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II PUC MID-TERM EXAMINATION, OCT./NOV. - 2024

SUBJECT : CHEMISTRY (34)

Time : 3 Hours

Max Marks : 70

PART - A

I Select the correct option from the given choices.

1x15=15

- 1) For a solution showing positive deviation from Raoult's law
 - a) Vapour pressure is lower than that predicted by Raoult's law.
 - b) Vapour pressure is higher than that predicted by Raoult's law.
 - c) Vapour pressure is either higher or lower than that predicted by Raoult's law.
 - d) None of the above.
- 2) Two solutions that have the same osmotic pressure at a particular temperature are called
 - a) Isotonic solutions
 - b) Binary solutions
 - c) Hypotonic solutions
 - d) Hypertonic solutions
- 3) Van't Hoff factor 'i' for the complete dissociation of NaCl is
 - a) 0.5
 - b) 1
 - c) 2
 - d) 1.5
- 4) The S.I. unit of conductivity is
 - a) Scm
 - b) Scm²
 - c) Sm⁻¹
 - d) Scm⁻¹
- 5) Statement I : During the electrolysis of aqueous NaCl solution; the products are NaOH, Cl₂ and H₂
Statement II : The product of electrolysis depends on the different oxidising and reducing species present in the cell and their electrode potentials.
 - a) Both Statement I and II are correct
 - b) Both Statement I and II are incorrect
 - c) Statement I is correct but Statement II is incorrect
 - d) Statement I is incorrect but Statement II is correct
- 6) The cell used for providing electrical power in the Apollo space programme was
 - a) Dry Cell
 - b) Daniel Cell
 - c) H₂ - O₂ Fuel Cell
 - d) Mercury Cell
- 7) Match the items of Column-I and Column-II

**Column I
(Metal ion)**

- A) Cr³⁺
- B) Fe²⁺
- C) Ni²⁺
- D) Mn²⁺

**Column II
(Magnetic moment in B.M)**

- i) $\sqrt{35}$
- ii) $\sqrt{8}$
- iii) $\sqrt{24}$
- iv) $\sqrt{15}$

- a) A-iv, B-iii, C-ii, D-i
 - b) A-iii, B-i, C-iv, D-ii
 - c) A-iii, B-i, C-ii, D-iv
 - d) A-iii, B-ii, C-iv, D-i
- 8) Which among the following ions is colourless ?
 - a) Sc³⁺
 - b) Ti³⁺
 - c) Cr³⁺
 - d) Fe³⁺
 - 9) An example for ambidentate ligand is
 - a) NO₂⁻
 - b) H₂O
 - c) NH₃
 - d) Br⁻

(P.T.O.)

- 10) The metal-carbon bond in metal carbonyls posses
 - a) σ character only
 - b) π character only
 - c) both σ and π character
 - d) None of the above
- 11) Which of the following is not a polyhalogen compound ?
 - a) DDT
 - b) Chloroform
 - c) Methylene chloride
 - d) Methyl chloride
- 12) The reaction $\text{CH}_3 - \text{Br} + \text{Ag} - \text{F} \rightarrow \text{CH}_3 - \text{F} + \text{Ag} - \text{Br}$ is an example for
 - a) Wurtz-reaction
 - b) Finkelstein reaction
 - c) Wurtz-Fittig reaction
 - d) Swartz reaction
- 13) Which of the following compounds would react faster with Lucas reagent at room temperature.
 - a) Methanol
 - b) Ethanol
 - c) Isopropyl alcohol
 - d) Tertiary butyl alcohol
- 14) Phenol reacts with Bromine water to form a white precipitate of A. A is
 - a) 2, 4, 6 - tribromophenol
 - b) O-Bromophenol
 - c) P-Bromophenol
 - d) m-Bromophenol
- 15) IUPAC name of the compound $\text{CH}_3 - \text{O} - \text{C}_2\text{H}_5$ is
 - a) Ethylmethyl ether
 - b) Ethoxymethane
 - c) Methoxyethane
 - d) Methyl ethanoate

II Fill in the blanks by choosing the appropriate word from those given in the brackets:

1x5=5

(Polar, non-polar, solute, diphenyl, zero, methanol)

- 16) Colligative properties donot depend on the nature of _____.
- 17) E^0 value of SHE is _____ volts.
- 18) Chlorobenzene react with Na in dry ether to give _____.
- 19) The chemical name of wood spirit is _____.
- 20) The C-O bonds in ethers are _____.

PART-B

III Answer any THREE of the following. Each question carries two marks.

3x2=6

- 21) What is meant by limiting molar conductivity ? Write the mathematical expression for limiting molar conductivity of NaCl.
- 22) Write any two consequences of lanthanoid contraction.
- 23) What are homoleptic complexes ? Give an example.
- 24) What is racemic mixture ? Why it is optically inactive ?
- 25) Among alcohols and phenols which one is more acidic and why ?

PART-C

IV Answer any THREE of the following. Each question carries three marks.

3x3=9

- 26) Write the balanced chemical equations for the manufacture of potassium dechromate from chromite ore.
- 27) a) Transition metals and their compounds are used as catalysts. Give two reasons.
b) Between Ti^{+4} and Ti^{+3} , which is more stable ?
- 28) a) Explain ionisation isomerism with an example.
b) Write the IUPAC name of $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$.

(P.T.O.)

- 29) Using valence bond theory account for the hybridisation, geometry and magnetic property of $[\text{CoF}_6]^{3-}$ ion.
- 30) a) Write any two postulates of Werner's theory of co-ordination compounds.
b) What is the co-ordination number cobalt in $[\text{Co}(\text{en}_3)]^{3+}$ ion.

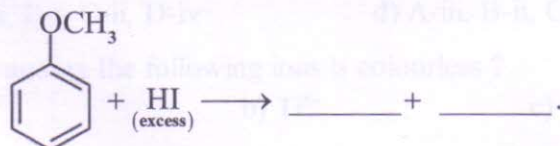
V Answer any TWO of the following. Each question carries three marks. 2x3=6

- 31) Write any three differences between ideal and non-ideal solutions.
- 32) a) What is the effect of increase in pressure on the solubility of a gas in a liquid? Name the law behind it. (2)
b) What are azeotropes? (1)
- 33) a) State Faraday's 2nd law of electrolysis. (2)
b) Write the symbolic representation of standard hydrogen electrode. (1)
- 34) a) Write the reaction occurring at anode in lead storage battery. (1)
b) Name any two methods to prevent corrosion. (2)

PART-D

VI Answer any FOUR of the following. Each question carries five marks. 4x5=20

- 35) a) Explain S_N^2 mechanism for the conversion of methyl chloride to methyl alcohol. Write the order of the reaction. (3)
b) Aryl halides are less reactive towards nucleophilic substitution reaction. Give two reasons. (2)
- 36) a) What are enantiomers? Give an example. (2)
b) Name the major product obtained when 2-bromopentane is heated with alcoholic KOH and also give the equation for the reaction. (2)
c) P-dichlorobenzene has higher melting point than those of ortho and meta isomers. (1)
- 37) a) Explain Friedel-Crafts alkylation reaction of chlorobenzene. (2)
b) Complete the following reactions
i) $\text{C}_2\text{H}_5 - \text{OH} + \text{SOCl}_2 \xrightarrow[\Delta]{\text{Pyridine}} \text{_____} + \text{SO}_2 \uparrow + \text{HCl}$
ii) $\text{CH}_3 - \text{CH}_2 - \text{Br} + \text{Mg} \xrightarrow{\text{dry ether}} \text{_____}$
iii) $\text{CH}_3 - \text{CH}_2 - \text{Br} + \text{AgCN}_{(\text{alc})} \xrightarrow{\Delta} \text{_____} + \text{AgBr}$. (3)
- 38) a) How is phenol manufactured by Cumene process? (3+2)
b) Explain Kolbe's reaction. (3+2)
- 39) a) Write the mechanism for acid catalysed dehydration of ethanol to ethene. (3)
b) Identify A and B in the following equation. (2)
 $\text{'A'} + \text{CH}_3\text{MgBr} \rightarrow \text{CH}_3\text{CH}_2\text{OMgBr} \xrightarrow{\text{H}_2\text{O}} \text{'B'} + \text{Mg}(\text{OH})\text{Br}$
- 40) a) Explain Williamson's ether synthesis. (2)
b) Complete the following reaction (2)



- c) Name the major product obtained in the nitration of anisole. (1)

(P.T.O.)

PART-E

VII Answer any THREE of the following. Each question carries three marks. 3x3=9

- 41) Vapour pressure of Chloroform (CHCl_3) and dichloromethane (CH_2Cl_2) at 298 K are 200 mm Hg and 415 mmHg respectively. Calculate the Vapour pressure of solution prepared by mixing 25.5 g of CHCl_3 and 40 g of CH_2Cl_2 at 298 K.
[Molar masses : $\text{CHCl}_3 = 119.5 \text{ g mol}^{-1}$, $\text{CH}_2\text{Cl}_2 = 85 \text{ g mol}^{-1}$].
- 42) The boiling point of benzene is 353.23 K. When 1.8g of a non-volatile solute was dissolved in 90g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. (K_b for benzene is $2.53 \text{ K kg mol}^{-1}$)
- 43) Determine the value of $\Delta_r G^\circ$ for the following reaction.
 $\text{Ni}_{(s)} + 2\text{Ag}^+_{(aq)} \longrightarrow \text{Ni}^{2+}_{(aq)} + 2\text{Ag}_{(s)}$
Given $E^\circ = 1.05\text{V}$ and $1F = 96500 \text{ C mol}^{-1}$.
- 44) Calculate the equilibrium constant of the following reaction at 298 K.
 $\text{Cu}_{(s)} + 2\text{Ag}^+_{(aq)} \longrightarrow \text{Cu}^{2+}_{(aq)} + 2\text{Ag}_{(s)}$
Given $E^\circ_{\text{cell}} = 0.46 \text{ V}$
- 45) The limiting molar conductivities of $\text{Ba}(\text{OH})_2$, BaCl_2 and NH_4Cl are $457.6 \text{ S cm}^2 \text{ mol}^{-1}$, $240 \text{ S cm}^2 \text{ mol}^{-1}$ and $129.8 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. Calculate the limiting molar conductivity of NH_4OH .
- 46) A solution of CuSO_4 is electrolysed for 10 minutes with a current of 1.5 amperes. What is the mass of the copper deposited at the cathode ? [Molar mass of Copper = $63.546 \text{ g mol}^{-1}$]

