

2025 II 20

0930

Seat No.

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Time : 3 Hours

**CHEMISTRY**

Subject Code

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Total No. of Questions : 35 (Printed Pages : 11)

Maximum Marks : 70

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**INSTRUCTIONS :** (i) There are **35** questions to answer. However Q. Nos. **17**,

**32, 33, 34** and **35** have internal choice.

(ii) Answer each question only once.

(iii) Use of calculator is not permitted. Logarithm tables shall be supplied on request.

(iv) For Question Nos. **1** to **8**, select and write the correct alternative from the options given below the statement.

(v) Question Nos. **1** to **13** carry *one* mark each.

(vi) Question Nos. **14** to **25** carry *two* marks each.

(vii) Question Nos. **26** to **32** carry *three* marks each.

(viii) Question Nos. **33** to **35** carry *four* marks each.

1. A hormone that contains iodine is ..... . 1
- adrenaline
  - thyroxine
  - testosterone
  - insulin
2. What happens to the value of  $\Delta G$  for a reaction when a catalyst is added to it ? 1
- It increases
  - It decreases
  - It remains unchanged
  - It is undefined on addition of catalyst
3. The compound  $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_2\text{Cl}$  is a ..... 1
- primary alkyl halide
  - primary allyl halide
  - secondary alkyl halide
  - secondary benzyl halide
4. Which of the following statements is true regarding the conductivity of electrolytic solutions ? 1
- It is independent of the size of the ions
  - It is independent of the viscosity of the solution
  - It decreases with temperature
  - It depends on the solvation of ions present in the solution

5. The correct order of boiling points of alcohols having the same number of Carbon atoms is ..... . 1

- $2^\circ > 1^\circ > 3^\circ$
- $1^\circ > 2^\circ > 3^\circ$
- $3^\circ > 1^\circ > 2^\circ$
- $3^\circ > 2^\circ > 1^\circ$

6. The metallic radii of some transition elements are given below :

Element	Iron	Cobalt	Nickel	Copper
Metallic radii/pm	126	125	125	128

An element that has the highest density from the above is ..... . 1

- Nickel
- Cobalt
- Iron
- Copper

7. The product formed in Aldol condensation is ..... . 1

- an  $\alpha, \beta$  unsaturated ester
- an  $\alpha$ -hydroxy aldehyde or ketone
- a  $\beta$ -hydroxy acid
- a  $\beta$ -hydroxy aldehyde or ketone.

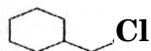
8. The  $K_H$  values of  $\text{Ar}_{(g)}$ ,  $\text{CO}_2(g)$ ,  $\text{HCHO}_{(g)}$  and  $\text{CH}_4(g)$  are 40.39, 1.67,  $1.83 \times 10^{-5}$  and 0.413 respectively. The correct order of their solubility is... 1
- $\text{HCHO} < \text{CH}_4 < \text{CO}_2 < \text{Ar}$
  - $\text{HCHO} < \text{CO}_2 < \text{CH}_4 < \text{Ar}$
  - $\text{Ar} < \text{CO}_2 < \text{CH}_4 < \text{HCHO}$
  - $\text{Ar} < \text{CH}_4 < \text{CO}_2 < \text{HCHO}$
9. Write the chemical name of Vitamin C. 1
10. Draw the structure of the chromate ion. 1
11. Write the structural formula of 2-ethoxy-2-methylpropane. 1
12. Define : Activation energy. 1
13. Identify the structure of the missing component in the given reaction sequence : 1
- $$\text{Toluene} \xrightarrow{\text{conc. HNO}_3 + \text{conc. H}_2\text{SO}_4} ? \xrightarrow{\text{Fe/HCl}} \text{4-aminotoluene}$$
14. Draw a neat labelled diagram of the Hydrogen-Oxygen fuel cell by specifying the electrolyte and the electrode material used. 2
15. State Faraday's first law of electrolysis. 2
- Calculate  $\Lambda_m^0$  for  $\text{CaCl}_2$  from the given data :
- $$\lambda_m^0 \text{ for Ca}^{+2} = 119.0 \text{ S cm}^2 \text{ mol}^{-1} \text{ and } \lambda_m^0 \text{ for Cl}^{-1} = 76.3 \text{ S cm}^2 \text{ mol}^{-1}$$
16. Write the IUPAC name of each of the following complexes : 2
- (i)  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$
- (ii)  $[\text{Cr}(\text{NH}_3)_4(\text{H}_2\text{O})_2]\text{Cl}_3$

17. On the basis of Valence Bond theory, deduce the type of hybridisation and geometry of the high spin complex  $[\text{CoF}_6]^{-3}$ . 2

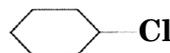
*Or*

17. On the basis of Valence Bond theory, deduce the type of hybridisation and magnetic character of the tetrahedral complex  $[\text{Ni}(\text{CO})_4]$ . 2
18. Select the correct compound from each of the given pairs.

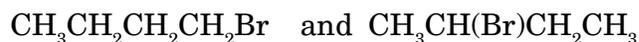
- (i) Which halogen compound from the following will undergo  $\text{S}_{\text{N}}2$  reaction faster ? 2



and



- (ii) Which molecule from the given pair is chiral ?



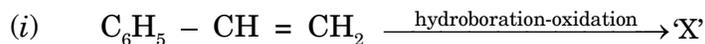
19. Write one point of difference as specified in each case : 2

- (i) Essential amino acids and non-essential amino acids on the basis of their synthesis.
- (ii) DNA and RNA with respect to the sugar moiety present in them.

20. Name the following : 2

- (i) An element of the  $3d$  series that exhibits maximum number of Oxidation states.
- (ii) An alloy which consists of 95% lanthanoid metal along with iron and other trace elements.

21. Identify the structure of the final product 'X' and 'Y' formed in each of the following reactions : 2



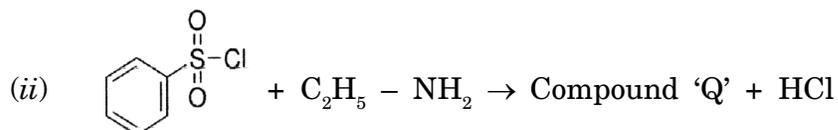
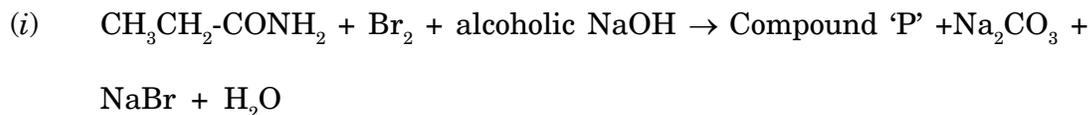
22. Write chemical equations for each of the following reactions : 2

(i) Phenol is treated with Bromine water.

(ii) Vapours of ethyl alcohol are passed over heated copper at 573 K.

23. Define azeotropes. State the type of azeotrope formed by a solution exhibiting positive deviation from Raoult's Law. 2

24. Identify the *structure or name* of Compounds 'P' and 'Q' in the following reactions : 2



25. For a reaction,  $H_2 + Cl_2 \xrightarrow{h\nu} 2 HCl$ , the rate law is 2

$$\text{Rate} = k$$

(i) Write the Order of the reaction.

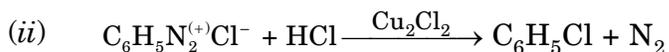
(ii) State the Unit of rate constant 'k' for the above reaction.

26. Half life period of a first order reaction is 693 seconds. Calculate the following : 3

(i) Rate constant 'k'.

(ii) Time required for 90% completion of this reaction in minutes.

27. Identify the Name of the reactions which are illustrated by the following chemical equations : 3



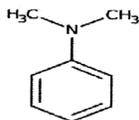
28. Answer the following : 3

(i) Draw and label the facial (fac-) and meridional (mer-) isomers of  $[Co(NH_3)_3(NO_2)_3]$ .

(ii) Write one point of difference between homoleptic and heteroleptic complexes.

29. Answer the following :

(i) Write the IUPAC name for : 3



(ii) Name the foul smelling compound obtained when aniline is subjected to Carbylamine Reaction.

(iii) State *two* factors that affect the basic strength of amines.

30. Name the following : 3

(i) The linkage between two monosaccharide units in carbohydrates.

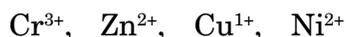
(ii) A nonreducing disaccharide which upon hydrolysis gives equimolar mixture of D(+) glucose and D(-) fructose.

(iii) The product obtained when glucose is heated with HI.

31. An alkene having molecular formula  $C_5H_{10}$  upon ozonolysis and further decomposition with zinc and water forms Compound 'B' and Compound 'C' as products. Compound 'B' gives Fehling's test as well as a positive iodoform test. Compound 'C' gives a positive iodoform test and not the Fehling's test. Write the appropriate chemical equation involved in the formation of Compounds B and C from the alkene. Also write the names of Compounds B and C. 3

32. With respect to 'd' and 'f' block elements, answer the following : 3

(i) Predict which of the following ions will be coloured in aqueous solution ?



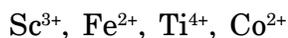
(ii) Write the complete ionic equation for the oxidising action of acidified permanganate ions on ferrous ions.

(iii) State the reason : Actinoid contraction is greater from element to element than Lanthanoid contraction.

*Or*

32. With respect to 'd' and 'f' block elements, answer the following : 3

(i) Predict which of the following ions will exhibit magnetic moment ?



(ii) Write the complete ionic equation for the conversion of dichromate ion into chromate ion.

(iii) State the reason : Zirconium and Hafnium have similar atomic radii.

33. With respect to Solutions, answer the following : 4

(i) Draw a neat labelled graph to represent the dependence of Vapour pressure on mole fraction of a component of a binary solution exhibiting ideal behaviour.

(ii) Calculate the Osmotic pressure of a 5% (w/v) solution of urea (molar mass 60) at 27°C.

(Given :  $R = 0.083 \text{ litre bar K}^{-1}\text{mol}^{-1}$ )

*Or*

33. With respect to Solutions, answer the following : 4

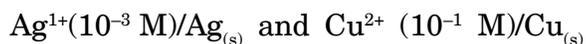
(i) Draw a neat labelled graph to represent the elevation in boiling point of a solvent upon the addition of a non-volatile solute.

(ii) Calculate the mole fraction of KI in an aqueous solution containing 20% of KI by mass.

(Given : At. mass of K = 39, I = 127, H = 1, O = 16)

34. On the basis of the given data, answer the questions below : 4

A galvanic cell is set up at 25°C with the following half cells.



(Given :  $E^\circ \text{Ag}^{1+}/\text{Ag} = 0.80 \text{ V}$ ,  $E^\circ \text{Cu}^{2+}/\text{Cu} = 0.34 \text{ V}$ )

(i) Write the net cell reaction taking place in this cell.

(ii) Is it possible to store a solution of Copper sulphate in a silver vessel ?

(iii) Calculate  $E_{\text{cell}}$  at the given concentrations.

(Consider the value of  $\frac{2.303 RT}{F}$  as 0.06 in the calculation)

Or

34. On the basis of the given half reactions, answer the questions below : 4



- (i) Represent an electrochemical cell using Nickel and Aluminium electrodes as per cell conventions.
- (ii) Among Ni and Al, which is a better reducing agent ?
- (iii) Calculate the equilibrium constant ( $K_c$ ) for the cell reaction.

(Consider the value of  $\frac{2.303 RT}{F}$  as 0.06 in the calculation)

35. Answer the following : 4

- (i) Select the carboxylic acid from the following having the highest acid strength :  
  
4-nitrobenzoic acid, benzoic acid, 4-methoxybenzoic acid
- (ii) Write the chemical equation for the preparation of an oxime from acetaldehyde.
- (iii) Identify the **reagent/s** and the **final product** in each of the following Name reactions :
  - (a) Etard Reaction with methylbenzene.
  - (b) Clemmensen reduction of acetone.

*Or*

35. Answer the following :

4

- (i) Select a compound that is most reactive towards nucleophilic addition reaction from the following :

Acetone, acetaldehyde, propionaldehyde.

- (ii) Write the chemical equation involved when Sodium acetate is heated with sodalime.

- (iii) Identify the reagent/s and the main reactant in each of the following Name reactions :

(a) Preparation of acetophenone by Friedel Craft's acylation.

(b) Preparation of  $\alpha$ -bromopropanoic acid by Hell Volhard Zelinsky Reaction.