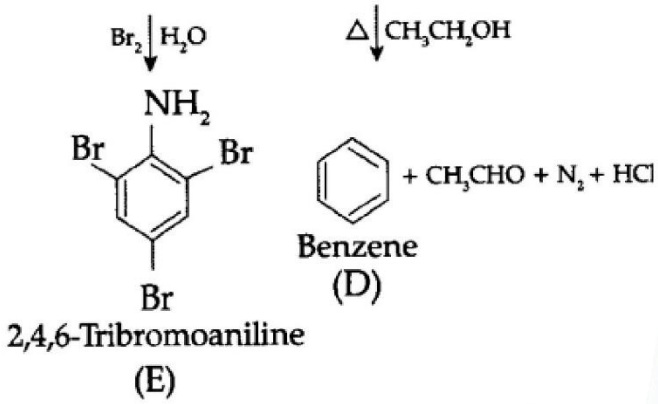
Homoleptic and hedroleptic: Complexes in which a metal is bound to only one kind of donor groups are known as homoleptic.

Example $[CO(NH_3)_6]^{3+}$

Complex in which a metal is bound to more than one kind of donor groups are called hetroleptic. Example : $[Co(NH_3)_4Cl_2]^+$



33.



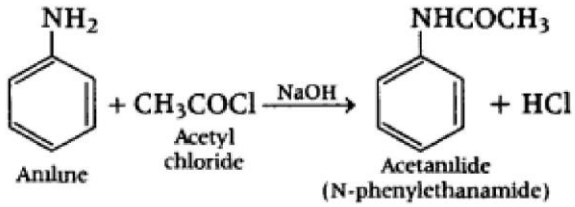
OR

i. **Carbylamine reaction:** Aliphatic or aromatic primary amines on heating with chloroform and ethanolic potassium hydroxide form isocyanides or carbylamine which are foul smelling substances. This reaction is known as carbylamine reaction.

$$\underset{\text{Aniline}}{C_6H_5NH_2} + CHCl_3 + 3KOH \xrightarrow{\Delta} C_6H_5NC + 3KCl + 3H_2O$$

This reaction is used as a test for primary aliphatic and aromatic amine.

ii. **Acetylation:**



iii. The structure of N,N-ethylmethylethanamide is:

$$C_2H_5 - \underset{\underset{CH_3}{|}}{\overset{\cdot\cdot}{N}} - \underset{\underset{O}{||}}{C} - CH_3$$