

SAMPLE PAPER-5

XII-Chemistry
TIME – 3 HRS

MARKS - 70

GENERAL INSTRUCTIONS: (i) All questions are compulsory.

(ii) Questions number 1 to 5 are very short-answer questions and carry 1 mark each.

(iii) Questions number 6 to 10 are short-answer questions and carry 2 marks each.

(iv) Questions number 11 to 22 are also short-answer questions and carry 3 marks each.

(v) Question number 23 is a value based question and carry 4 marks?

(vi) Questions number 24 to 26 are long-answer questions and carry 5 marks each.

(vii) Use Log Tables, if necessary. Use of calculators is not allowed.

1. What are current carrying species in metals and electrolyte?
2. What type of semiconductor is formed when aluminum is doped in germanium?
3. Ammonia has higher boiling point than phosphine. Why?

4. Give IUPAC name for :-
 $\text{H}_2\text{C}=\text{CH}-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{CHO}$
5. What is the role of fluorspar or cryolite in purification of Aluminum?
6. Define a) Elementary reaction, b) Order of reaction.
7. Describe the concept of (a) Mond process, (b) Van arkel method.
8. Complete the following reactions:
(a) $\text{XeF}_6 + \text{H}_2\text{O} (\text{excess}) \rightarrow$
(b) $\text{PCl}_5 + \text{H}_2\text{O} (\text{excess}) \rightarrow$
9. What is the reaction of permanganate ions in acidic solution with?
a) Ferrous ions, b) oxalate ions.
10. Which one of the following will undergo SN^2 mechanism faster? why?
(a) CH_3Br or $(\text{CH}_3)_3\text{CBr}$ (b) CH_3Br or CH_3I
11. Complete the following :
(a) $\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}_2 + \text{HBr} \rightarrow$
(b) $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{OH} \xrightarrow[573\text{K}]{\text{Cu}}$
(c) $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{H}_3\text{PO}_2 + \text{H}_2\text{O} \rightarrow$

12. Differentiate between Globular and fibrous protein?
13. Write a short note on: a) Anti fertility drugs b) Tranquilisers c) Disinfectant.
14. Write the monomers of a) Nylon-66, b) PHBV & c) Buna-S
15. The rate constant for first order reaction is 60/s. How much time will it take to reduce the concentration of the reaction to 1/10 of its initial value ?
16. The density of chromium is 7.2 g cm^{-3} . If the unit cell is a cubic with length of 289 pm, determine the type of unit cell (Atomic mass of Cr = 52 u and $N_A = 6.022 \times 10^{23} \text{ atoms mol}^{-1}$).
17. For the standard cell:
- $$\text{Cu(s)}/\text{Cu}^+(\text{aq}) \parallel \text{Ag}^+(\text{aq})/\text{Ag(s)}$$
- $$E^0_{\text{cell } 2+/\text{Cu}} = +0.34 \text{ V}$$
- $$E^0_{\text{cell } 2+} = +0.34 \text{ V}$$
- $$E^0_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$$
- identify the cathode and the anode as the current is drawn from the cell.
 - Write the reaction taking place at the electrodes.
 - Calculate the standard cell potential.
18. Explain the terms a) Tyndal effect b) Electrophoresis, c) peptisation ,
19. Explain the following observations:
- The boiling point of ethanol is higher than methoxy methane.
 - Primary alcohol is more acidic than secondary or tertiary alcohol.
 - Ortho nitro phenol is steam volatile whereas para nitro phenol is not.
20. Explain the hybridization on the basis of VBT of $[\text{Fe}(\text{CN})_6]^{4-}$
21. Give reasons:
- Transition metals are good catalyst.
 - Most of transition metals form coloured compounds.
 - Transition metals form complexes.
22. Write chemical equation to illustrate:
- HVZ Reaction
 - Rosenmund Reduction

23. Ashraf is 50 years old and has diabetes. He uses saccharine as sweetening agent in tea and coffee and sugar free in sweets. Lakshmi too is diabetic. She controls her sugar level in diet by using less sugar and by exercising.

a. Who is able to handle diabetes more efficiently and why?

b. What value do you derive from this?

c. What are the harmful effects of artificial sweeteners?

24. (i) Account for the following:

(a) Nitrogen gas is inert at room temp.

(b) F_2 is better oxidizing agent than Cl_2 . Why?

(c) In aqueous solution HI is stronger acid than HCl.

(d) Noble gases have low boiling point.

(ii) Draw the structure of BrF_3

OR

(a) Write balanced equations for the following:

(i) White phosphorus is heated with concentrated NaOH solution in an inert atmosphere of CO_2 .

(ii) The reaction of Cl_2 with hot and concentrated NaOH.

(iii) The reaction of platinum with aqua-regia

(b) Write the chemical equations involved in Brown ring test for nitrate ion.

25. a) A 6.2% solution of menthol in cyclohexane freezes at $-1.95^\circ C$. Determine the molecular mass of menthol. The freezing point and molal depression constant of cyclohexane are $6.5^\circ C$ and $20.2 K m^{-1}$, respectively.

b) State Henry's Law and mention its two important applications.

c) Which of the following has higher boiling point and why: 0.1 M NaCl or 0.1 M Glucose.

OR

a) Explain the following:

i) Raoult's Law

ii) Boiling point elevation constant for a solvent.

b) A solution of glycerol ($C_3H_8O_3$) in water was prepared by dissolving some glycerol in 500 g of water. This solution has a boiling point of $100.42^\circ C$. What mass of glycerol was dissolved to make this solution? (K_b for water = $0.512 K kg mol^{-1}$).

26.(a) An organic compound (A) has molecular formula ($C_6H_{10}O$). It does not reduce Tollen's reagent but forms an orange precipitate with 2,4 DNP reagent. It forms a carboxylic acid (B) with molecular formula ($C_3H_6O_2$) when treated with alkaline $KMnO_4$ yellow precipitate on treatment with $NaOH$. And I_2 . Under vigorous conditions. On oxidation it gives ethanoic acid and propanoic acid. Sodium salt of (B) gave a hydrocarbon (C) in Kolbe electrolytic reduction. Identify (A), (B) and (C) and write the reactions involved.

(b) Predict the products formed in the following cases:

(i) (A) reacts with $PhMgBr$ and is then hydrolysed.

(ii) (A) reacts with hydrazine and is then heated with KOH and ethylene glycol.

OR

Two isomeric compound A and B having molecular formula $C_{15}H_{11}N$, both lose N_2 on treatment with HNO_2 and gives compound C and D. C is resistant to oxidation but immediately responds to oxidation to Lucas reagent after 5 minutes and gives a positive Iodoform test. Identify A and B.

Marking Scheme of Sample Paper -5

1. Metal – free electron and in electrolyte –ions 1
2. P-type semiconductor. 1
3. Due to intermolecular hydrogen bonding. 1
4. 4-hydroxy hex-5-enal 1
5. To decrease the melting point and to increase the conductivity of alumina. 1
6.
 - a. Elementary reaction- the reaction which completes in one step. 1
 - b. ORDER OF REACTION- The sum of powers to which the concentrations terms are raised in a rate law expression is called order of reactions. For above case order = P+Q: orders of r^n is determined experimentally. 1
7. a. In the Mond Process, Ni is heated in a stream of CO forming a volatile complex, which then decomposes at higher temperature to give Ni.

At 330-350K: - $\text{Ni} + 4\text{CO} \rightarrow \text{Ni}(\text{CO})_4$

At 450-470K $\text{Ni}(\text{CO})_4 \rightarrow \text{Ni} + 4\text{CO}$ 1

 - b. Van Arkel process is used for obtaining ultrapure metal. The impure metal is converted into volatile compound, which then decomposes electrically to get pure metal.

At 850K: - $\text{Zr (impure)} + 2\text{I}_2 \rightarrow \text{ZnI}_4$

At 2075K:- $\text{ZnI}_4 \rightarrow \text{Zr (pure)} + 2\text{I}_2$ 1
8. (a) $\text{XeF}_6 + \text{H}_2\text{O (excess)} \rightarrow \text{XeO}_3 + 6\text{HF}$ 1
- (b) $\text{PCl}_5 + \text{H}_2\text{O(excess)} \rightarrow \text{H}_3\text{PO}_4 + \text{HCl}$ 1
9.
 - (i) $\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O}$ 1
 - (ii) $2\text{MnO}_4^- + 5\text{C}_2\text{O}_4^{2-} + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 10\text{CO}_2 + 8\text{H}_2\text{O}$ 1
10. (a) CH_3Br – methyl bromide is less hindered 1
- (b) CH_3I - iodide is good leaving group 1
11. a. $\text{CH}_3\text{-CH}_2\text{-CH(Br)-CH}_3$ 1
- b. $(\text{CH}_3)_2\text{C=CH}_2 + \text{H}_2\text{O}$ 1
- c) $\text{C}_6\text{H}_6 + \text{H}_3\text{PO}_3 + \text{N}_2 + \text{HCl}$ 1
- 12.

Globular Protein (1 ½)	Fibrous Protein (1 ½)
------------------------	-----------------------

<p>1. they form α-helix structure.</p> <p>2. they are water soluble.</p> <p>3. they involve H bonding.</p>	<p>1. they have β-pleated structure.</p> <p>2. they are water insoluble.</p> <p>3. they have strong intermolecular forces of attraction.</p>
--	---

13. a) Anti fertility drugs-These is the chemical substances used to control the pregnancy. They are also called oral contraceptives or birth control pills.

Eg-Mifepristone, norethindrone. 1

b) Tranquilisers -The class of chemical compounds used for the treatment of stress,mild or even severe mental diseases. Eg-idardil, iproniagid, luminal, second equaqnil . 1

c) Disinfectant - are applied to inanimate objects such as floors , drainage , system.

Eg- 0.2% solution of phenol is an antiseptic while 1% solution is an disinfectant. 1

14.

a. Hexamethylenediamine +Adipic acid 1

b. 3-hydroxybutanoic acid +3-hydroxypantanoic acida. 1

C. 1,3-Butadiene + Styrene 1

15. Ans:-

$$t = \frac{2.303 \log [R_0]}{K [R]} \quad 1$$

$$t = \frac{2.303 \log [R_0]}{1/10[R]} \quad 1$$

$$t = \frac{2.303 \log 10}{60}$$

$$t = \frac{2.303}{60} = 3.38 \times 10^{-2} \text{ s}^{-1} \quad 1$$

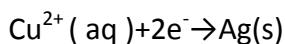
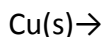
16. $d = \frac{Z * M}{a^3 * N_A} \quad 1$

$$Z = \frac{d * a^3 * N}{M} = \frac{7.2(\text{g cm}^{-3}) * [289 * 10^{-10} \text{ cm}]^3 * 6.022 * 10^{23}(\text{atom mol}^{-1})}{52 \text{ g mol}^{-1}} \quad 1 \frac{1}{2}$$

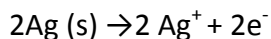
17. From the cell representation

Ag/Ag⁺ electrode is cathode and Cu/Cu⁺ electrode is anode . 1

1. At anode :



At anode



1

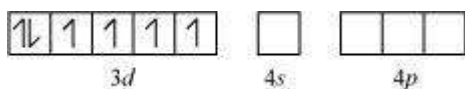
$$\begin{aligned} E^{\circ}_{\text{cell}} &= E^{\circ}_{\text{cathode}} - E^{\circ}_{\text{anode}} \\ &= E^{\circ}_{\text{Ag}^+/\text{Ag}} - E^{\circ}_{\text{Cu}^{2+}/\text{Cu}} \\ &= +0.80\text{V} - (+0.34\text{V}) \\ &= +0.80\text{V} - 0.34\text{V} \\ &= 0.46\text{V} \end{aligned}$$

1

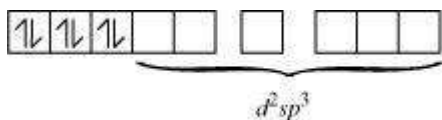
18. a. Tyndall effect-scattering of light by colloidal particles by which path of beam becomes clearly visible. This effect is known as tyndall effect. 1
 b. Electrophoresis - Movement of Colloidal particles towards opposite electrode in presence of external electric field 1
 c. Peptization- Process of converting a precipitate into colloidal sol. By shaking it with dispersion medium in the presence of a small amount of electrolyte. 1
19. a. Due to intermolecular hydrogen bonding. 1
 b. Due to less electron releasing group. 1
 c. Due intra molecular hydrogen bonding in o- nitro phenol. 1

20. (i) $[\text{Fe}(\text{CN})_6]^{4-}$ In the above coordination complex, iron exists in the +II oxidation state. Fe^{2+}

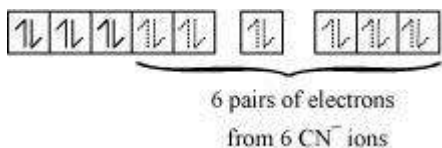
Electronic configuration is $3d^6$ Orbitals of Fe^{2+} ion:



As CN^- is a strong field ligand, it causes the pairing of the unpaired 3d electrons. Since there are six ligands around the central metal ion, the most feasible hybridization is d^2sp^3 . d^2sp^3 hybridized orbitals of Fe^{2+} are:



6 electron pairs from CN^- ions occupy the six hybrid d^2sp^3 orbitals. Then,



Hence, the geometry of the complex is octahedral and the complex is diamagnetic (as there are no unpaired electrons).

21. (i) Transition metals and their many compounds act as good catalyst It is due to (i) partially filled (n-1) d orbital (ii) Variable oxidation

state (iii) Ability to change oxidation state frequently.

1

(ii) The transition metals generally form coloured compounds due to presence of unpaired electrons in (n-1) d orbital & thus they can undergo d-d transition. 1

(iii). Transition metals have a strong tendency to form complexes Most of transition elements form complex compounds due to (i) small size (ii) high charge (iii) presence of vacant d-orbital of suitable energy 1

22. Reaction with proper equation. 3

23. a. Lakshmi is able to handle diabetes better, because exercises activate the pancreases to produce insulin. Exercise keeps one fit and fine. 1 ½

b.) It is necessary to lead a disciplined life. 1

c.) Researches have shown that the artificial sweeteners have harmful effect on the body because they are not excreted easily. 1 ½

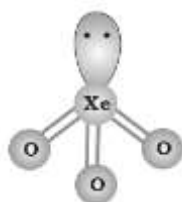
24.

(a) Nitrogen can form triple bond due to smaller size an dhigh electronegativity. 1

(b) Due to lone pair-lone pair repulsion in F atoms as F has smaller size. 1

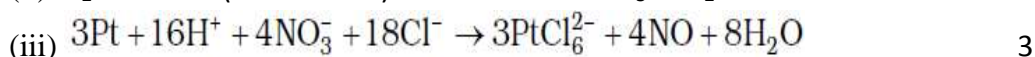
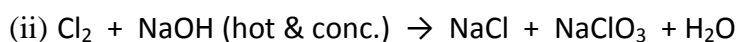
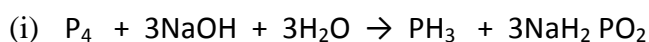
(c) Bond dissociation enthalpy of HI is smaller than HCl 1

(d) Due to weak Vanderwaal force of attraction in noble gases. 1 +1

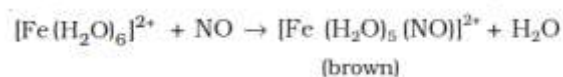
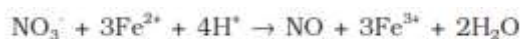


Or

(a)



(b)



2 mark

25.

a) $\Delta T_f = K_f m = K_f W_B / M_B \times 1000 / W_A$ (0.5 mark)

$8.45 = 20.2 \times 6.2 / M_B \times 1000 / 93.8$ (0.5 mark)

$M_B = 158 \text{ g mol}^{-1}$ (1 mark)

b) The solubility of a gas in a liquid is directly proportional to the pressure of the gas.

Applications:

- 1) Solubility of CO₂ is increased at high pressure.
 2) Mixture of He and O₂ are used by sea divers as He is less soluble than nitrogen.
 (1 + 0.5 + 0.5 mark)
- c) 0.1 M NaCl and because NaCl gets dissociated into 2 ions. (0.5 + 0.5 mark)

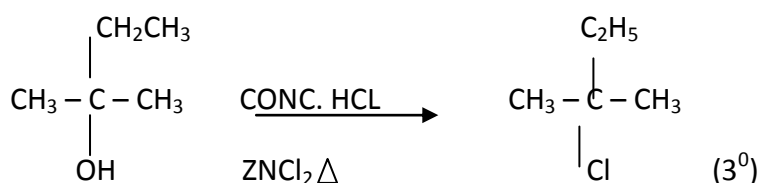
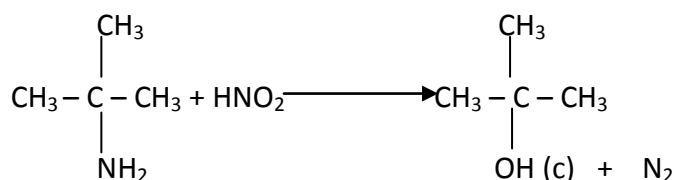
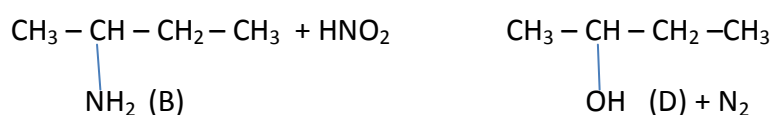
OR

- a) i) It states that for a solution of volatile solute the partial pressure of each component is directly proportional to its mole fraction.
 (1 mark)
- ii) the elevation in boiling point when one mole of a non volatile solute is dissolved in 1 kg of solvent (1 mark)
- b) $\Delta T_b = 100.42^\circ\text{C} - 100^\circ\text{C} = 0.42^\circ\text{C}$ or 0.42 K (1 mark)
- $\Rightarrow W_B = M_B \times \Delta T_b \times W_A / K_b \times 1000$ (1 mark)
- $\Rightarrow W_B = 92 \times 0.42 \times 500 / 0.512 \times 1000 = 37.73\text{ g}$ (1 mark)

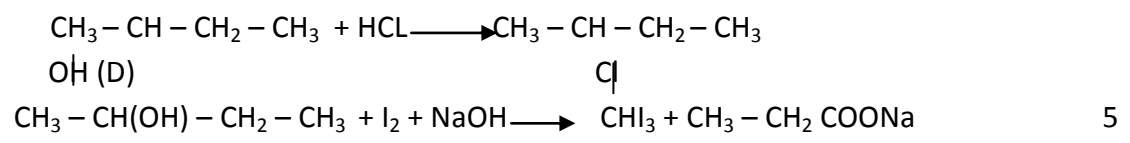
26.

- a) (A) = $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$ 1
 $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3 \xrightarrow{\text{oxidation}} \text{CH}_3\text{CH}_2\text{COOH}$ 1
 $\text{CH}_3\text{CH}_2\text{COONa} \xrightarrow{\text{Kolbe Electrolysis}} \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ 1
 B) i) $\text{CH}_3\text{CH}_2\text{C}(\text{Ph})(\text{OH})\text{CH}_2\text{CH}_3$ 1
 ii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ 1

or



But 'D' respond to lucas reagent in 5 minutes.



5