2025
CHEMISTRY

Total marks : 70 Time : 3 hours

General instructions:

i) Approximately 15 minutes is allotted to read the question paper and revise the answers.

ii) The question paper consists of 34 questions. All questions are compulsory.

iii) Marks are indicated against each question.

iv) Internal choice has been provided in some questions.

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

1. Which of the following pairs will not form an ideal solution? **1**
   (a) Benzene and Toluene (b) Ethanol and Acetone
   (c) n- hexane and n-heptane (d) Bromoethane and Chloroethane.

2. The correct statement in a cell of zinc and copper is **1**
   (a) zinc acts as cathode and copper as anode
   (b) zinc acts as anode and copper as cathode
   (c) the standard reduction potential of zinc is more than that of copper
   (d) the flow of electrons is from copper to zinc.

3. Which one of the following is a pseudo first order reaction? **1**
   (a) Hydrogenation of ethene
   (b) Hydrolysis of ethyl acetate in the presence of dilute acid
   (c) Combination of H_2 and Br_2
   (d) Decomposition of NH_2 on a platinum surface.

4. Which of the following transition metals does not show variable oxidation state? **1**
   (a) Ti (b) Cr (c) Cu (d) Sc.

5. Which of the following is a paramagnetic complex? **1**
   (a) $[Ni(H_2O)_6]^{2+}$ (b) $[Ni(CO)_4]$
   (c) $[Zn(NH_3)_4]^{2+}$ (d) $[Co(NH_3)_6]$.

6. The position of –Br in the compound in $CH_3{-}CH{=}CHC(Br)(CH_3)_2$ can be classified as **1**
   (a) allyl (b) aryl (c) vinyl (d) secondary

7. Salicyaldehyde can be prepared from phenol by **1**
   (a) Schotten-Baumann reaction (b) Kolbe's reaction
   (b) Reimer-Tiemann reaction (d) Cannizzaro reaction.

8. Which of the following is not a characteristic of carbonyl compounds? **1**
   (a) They have a polarized C=O bond.
   (b) They undergo nucleophilic addition reactions.
   (c) They show geometric isomerism.
   (d) They can be reduced to alcohol.

9. Benzene diazonium chloride on hydrolysis gives **1**
   (a) phenol (b) chlorobenzene (c) benzene (d) aniline

10. The only vitamin with metal atom in it is **1**
    (a) Vitamin A (b) Vitamin K (c) Vitamin B_{12} (d) Vitamin E

11. What is ebullioscopic constant? **1**

12. Why Fe is a transition metal but Hg is not a transition metal? **1**

13. Write the IUPAC name of $K_3[Al(C_2O_4)_3]$. **1**

14. Why are ethers relatively inert compounds? **1**

15. Why do amines react as nucleophiles? **1**

16. Complete the reaction: **1**
    $CH_3CH_2NH_2 + CHCl_3 + 3KOH(alc.) \rightarrow ?$

17. 2.82 g of glucose ($C_2H_{12}O_6$) are dissolved in 30 g of water. Calculate the mole fraction of glucose and water. **2**

18. The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times, how will it affect the rate of formation of Y? **2**

19. **a.** Which one of the following $La(OH)_3$ and $Lu(OH)_3$ is more basic and why?

    Or **2**

    b. Which is a stronger reducing agent Cr^{2+} or Fe^{2+} and why?

20. Write the equation for the preparation of propan-2-ol from Grignard reagent. **2**

21. I. Define Swarts reactions.
II. Write the IUPAC name of the compound $ClCH_2C{\equiv}CCH_2Br$. **2**

22. **a.** Differentiate between amylose and amylopectin.
Or **2**
b. Why amino acid behaves like salts in aqueous solution?

23. **a.** A solution contains 0.896 g of K_2SO_4 in 500ml solution. Its osmotic pressure is found to be 0.690 atm at 27°C. Calculate the value of Van't-Hoff factor. ($R = 0.082 atm\ mol^{-1}K^{-1}$).
Or **3**
b. A 5% solution (by mass) of cane sugar in water has freezing point of 271K. Calculate the freezing point of a 5% glucose in water, if the freezing point of pure water is 273.15K. [Given $K_f = 1.86 KKgmol^{-1}$].

24. Represent the galvanic cell in which the reaction takes place- **3**
$Zn\ (s) + 2\ Ag^+\ (aq) \rightarrow Zn^{2+}\ (aq) + 2\ Ag\ (s)$.
i) Which of the electrode is negatively charged?
ii) The carrier of the current in the cell.
iii) Write the reaction at each electrode.

25. **a.** If time taken for half of the first order reaction to complete is t_1, whereas that for $\frac{3}{4}th$ of the reaction to complete is t_2. How are t_1 and t_2 related to each other.(log 4 = 0.60)
Or **3**
b. The rate of a particular reaction triples when temperature changes from 50°C to 100°C. Calculate the activation energy of the reaction. [log 3 = 0.47, $R = 8.314\ JK^{-1}mol^{-1}$].

26. I. What are heteroleptic complexes? Give example.
II. On the basis of crystal field theory, write the electronic configuration of d^5 ion for high spin complex.
III. Draw the geometrical isomers of $[Co(NH_3)Cl(en)_2]^{2+}$. **3**

27. I. Show the preparation of 1-iodobutane from but-1-ene.
II. Write the SN_2 mechanism for the reaction of chlorobutane to butanol. **3**

28. **a.** Explain Kolbe's reaction with the chemical equation involved in it.
Or **3**
b. What happens when-
i) anisole reacts with HI?
ii) ethanol reacts with CH_3COCl/pyridine?
iii) phenol is oxidized with $Na_2Cr_2O_7/H^+$?

29. Complete the following reaction: **3**

i) $CH_3MgCl + CO_2 \xrightarrow[H_3O^+]{ether} ?$

ii) $2\ CH_3{-}CHO \xrightarrow[\Delta]{dil.NaOH} ?$

iv) $CH_3{-}CH{=}CH{-}COCl \xrightarrow[Pd-BaSO_4]{H_2} ?$

30. (i) Name the reaction when benzene diazonium chloride is treated with cupruous chloride.
(ii) Why are aryl diazonium ion more stable than akyl diazonium ion? **3**

31. (i) What is isoelectric point?
(ii) What is the effect of denaturation on the structure of proteins? **3**

32. **a.** (i) State Kohlrausch law of independent migration of ions.Write one application.
(ii) The conductivity of 0.001028 mol L^{-1} acetic acid is $4.95 \times 10^{-5} Scm^{-1}$. Calculate its dissociation constant if $\Lambda^{\circ}m$ for acetic acid is 390.5 Scm^2mol^{-1}.

Or **5**

b. (i) Write the oxidation and reduction reaction for corrosion of iron in atmosphere.
(ii) Calculate how long it will take to deposit 1 g of chromium when a current of 1.25A, flows through a solution of chromium III sulphate. (Molar mass of Cr = 52, F = 96500C).

33. Explain the following with reason:- **5**
i) Transition metals and their compounds show catalytic activities.
ii) Actinoid contraction is greater from element to element than lanthanoid contraction.
iii) Sc^{3+} is colourless whereas Ti^{3+} is coloured in an aqueous solution.

34. **a.** (i) Convert benzene to acetophenone.
(ii) Write the chemical reaction of Tollen's reagent with propanone and propanal.
(iii) Write the reaction involved in Wolf-Kishner reduction.

Or **5**

b. (i) Show the formation of ketal from acetone.
(ii) Why are the boiling point of carboxylic acids higher than the corresponding alcohol?
(iii) Arrange the following compounds in the increasing order of their acidic strength: $ClCH_2COOH$, CH_2ClCH_2COOH and FCH_2COOH.

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