# BRIKS ACADEMY

**Class: II Year**        **PUC MODEL QUESTION PAPER**        **Academic Year: 2023-24**

**Subject: Chemistry (34)**                                    **Maximum Marks:70**
**Time: 3.15hours**                                            **Number of questions: 49**
**Instructions:**

**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.**
        **1 ×15 = 15**

1. Value of Henry's constant $K_H$ _____.

(a) increases with increase in temperature.        (b) decreases with increase in temperature.

(c) remains constant.                              (d) first increases then decreases.

2. Which colourless gas evolves, when $NH_4Cl$ reacts with zinc in a dry cell battery

(a) $NH_4$            (b) $N_2$            (c) $H_2$            (d) $Cl_2$

3. The electric charge for electrode decomposition of one gram equivalent of a substance is

(a) one ampere per second            (b) 96500 coulombs per second

(c) one ampere for one hour           (d) charge on one mole of electrons

4. Which of the following is not a first order reaction?

(a) Hydrogenation of ethene            (b) Natural radioactive decay of unstable nuclei

(c) Decomposition of HI on gold surface        (d) Decomposition of N2O

5. Which one of the following elements shows maximum number of different oxidation states in its compounds? (a) Eu        (b) La        (c) Gd        (d) Am

6. Chlorobenzene can be prepared by reacting aniline with :

(a) hydrochloric acid

(b) cuprous chloride

(c) chlorine in presence of anhydrous aluminium chloride

(d) nitrous acid followed by heating with cuprous chloride

7. Lucas test is done to differentiate between

(a) alcohol and ketone                (b) alcohol and aromatic ketones

(c) 1°, 2° and 3° alcohols       (d) None of these

8. The reaction of sodium ethoxide with ethyl iodide to form diethyl ether is termed

(a) electrophilic substitution           (b) nucleophilic substitution

(c) electrophilic addition      (d) radical substitution

9. Which of the following is most acidic?

(a) Benzyl alcohol         (b) Cyclohexanol    (c) Phenol    (d) m-chlorophenol

10. The product formed in Aldol condensation is

(a) a beta-hydroxy aldehyde or a beta-hydroxy ketone       (b) a alpha-hydroxy aldehyde or ketone

(c) an alpha, beta unsaturated ester          (d) a beta – hydroxy acid

11. Imine derivatives of aldehyde and ketone is called as

(a) Schiff's reagent       (b) Fehling's reagent (c) Schiff's base    (d) Schiff's acid

12. Reaction of aniline with benzaldehyde is

(a) substitution         (b) addition      (c) condensation    (d) polymerization

13. Carbylamine reaction is used for the detection of

(a) aliphatic 2° amines    (b) aliphatic 1° amines    (c) aromatic 1° amines   (d) Both (b) and (c)

14. Which of the following is also known as animal starch?

(a) Glycine       (b) Glycogen      (c) Amylose      (d) Cellulose

15. Which of the following is an example of globular proteins?

(a) Glycine      (b) Albumin     (c) Alanine      (d) Cellulose (d) Both (a) and

**II. Fill in the blanks by choosing the appropriate word from those given in the brackets: 5 × 1 = 05**

    (Five, Hydrogen, Benzene sulphonyl chloride, Anoxia, Activation energy)

16. Low oxygen level in blood in high altitude regions causes _____

17. The Arrhenius equation accounts for the rate of a chemical reaction in terms of _____

18. The gas liberated when lanthanoids are treated with acids is _____

19. The coordination number of carbon in the transition state formed when haloalkane undergo $SN_2$ reaction is _____.

20. The chemical name of Hinsberg's reagent is_____

## PART - B

**III. Answer any three of the following. Each question carries two marks.          3 × 2 = 06**

21. Concentration of urea in an aqueous solution is 45% by mass. Calculate the mass of urea in 100g of water.

22. In a reaction 2A ⟶ products, the concentration of A decreases from 0.5 to 0.4 mol $L^{-1}$ in 10 minutes. Calculate the rate of reaction during this interval.

23. What is ambidentate ligand? Give an example.

24. Write the IUPAC name of the following compounds:

a) Br, Br, Br (benzene ring)    b) $H_3C-C(CH_3)(CH_3)-CH_2-Cl$
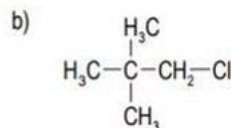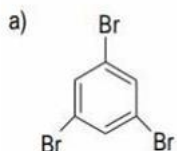
25. Explain Stephen reaction with the general equation.

26. Mention two reactions and facts that cannot be explained by the open chain structure of glucose.

## PART - C

**IV. Answer any three of the following. Each question carries three marks. 3 × 3 = 09**

27. Second ionisation enthalpy is unusually high for chromium (atomic number 24) but for zinc (atomic number 30) it is unusually low. Give reasons.

28. Give reason: Transition metals and their many compounds act as good catalysts.

29. Write equations to show the catalytic activity of Fe (III) in the reaction: $2I^- + S_2O_8^{-2} \longrightarrow I_2 + 2SO_4^{-2}$

30. Mention any three limitations of VBT that can be accounted for in CFT.

31. Which d-orbitals form the eg set in a tetrahedral field? Between t2g and eg which set has lower energy in octahedral complex? Give reason.

32. Explain colour in coordination compounds using CFT taking $[Ti(H_2O)_6]^{3+}$ as an example.

**V. Answer any two of the following. Each question carries three marks. 2 × 3 = 06**

33. i) Cylinders used by Scuba divers is diluted with helium gas. Why? ii) State Raoult's law. iii) Write the mathematical expression for Henry's law.

34. Name the following: i) The difference between the electrode potentials of two electrodes when no current is drawn through the cell ii) the quantity length/area of the electrode in a conductivity cell iii) $M^{n+}/M$

35. Name the anode, cathode and the electrolyte used in dry cell.

36. Derive an integrated rate equation for the rate constant of a zero order reaction

## PART - D

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

37. Primary alkyl halide C4H9Br (A) reacted with alcoholic KOH to give compound (B). Compound (B) reacts with HBr to give (C) which is an isomer of (A). When (A) is treated with

sodium metal it gives compound (D), $C_8H_{18}$ which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formulae of A, B, C and D

38. (a) Write equations for the mechanism of acid dehydration of ethanol to diethyl ether. (b) Write the equations along with enzymes involved in the manufacture of ethanol from molasses.

39. (a) Cresols are less acidic than phenol. Why? (b) Give reasons: Phenol is a stronger acid than an alcohol. (c) Explain Kolbe's reaction.

40. a) Given



Write the structures of the product formed when A reacts with i) $NH_2-NH_2$ ii) boiled with acidified KMnO4. b) Name the reaction by which i) sodium benzoate is converted into benzene ii) Propanoic acid is converted into 2-bromopropanoic acid c) Arrange the following in increasing order of their acid strength: benzoic acid, 4-nitrobenzoic acid, 4-methoxybenzoic acid

41. a) Give reasons: i) oxidation of toluene by $CrO_2Cl_2$ in $CS_2$ does not yield benzoic acid ii) benzoic acid does not undergo Friedel-Craft reaction iii) In *$NH_2CONHNH_2$ (semicarbazide) the *$NH_2$ group is not involved in formation of semicarbazone b) Write a self-explanatory equation for Clemmensen reduction of propanone.

42. a) What are X, Y and Z? Name the two inorganic reagents that are used to convert Z into nitrobenzene. b) Between N-methylethanamine and propan-2-amine, which will liberate $N_2$ gas on treatment with nitrous acid. Write the equation for the reaction.



43. a) Aniline is nitrated in 3 steps to get p-nitroaniline as a major product. Name the reactions involved in three steps in the correct sequence.

b) Name the reaction involved in the conversion of A to B and B to C.



## PART – E (PROBLEMS)

**VII. Answer any three of the following. Each question carries three marks. 3 × 3 = 09**

44. Twenty four grams of a non–volatile, non–electrolyte solute is added to 600 g of water. The boiling point of the resulting solution is 373.35K. Calculate the molar mass of the solute (Given boiling point of pure water = 373 K and $K_b$ for water = 0.52 K kg mol$^{-1}$ ).

45. A 1.46% solution of a compound has an osmotic pressure of 783 mm of Hg at 300K. Calculate the molar mass of the compound. R = 62.36 L mm Hg K$^{-1}$ mol$^{-1}$.

46. Resistance of a conductivity cell containing 0.1M KCl solution is 100 Ω. Cell constant of the cell is 1.29 /cm. Calculate the conductivity of the solution at the same temperature.

$$Ni_{(s)} \mid Ni^{2+}_{0.1M} \parallel Ag^+_{0.01M} \mid Ag_{(s)} \text{ at 298} \quad \text{Given, } E^0_{cell} = 1.05 \text{ V;}$$

47. Calculate the e.m.f. of the cell represented below:

48. Following data was obtained for the reaction : A + B $\longrightarrow$ P

| Experiment | [A]M | [B]M | Initial rate [R$_0$] for appearance of product P |
|:---:|:---:|:---:|:---:|
| 1 | 0.2 | 0.3 | $2 \times 10^{-3}$ mol $L^{-1}s^{-1}$ |
| 2 | 0.2 | 0.1 | $2 \times 10^{-3}$ mol $L^{-1}s^{-1}$ |
| 3 | 0.4 | 0.3 | $4 \times 10^{-3}$ mol $L^{-1}s^{-1}$ |

i) What is the order of the reaction with respect to A and B? ii) Write the rate law. iii) Calculate rate constant. 49. The activation energy for the reaction 2HI (g) $\longrightarrow$H$_2$(g)+I$_2$ (g) is 209.5 kJ/mol at 581 K. Calculate the fraction of molecules having energy equal to or greater than activation energy (R = 8.314 Jk$^{-1}$ mol$^{-1}$)

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