INSTRUCTION :

1. Question paper has five parts. All parts are compulsory.
2. a) Part-A carries 20 marks. Each question carries 1 mark.   (b) Part-B carries 06 marks. Each question carries 2 marks.
   (c) Part-C carries 15 marks. Each question carries 3 marks. (d) Part-D carries 20 marks. Each question carries 5 marks.
   (e) Part-E carries 09 marks. Each question carries 3 marks.
3. In Part-A questions, first attempted answer will be considered for awarding marks.
4. Write balanced chemical equations and draw neat labelled diagrams and graphs wherever necessary.
5. Direct answers to the numerical problems without detailed steps and specific unit for final answer will not carry any marks.
6. Use log tables and simple calculator if necessary (use of scientific calculator is not allowed)

PART A

I Select the correct option from the given choices: 15×1=15

1) A non-ideal solution with negative deviation was prepared by mixing 30 ml chloroform with 50 ml acetone. The volume of mixture will be
   a) >80 ml   b) < 80 ml   c) = 80 ml   d) ≥ 80 ml

2) Standard electrode potential of SHE at 298 K is _____ .
   a) -0.76v   b) 0.10v   c) 0.34v   d) 0.0v

3) Fused NaCl on electrolysis, at cathode gives _____
   a) Chlorine   b) Sodium   c) Sodium amalgam   d) Hydrogen

4) Radioactive disintegration is an example of _____
   a) first order reaction   b) zero order reaction   c) second order reaction   d) third order reaction

5) General electronic configuration of Lanthanoids is _____
   a) $[Rn]5f^{1-14}6d^{0-1}7s^2$ b) $[Xe]4f^{1-14}5d^{0-1}6s^{1-2}$ c) $[Kr]4f^{1-14}5d^{0-1}6s^2$ d) $[Xe]4f^{1-14}5d^{0-1}6s^2$

6) The denticity of the EDTA ligand is
   a) 2   b) 6   c) 3   d) 1

7) Which one of the following has the lowest boiling point?
   a) CH_3Cl b) C_2H_5Cl c) C_2H_5Br d) C_2H_5I

8) P-nitrophenol is less volatile than O-nitrophenol due to
   a) intramolecular H-bond   b) intermolecular H-bond   c) Co-valent bond   d) ionic bond

9) Phenol reacts with Zinc dust to give
   a) Benzene   b) Benzoic acid   c) Benzaldehyde   d) Cumene

10) Aldehyde which does not undergo cannizzaro reaction is
    a) HCHO   b) CH_3CHO c) C_6H_5CHO d) All the three a, b & c

11) The P^{Ka} value of trifluoroacetic acid, benzoic acid, formic acid and acetic acid are 0.23, 4.19, 3.75 and 4.76 respectively. The strongest acid amongst them is
    a) Trifluoroacetic acid   b) benzoic acid   c) Acetic acid   d) formic acid

12) Which of the following amines cannot be prepared by Gabriel Synthesis
    a) Methanamine   b) Ethanamine   c) Propanamine   d) Aniline

13) Primary, Secondary and tertiary amines can be distinguished by
    a) Schiff's reagent   b) Fehling's reagent   c) Tollen's reagent   d) Hinsberg's reagent

14) Which one of the following acids is a vitamin?
    a) Aspartic acid   b) Ascorbic acid   c) Adipic acid   d) Saccharic acid

15) The number of peptide bonds present in a tetrapeptide is
    a) One   b) Two   c) Three   d) Four

II Fill in the blanks by choosing the appropriate word from those given in the brackets: 5×1=5

[Rate constant, association, 2-chloro-2-methyl propan oxidation, tetrahedral, dissociation]

16) Van't Hoff factor for a solute is more than one indicates that the solute undergoes _____ in solution.

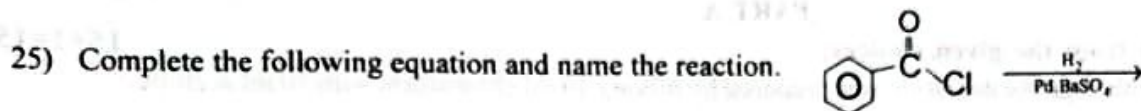17) The half life period for a zero-order reaction is inversely proportional to the _____

(P.T.O.)

18) The structure of chromate ion is _____
19) IUPAC name of tertiary butyl chloride is _____
20) Arylamines get coloured on storage due to atmospheric _____.

PART - B

III Answer any three of the following. Each question carries two marks. 3×2=6

21) What are isotonic solutions? What happens when such solutions are separated by semipermeable membranes?
22) Define the term "Collision frequency".
23) What are heteroleptic complexes? Give an example.
24) Explain the Swart's reaction with an example.

25) Complete the following equation and name the reaction.

$$\text{C}_6\text{H}_5\overset{\overset{O}{\|}}{C}\text{--Cl} \xrightarrow{\text{H}_2 \atop \text{Pd.BaSO}_4}$$

26) Give an example of   a) Fibrous protein   (b) Globular protein

PART - C

IV Answer any THREE of the following. Each question carries three marks. 3×3=9

27a) Calculate the magnetic moment of Ti^{3+} ion [Atomic number of Ti=22]
  b) Give reason : 3d - series elements exhibit variable oxidation states.
28) Explain the preparation of potassium permanganate from pyrolusite ore $[MnO_2]$ with balanced equations.
29) What is lanthanoid contraction? Mention any two consequences of lanthanoid contraction.
30a) Write the IUPAC name of $[Cr(NH_3)_2(H_2O)_4]Cl_3$?
  b) Give the facial and meridional isomeric structures of $[CO(NH_3)_3(NO_2)_3]$.
31) Explain the hybridization, geometry and magnetic properties of $[CoF_6]^{3-}$ ion using VBT.
32a) What is spectrochemical series?
  b) Differentiate between strong field ligands and weak field ligands.

**V Answer any TWO of the following. Each question carries three marks.** 2×3=6

33) Give the main points of distinction between non-ideal solutions showing positive and negative deviations.
34) What are fuel cells? Write the reactions occuring at anode and cathode in $H_2 - O_2$ fuel cell.
35) Define molar conductivity. How is it related to concentration and conductivity? Write the SI unit of conductivity.
36) Derive an integrated rate equation for the rate constant of a first order reaction.

PART - D

VI Answer any FOUR of the following. Each question carries five marks. 4×5=20

37a) Write the mechanism involved in the following reaction: $CH_3Cl + KOH \rightarrow CH_3OH + KCl$
  Mention the order and configuration of the product.
  b) What are optically active compounds? Give the condition for the molecule to be optically active.
38a) Explain the preparation of propan-1-ol from propene and name the rule involved.
  b) Write the equation for the preparation of t-butyl methyl ether by Williamson's synthesis.
39a) Explain Reimer Tiemann reaction.
  b) Give reason : phenols are more acidic than alcohols.
40a) Write balanced chemical equation and name the reaction.
  Benzene is treated with CO & HCl in presence of anhydrous $AlCl_3$
  b) Describe Wolff Kishner reduction.
  c) Name the oxidizing agent used in Etard's reaction.
41a) Explain decarboxylation reaction with an example.
  b) Among formic and acetic acid which is more acidic and why?

  c) Complete the reaction $\text{C}_6\text{H}_5\text{COOH} + NH_3 \xrightarrow[-H_2O]{\Delta}$ _____
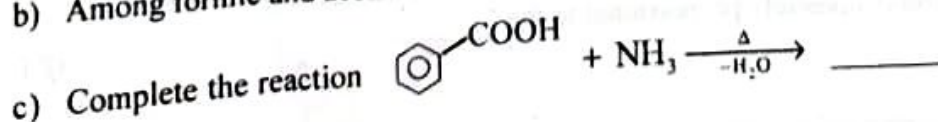
42a) Explain Hoffmann bromamide reaction with example.
  b) How do you prepare benzene diazonium chloride by diazotization? Give equation.
  c) Give reason ; aromatic amines are weaker bases than ammonia.
43a) What is denaturation of proteins? Which level of structure remains intact during denaturation?
  b) How do you show that,
    i) Glucose contains six carbon atoms in straight chain.
    ii) Glucose contains carbonyl group?
  c) Name the sugar unit present in DNA.

PART - E

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

44) 12.6g of non-electrolyte is dissolved in 75g of water. The freezing point of this solution is 271.9k. Calculate molar mass of the solute [freezing point of pure water & molar depression constant of water are 273.15K & 1.86K kgmol⁻¹ respectively].

45) Vapour pressure of dichloromethane (Molar mass = 119.5 g/mol) and chloroform (molar mass = 85 g/mol) at 298k are 200 & 415 mm Hg respectively. Calculate the vapour pressure of the solution prepared by mixing 25.5g of dichloromethane and 40g of chloroform at 298k.

46) Calculate the equilibrium constant for the reaction. $Cu_{(s)} + 2Ag^+_{aq} \rightleftharpoons Cu^{2+}_{(aq)} + 2Ag_{(s)}$

   [Given $E^0_{cell} = 0.46v$]

47) The resistance of 0.1m KCl solution is found to be 520Ω and shows a conductivity volue of 0.248 s/cm. Find the value of cell constant.

48) Show that for a first order reaction, the time taken for the completion of 99% of the reaction is twice the time required for completion of 90% of a reaction.

49) The rate of a particular reaction doubles when the temperature changes from 300k to 310k. Calculate the energy of activation of the reaction. [Given R = 8.314 J K⁻¹ mol⁻¹].