

12th
STD

PUBLIC EXAM - MARCH 2025

Reg. No.

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Part - III

TIME ALLOWED : 3.00 Hours]

CHEMISTRY (with answers)

[MAXIMUM MARKS : 70

Instructions :

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

Note : Draw diagrams and write equations wherever necessary.

PART - I

Note : (i) Answer **all** the questions. $15 \times 1 = 15$

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. During the decomposition of H_2O_2 to give dioxygen, 48 g O_2 is formed per minute at certain point of time. The rate of formation of water at this point is :

- (a) $2.25 \text{ mol min}^{-1}$ (b) $0.75 \text{ mol min}^{-1}$
(c) 3.0 mol min^{-1} (d) 1.5 mol min^{-1}

2. How many moles of I_2 are liberated when 1 mole of potassium dichromate react with potassium iodide?

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

3. Non-stick cook wares generally have a coating of a polymer, whose monomer is :

- (a) chloroethene
(b) ethane
(c) 1,1,2,2-tetrafluoroethane
(d) prop-2-enenitrile

4. The compound that reacts with nitrous acid to give yellow oily liquid is _____ :

- (a) N - methylaniline
(b) Nitro benzene
(c) N, N-dimethyl aniline
(d) Aniline

5. Boric acid is an acid because its molecule :

- (a) combines with proton to form water molecule
(b) contains replaceable H^+ ion
(c) accepts OH^- from water, releasing proton.
(d) gives up a proton

6. In an electrical field, the particles of a Colloidal system move towards cathode. The coagulation of the same sol is studied using (i) K_2SO_4 (ii), Na_3PO_4 (iii), $K_4[Fe(CN)_6]$ and (iv) $NaCl$. Their coagulating power should be :

- (a) (iii) > (ii) > (i) > (iv)
(b) (i) > (ii) > (iii) > (iv)
(c) (ii) > (i) > (iv) > (iii)
(d) None of these

7. **Assertion :** Bond dissociation energy of Fluorine is greater than Chlorine gas.

Reason : Chlorine has more electronic repulsion than Fluorine.

- (a) **Assertion** is true but **Reason** is false.
(b) Both **Assertion** and **Reason** are true and **Reason** is the correct explanation of **Assertion**.
(c) Both **Assertion** and **Reason** are false
(d) Both **Assertion** and **Reason** are true but **Reason** is not the correct explanation of **Assertion**.

8. In calcium fluoride, having the fluorite structure, the coordination number of Ca^{2+} ion and F^- ion are :

- (a) 8 and 4 (b) 4 and 2
(c) 4 and 8 (d) 6 and 6

9. The secondary structure of a protein refers to _____.

- (a) sequence of α -amino acids
(b) fixed configuration of the polypeptide backbone
(c) α -helical backbone
(d) hydrophobic interaction

[1]

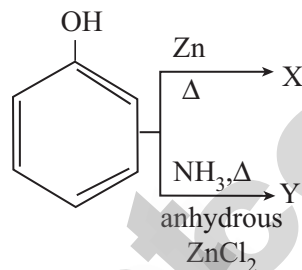
10. At 25°C, ionic product constant K_w of water is 1.00×10^{-14} . Its value of 40°C is _____.
- (a) 1.00×10^{-14} (b) 1.14×10^{-15}
(c) 2.71×10^{-14} (d) 2.95×10^{-15}
11. What is the oxidation number of the central metal ion in the complex, $[\text{Pt}(\text{NO}_2)(\text{H}_2\text{O})(\text{NH}_3)_2]\text{Br}$?
- (a) +4 (b) +2 (c) +6 (d) +3
12. The number of electrons that have a total charge of 9650 coulombs is :
- (a) 6.022×10^{22} (b) 6.22×10^{23}
(c) 6.022×10^{-34} (d) 6.022×10^{24}
13. Which one of the following is the Strongest acid?
- (a) 4-nitrophenol (b) 2-nitrophenol
(c) 3-nitrophenol (d) 4-chlorophenol
14. $\text{CH}_3\text{Br} \xrightarrow{\text{KCN}} (\text{A}) \xrightarrow{\text{H}_3\text{O}^+} (\text{B}) \xrightarrow{\text{PCl}_5} (\text{C})$
Product (C) is :
- (a) chloro acetic acid
(b) α - chlorocyno ethanoic acid
(c) acetylchloride
(d) none of these
15. Extraction of gold and silver involves leaching with cyanide ion. Silver is later recovered by :
- (a) Displacement with Zinc
(b) Distillation
(c) Liquation
(d) Zone refining

PART - II

Note : Answer any six questions. Question No. 24 is **Compulsory.** $6 \times 2 = 12$

16. Which type of ores can be concentrated by froth floatation method? Give an example for ores.
17. What happens when PCl_5 is heated?
18. Why do Zirconium and Hafnium exhibit similar properties?
19. Define Solubility Product.
20. Define Equivalent Conductance.
21. Peptising agent is added to convert precipitate into colloidal solution. Explain this statement with an example.

22. Write Gattermann - Koch reaction.
23. How are drugs classified?
24. Find the products X and Y in the following reactions.

**PART - III**

Note : Answer any six questions. Question No. 33 is **Compulsory.** $6 \times 3 = 18$

25. Describe a method for refining Nickel.
26. Write short notes on bleaching action of Sulphur dioxide.
27. What are hydrate isomers? Explain with an example.
28. Distinguish tetrahedral and octahedral voids.
29. What are the limitations of Freundlich adsorption isotherm?
30. Identify compounds A, B and C in the following sequence of reaction.
- $$\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Sn/HCl}} \text{A} \xrightarrow[273 \text{ K}]{\text{NaNO}_2 + \text{HCl}} \text{B} \xrightarrow{\text{CuCN}} \text{C}$$
31. What is Condensation Polymer? Give two examples.
32. Mention any three functions of lipids in living organism.
33. The rate constant for a first order reaction is $1.54 \times 10^{-3} \text{ s}^{-1}$. Calculate its half life time.

PART - IV

Note : Answer all the questions. $5 \times 5 = 25$

34. (a) (i) Describe the role of the following in the process mentioned.
- (1) Cryolite in the extraction of Aluminium.
(2) Iodine in the refining of Zirconium.
- (ii) State any three properties of inter halogen compounds.

(OR)

- (b) (i) How will you identify borate radical?
(ii) Give the uses of Borax.

35. (a) Describe the preparation of potassium dichromate.

(OR)

- (b) Write the postulates of Werner's theory.

36. (a) (i) Write a short note on metal excess defect with an example.
(ii) Explain Pseudo first order reaction with an example.

(OR)

- (b) Calculate the pH of 0.1 M CH_3COOH solution. Dissociation constant of acetic acid is 1.8×10^{-5} .

37. (a) Derive an expression for Nernst equation.

(OR)

- (b) How will you convert
(i) Ethyl alcohol → Ethene
(ii) Ethylene glycol → 1, 4 - dioxane
(iii) Glycerol → Acrolein

38. (a) An organic Compound (A) of molecular formula $\text{C}_7\text{H}_6\text{O}$ undergoes Cannizzaro reaction. Compound (A) also reacts with Chlorine in the presence of Conc. FeCl_3 to give Compound (B). Compound (A) reacts with Chlorine in the absence of catalyst to give Compound (C). Identify A, B and C with suitable reactions.

(OR)

- (b) (i) How will you distinguish between nitro and aci form of CH_3NO_2 ?
(ii) What are the types of RNA which are found in cell?



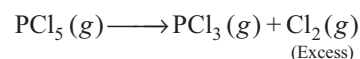
ANSWER

PART - I

1. (c) 3.0 mol min^{-1}
2. (a) 3
3. (c) 1, 1, 2, 2-tetrafluoroethane
4. (a) N - methylaniline
5. (c) accepts OH^- from water, releasing proton.
6. (a) (iii) > (ii) > (i) > (iv)
7. (c) Both **Assertion** and **Reason** are false
8. (a) 8 and 4
9. (c) α -helical backbone
10. (c) 2.71×10^{-14}
11. (b) +2
12. (a) 6.022×10^{22}
13. (a) 4-nitrophenol
14. (c) acetylchloride
15. (a) Displacement with Zinc

PART - II

16. (i) Sulphide ores can be concentrated by froth floatation method.
(ii) **Ex** : Lead sulphide galena (PbS) and zinc blende (ZnS).
17. On heating phosphorus pentachloride, it decomposes into phosphorus trichloride and chlorine.

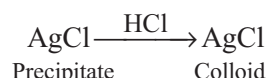


18. This is because Zr and Hf have similar atomic sizes (Zr = 160 pm and Hf = 159 pm) which is due to lanthanoid contraction. Hence, Zirconium and Hafnium exhibit similar properties.
19. The solubility product of a compound is defined as the product of the molar concentration of the constituent ions, each raised to the power of its stoichiometric co-efficient in a balanced equilibrium equation.

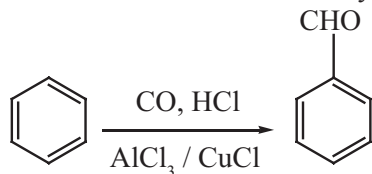
20. Equivalent conductance is defined as the conductance of 'V' m³ of electrolytic solution containing one gram equivalent of electrolyte in a conductivity cell in which the electrodes are one meter apart.

$$\Lambda = \frac{\kappa(\text{Sm}^{-1}) \times 10^{-3} (\text{gram equivalent})^{-1} \text{m}^3}{N}$$

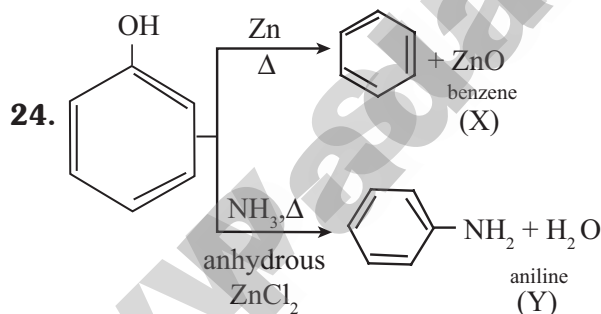
21. By addition of suitable electrolytes precipitated particles can be brought into colloidal state. The process is termed as peptisation and the electrolyte added is called **peptising** or **dispersing agent**.



22. This reaction is a variant of Friedel – Crafts acylation reaction. In this method, reaction of carbon monoxide and HCl generate an intermediate which reacts like formyl chloride.



23. Drugs are classified by chemical structure, pharmacological effect, target system, site of action.

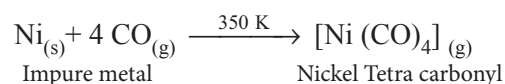


PART - III

25. Nickel is refined by Mond's process in two steps :

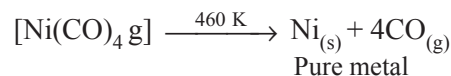
Step 1 :

Formation of a **volatile compound** with the metal



Step 2 :

Volatile compound decomposed to give **pure metal**.



26. (i) (i) **Bleaching action of sulphur dioxide:** In presence of water, sulphur dioxide bleaches coloured wool, silk, sponges and straw into colourless due to its reducing property.



(ii) However, the bleached product (colourless) is allowed to stand in air, it is reoxidised by atmospheric oxygen to its original colour.

(iii) Hence bleaching action of sulphur dioxide is temporary.

27. When solvent molecules like water are exchanged by the ligands in the crystal lattice of the coordination compounds are called hydrate isomers.

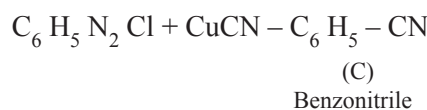
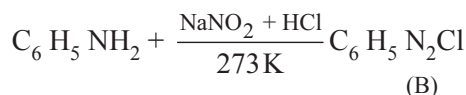
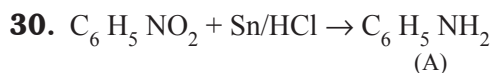
Eg: [Cr(H₂O)₆]Cl₃ - Violet colour
[Cr(H₂O)₅Cl]Cl₂.H₂O - Pale green colour
[Cr(H₂O)₄Cl₂]Cl.2H₂O - Dark green colour.

28.

Tetrahedral Void	Octahedral Void
A void surrounded by four spheres occupying the corners of a tetrahedron.	A void surrounded by six spheres along the corners of an octahedron.
It is formed when a sphere of the second layer is placed above the void of the first layer.	All the voids of the first row, which remain unoccupied, form an octahedral void.
The coordination number is 4.	The coordination number is 6.
The number of tetrahedral voids is equal to 2n.	The number of octahedral voids is equal to n.

29. (i) This equation is purely empirical and valid over a limited pressure range.

(ii) The values of constants k and n also found vary with temperature. No theoretical explanations were given.



A	Aniline ($C_6H_5NH_2$)
B	Benzene diazoniumchloride (C_6H_5Cl)
C	Benzonitrile - ($C_6H_5 - CN$)

31. Condensation polymers are formed by the reaction between functional groups an adjacent monomers with the elimination of simple molecules like H_2O , NH_3 etc....

Ex : Nylon - 6, 6, terylene

32. Biological importance of lipids :

(i) Lipids are the integral component of cell membrane. They are necessary of structural integrity of the cell.

(ii) The main function of triglycerides in animals is as an energy reserve. They yield more energy than carbohydrates and proteins.

(iii) They act as protective coating in aquatic organisms.

33. $t_{\frac{1}{2}} = \frac{0.693}{K} = \frac{0.693}{1.54 \times 10^{-3} \text{ sec}^{-1}} = 450 \text{ seconds.}$

PART - IV

34. (a) (i) (1) Lowers the melting point to 1173 K and improves the electrical conductivity of the aluminium.

(2) To form a volatile compound which on further heating decomposes to give **pure Zn**.

(ii) **Properties of inter halogen compounds:**

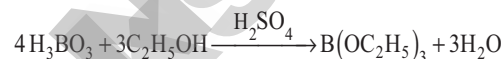
(i) The central atom will be the larger one.

(ii) It can be formed only between two halogens and not more than two halogens.

(iii) Fluorine can't act as a central metal atom being the smallest one.

(OR)

(b) (i) When borate radical is heated with **ethyl alcohol** and **sulphuric acid**, it gives trialkyl borate, which burns with a green edge flame.



(ii) (i) Borax is used for the identification of **coloured metal ions**.

(ii) In the manufacture optical and borosilicate glass, enamels and glazes for pottery.

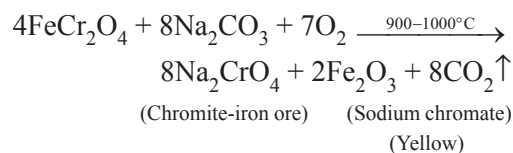
(iii) It is also used as a **flux in metallurgy** and also acts as a **preservative**.

35. (a) (i) Potassium dichromate is prepared from chromite - Iron ore or Chromite ore.

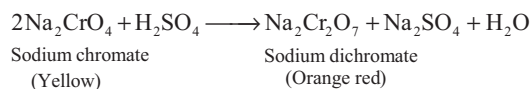
(ii) **Concentration method :**

The ore is concentrated by gravity separation.

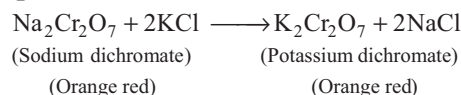
(iii) **Conversion of chromite iron ore into sodium chromate :**



(iv) **Conversion of sodium chromate to sodium dichromate :**



(v) **Conversion of sodium dichromate to potassium dichromate :**



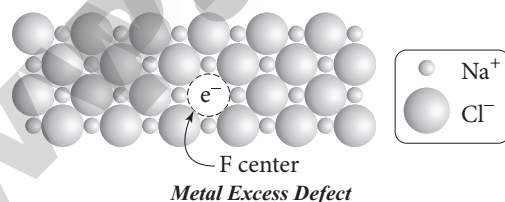
(OR)

(b) Postulates of Werner's theory:

- Most of the elements exhibit two types of valence namely (i) primary valence and (ii) secondary valence. The primary valence is referred as the oxidation state of the metal atom and the secondary valence as the coordination number.
- The primary valence of a metal ion is positive in most of the cases and zero in certain cases. They are always satisfied by negative ions.
- The secondary valence is satisfied by negative ions, neutral molecules, positive ions or the combination of these.
- According to Werner, there are two spheres of attraction around a metal atom/ion in a complex.
- The inner sphere is known as coordination sphere. The outer sphere is called ionisation sphere.
- The primary valences are non-directional while the secondary valences are directional. The geometry of the complex is determined by the spacial arrangement of the groups which satisfy the secondary valence.

36. (a) (i) Metal excess defect :

- (i) Metal excess defect arises due to the presence of more number of metal ions as compared to anions.
Ex : NaCl, KCl

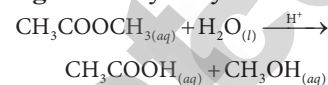


- (ii) The electrical neutrality of the crystal can be maintained by the presence of anionic vacancies equal to the excess metal ions (or) by the presence of extra cation and electron present in interstitial position.
- (iii) The anionic vacancies which are occupied by unpaired electrons are called F centers.

- (iv) Hence, the formula of NaCl which contains excess Na⁺ ions can be written as Na_{1+x}Cl.

(ii) Pseudo first order reaction :

- (i) A second order reaction can be altered to a first order reaction by taking one of the reactant in large excess, such reaction is called pseudo first order reaction.

Ex : Acid hydrolysis of ester.

$$\text{Rate} = k [\text{CH}_3\text{COOCH}_3] [\text{H}_2\text{O}]$$

- (ii) If the reaction is carried out with the large excess of water, there is no significant change in the concentration of water during hydrolysis. i.e., concentration of water remains almost a constant.

- (iii) Now, we can define $k [\text{H}_2\text{O}] = k'$; Therefore the above rate equation becomes

$$\text{Rate} = k' [\text{CH}_3\text{COOCH}_3]$$

- (iv) Thus it follows first order kinetics

(OR)

$$\text{pH} = -\log [\text{H}^+]$$

For weak acids,

$$\begin{aligned} [\text{H}^+] &= \sqrt{K_a \times C} \\ &= \sqrt{1.8 \times 10^{-5} \times 0.1} \\ &= 1.34 \times 10^{-3} \text{ M} \end{aligned}$$

$$\begin{aligned} \therefore \text{pH} &= -\log (1.34 \times 10^{-3}) = 3 - \log 1.34 \\ &= 3 - 0.1271 = 2.8729 \approx 2.87 \end{aligned}$$

37. (a) Nernst equation :

- (i) Nernst equation is the one which relates the cell potential and the concentration of the species involved in an electrochemical reaction. Let us consider an electrochemical cell for which the overall redox reaction is,



- (ii) The reaction quotient Q for the above reaction is given below

$$Q = \frac{[\text{C}]^m [\text{D}]^n}{[\text{A}]^x [\text{B}]^y} \quad \dots(1)$$

We have already learnt that,

$$\Delta G = \Delta G^\circ + RT \ln Q$$

.....(2)

- (iii) The Gibbs free energy can be related to the cell emf as follows

$$DG = -nFE_{\text{cell}}; DG^\circ = -nFE_{\text{cell}}^\circ$$

- (iv) Substitute these values and Q from (1) in the equation (2)

$$(2) \Rightarrow -nFE_{\text{cell}} = -nFE_{\text{cell}}^\circ + RT \ln \frac{[C]^l [D]^m}{[A]^x [B]^y}$$

.....(3)

- (v) Divide the whole equation (3) by $(-nF)$, we get,

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{RT}{nF} \ln \frac{[C]^l [D]^m}{[A]^x [B]^y}$$

$$(or) E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{2.303RT}{nF} \log \frac{[C]^l [D]^m}{[A]^x [B]^y}$$

.....(4)

The above equation (4) is called the **Nernst equation**

- (vi) At 25°C (298 K), the above equation (4) becomes,

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{2.303 \times 8.314 \times 298}{n(96500)} \log \frac{[C]^l [D]^m}{[A]^x [B]^y}$$

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{0.0591}{n} \log \frac{[C]^l [D]^m}{[A]^x [B]^y}$$

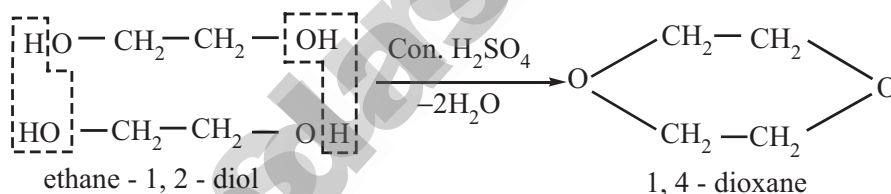
.....(5)

(OR)

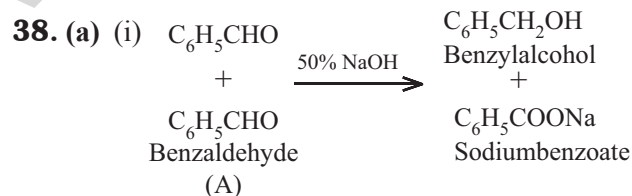
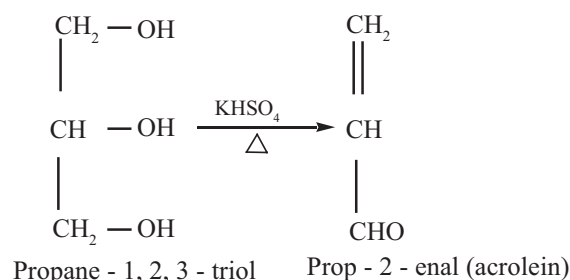
- (b) (i) When alcohols are heated with a suitable dehydrating agents like sulphuric acid, the H and OH present in the adjacent carbons of alcohols are lost, and it results in the formation of a carbon - carbon double bond. Phosphoric acid, anhydrous $ZnCl_2$, alumina etc., can also be used as dehydrating agents.

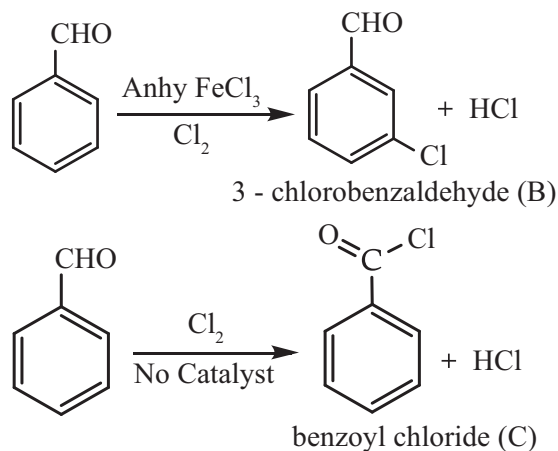


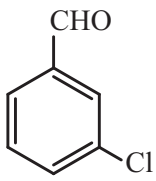
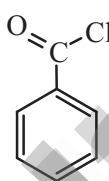
- (ii) When distilled with Conc. H_2SO_4 , glycol forms dioxane



- (iii) When glycerol is heated with dehydrating agents such as Con H_2SO_4 , $KHSO_4$ etc....., it undergoes dehydration to form acrolein.





	COMPOUND	NAME
A	$\text{C}_6\text{H}_5\text{CHO}$	Benzaldehyde (Phenyl methanal)
B	 (or) $\text{Cl}-\text{C}_6\text{H}_4\text{CHO}$	3-chlorobenzaldehyde
C	 (or) $\text{C}_6\text{H}_5\text{COCl}$	Benzoyl chloride

(OR)

(b) (i)

S.No	Nitro form	Aci - form
1.	Less acidic	More acidic
2.	Dissolves in NaOH slowly	Dissolves in NaOH instantly
3.	Decolourises FeCl_3 solution	With FeCl_3 gives reddish brown colour
4.	Electrical conductivity is low	Electrical conductivity is high.

(ii) RNA molecules are classified into three major types,

- (i) Ribosomal RNA (rRNA)
- (ii) Messenger RNA (mRNA)
- (iii) Transfer RNA (tRNA)

