GG

DISTRICT LEVEL II PUC PREPARATORY EXAM, JANUARY – 2024

Time: 3 Hrs. 15 Mins. **Sub: CHEMISTRY (34)** **Max. Marks: 70**

General Instructions:

1. The question paper has five parts. All parts are compulsory.
2. Part – A carries 20 marks, each question carries 1 mark.
   Part – B carries 6 marks, each question carries 2 marks.
   Part – C carries 15 marks, each question carries 3 marks.
   Part – D carries 20 marks, each question carries 5 marks.
   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 diagrams 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 table and simple calculators if necessary. (Use of scientific calculator is not allowed).

PART – A

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

1. Which of the following modes of expressing concentration is dependent of temperature?
   (A) Molarity (B) Mole fraction
   (C) Parts per million (D) Molality

2. The standard electrode potential for fluorine is the highest in the electrochemical series indicating that fluorine gas is
   (A) Strong reducing agent (B) Weak reducing agent
   (C) Weak oxidizing agent (D) Strong oxidizing agent

3. The cathode in lead acid battery during discharging is
   (A) Pb (B) PbO_2 (C) PbO (D) $PbSO_4$

4. The order of the reaction for the decomposition of hydrogen peroxide in alkaline medium
   (A) First order (B) Zero order (C) Second order (D) Pseudofirst order

5. Which of the following statements about the interstitial compounds is incorrect?
   (A) They retain metallic conductivity
   (B) They have higher melting points than the pure metal
   (C) They are much harder than pure metal
   (D) They are chemically reactive

6. The isomers of $\left[Co(NH_3)_5(SO_4)\right]Br$ are an example for
   (A) Linkage isomerism (B) Co-ordination isomerism
   (C) Ionisation isomerism (D) Solvate isomerism

7. The method of preparation of an alkyl fluoride by treating alkyl chloride with metallic fluoride is
   (A) Finkelstein reaction (B) Wurtz reaction (C) Swartz reaction (D) Fittig reaction

8. When phenol is treated with conc. HNO_3 forms
   (A) Anisole (B) Picric acid (C) Aspirin (D) Salicylic acid

9. Denaturated alcohol is
   (A) Ethanol + methane (B) Rectified spirit + Methanol + Pyridine
   (C) Undistilled ethanol (D) Rectified spirit

10. The carboxylic acids have higher boiling points than aldehydes, ketones and alcohols due to
    (A) Intra molecular hydrogen bonding (B) Vanderwaal's force of attraction
    (C) Dipole moment (D) Intermolecular hydrogen bonding

11. The catalyst used in Rosenmund reaction is
(A) Zn / Hg (B) Pb / $BaSO_4$ (C) CO + HCl (D) Raney Ni

12. Hofmann's Bromamide reaction is to convert
(A) Acid to alcohol (B) Alcohol to acid
(C) Amide to amine (D) Amine to amide

13. The bad smelling substance formed by the action of alc.KOH on chloroform and aniline is
(A) Nitrobenzene (B) Phenyl isocyanide
(C) Phenyl cyanide (D) Phenyl thiocyanide

14. The Vitamin B_2 is also known as
(A) Thiamine (B) Pyridoxine (C) Ascorbic acid (D) Riboflavin

15. The helical structure of protein is stabilized by
(A) Dipeptide bond (B) Hydrogen bond (C) Peptide bond (D) Ionic bond

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

(Manganese, Henry's law, Gatterman reaction, Na in ether, Arrhenius equation)

16. The relationship between mole fraction of gas in solution and partial pressure over the solution is given by _____.
17. The temperature dependence of the rate of a chemical reaction is explained by _____.
18. The metal used to make alloy steel for armour plates, safes and helmet is _____.
19. Wurtz reaction involves the reaction of alkyl halide with _____.
20. The conversion of benzene diazonium salt to haloarenes in presence of copper in acidic medium is called _____.

PART – B

III. **Answer any <u>THREE</u> of the following questions. Each question carries two marks:** 3 × 2 = 6

21. Define azeotropic mixtures. Given an example for maximum boiling azeotropes.
22. Show that for the first order reaction, half life period is independent of initial concentration of the reactants.
23. The transition elements forms coloured complexes. Explain.
24. Define freons. Give an example.
25. Explain HVZ reaction with chemical equation.
26. Define denaturation of protein. Give an example.

PART – C

IV. **Answer any <u>THREE</u> of the following. Each question carries three marks:** 3 × 3 = 9

27. (a) The transition elements acts as good catalysts. Give any two reasons. [2M]
(b) Mention the unit for magnetic momentum. [1M]
28. Explain the manufacturing of potassium permanganate from its ore with chemical equation. [3M]
29. What is lanthanoid contraction? Mention any two consequences of lanthanoid contraction. [3M]
30. Based on VBT, explain the geometry, hybridization and magnetic properties of $\left[Ni(CN)_4\right]^{2-}$. [3M]

31. Explain the splitting of d – orbitals in tetrahedral co-ordination sphere. [3M]

32. (a) Explain synergetic bonding in metal carbonyls. [2M]

(b) Write the structure of $Co(CO)_8$ complex. [1M]

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

33. (a) What are hypertonic solutions? Give an example. [2M]

(b) Define reverse osmosis. [1M]

34. (a) How the molar conductivity varies with concentration? Mention the graphical representation of variation of molar conductivity of acetic acid and potassium chloride in aqueous solution. [2M]

(b) Define limiting molar conductivity. [1M]

35. Explain the construction of SHE with neat labelled diagram. [3M]

36. Derive an integrated rate equation for the rate constant of a zero – order reaction. [3M]

PART – D

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

37. (a) Explain the mechanism of S_N1 reaction for the conversion of tert – butyl bromide to tert – butyl alcohol. [3M]

(b) Mention the condition to show an optical activity of an organic molecule. [1M]

(c) Give an example for an alkylidene halide. [1M]

38. (a) With chemical equation, explain the preparation of primary alcohol from Grignard reagent. [2M]

(b) Explain the manufacturing of phenol from Cumene process. [3M]

39. (a) Predict the product formed in the following chemical reactions [2M]

(i) $CH_3CH_2OH \xrightarrow{conc.\ H_2SO_4,\ 413K} P$

(ii) $(CH_3)_3C - OC_2H_5 \xrightarrow{HI} P$

(b) Explain the mechanism of dehydration of ethanol to an ethane in acidic medium. [3M]

40. (a) Explain how an acetaldehyde forms an oxime. [2M]

(b) Mention the condition, that an organic compound to undergo Cannizzaro reaction. [1M]

(c) Write the product formed when benzaldehyde is heated with conc. NaOH. [2M]

41. (a) Explain how diethyl cadmium reacts with acetyl chloride. [2M]

(b) Explain with chemical equation effect of heat on acetic acid with ammonia. [2M]

(c) Write the IUPAC name of $H_5C_2 - \underset{\underset{O}{\|}}{C} - CH_3$ [1M]

42. (a) Explain the preparation of primary amine by Gabriel phthalimide synthesis. [3M]

(b) Arrange the following compounds, in the increasing order of their basic nature in aqueous solution. [2M]

$$\frac{Benzamine}{pK_b = 9.38};\ \frac{Ethanamine}{pK_b = 3.29};\ \frac{Phenylmethanamine}{pK_b = 4.70};$$

43. (a) Mention the glycosidic linkage present in lactose. [1M]

(b) Name any one sulphur containing amino acid. [1M]

(c) How many peptide bonds are present in tetrapetide. [1M]

(d) Define nucleotide. [1M]

(e) Give an example for a reducing sugar. [1M]

PART – E

V. **Answer any <u>THREE</u> of the following. Each question carries THREE marks:** $3 \times 3 = 9$

44. Vapour pressure of benzene is 20mm of Hg. When 2 gram of a non-volatile solute dissolved in 78 grams of benzene. Benzene has vapour pressure of 195mm of Hg. Calculate the molar mass of the solute. (molar mass of benzene is 78 $gram\ mol^{-1}$)

45. 450 cm^3 of an aqueous solution of a protein contains 1.0g of the protein. The osmotic pressure of such a solution at 310K is found to be $3.1 \times 10^{-4}\ bar$. Calculate the molar mass of the protein. $\left(R = 0.083\ L\ bar\ mol^{-1}k^{-1}\right)$.

46. Find the value of ΔG^0 at 25°C for the following electrochemical cell.

$$Cu / Cu^{2+}_{(1M)} // Ag^{+}_{(1M)} / Ag \quad Given: \left[E^0_{Cu} = +0.34V,\ E^0_{Ag} = +0.8V\right] and\ F = 96500C$$

47. For a given data: $E^0_{Mg^{2+}/Mg} = -2.37V$, $E^0_{Cu^{2+}/Cu} = +0.34V$. Calculate the emf of the cell in which the following reaction takes place $Mg_{(s)} + \underset{(0.0001M)}{Cu^{2+}_{(aq)}} \rightarrow \underset{(0.001M)}{Mg^{2+}_{(aq)}} + Cu_{(s)}$

48. The rate of a particular reaction doubles when the temperature changes from 300K to 310K. Calculate the energy of activation of the reaction. $\left[R = 8.314 JK^{-1}mol^{-1}\right]$.

49. Calculate the rate constant of the first order reaction, if 70% of chemical reaction is completed in 23 mins.