I – PUC – CHEMISTRY (34): MODEL QUESTION PAPER 1

Time: 3 hours 15 minutes   **Maximum Marks: 70**

Instructions:
1. **The question paper has four parts: A, B, C and D. All parts are compulsory.**
2. **Write balanced chemical equations and draw labeled diagrams wherever required.**
3. **Use log tables and the simple calculators if necessary.**
   (Use of Scientific Calculators is not allowed)

PART- A

I. Answer ALL of the following.   **10 × 1M = 10M**

(Answer each question in one word or one sentence)

1. 'Cis platin' a medicine used in the treatment of which disease?
2. Write the mathematical expression for Boyle's law.
3. Give the example for gaseous reversible reaction for which Kp = Kc
4. Which group elements in the periodic table are called Noble gases?
5. What is the oxidation number of the element in its free state?
6. Write the general electronic configuration of First group elements.
7. Why is boric acid is considered as weak acid
8. Mention the structure of SiO_4^{4-}
9. Give an example for non-benzenoid compound.
10. Write the expanded form of 'CNG'.

PART- B

II. Answer Any FIVE questions   **5 × 2M = 10M**

11. Convert 37°C to °F.
12. Under what conditions of temperature and pressure real gases tend to behave ideally?
13. What is dipole moment? What is its SI unit
14. Write any two diagonal relationship between Beryllium and Aluminium.
15. Give the reaction for the synthesis of water gas and producer gas
16. How is chloromethane converted into methane?
17. Illustrate Markovnikov's rule with an example.
18. What B O D? What is its significance?

PART- C

III. Answer Any FIVE questions   **5 × 3M = 15M**

19. (i) Give reason: Ionic radius of F⁻ is more than atomic radius of F   1
    (ii) How does ionization enthalpy varies down the group?   1
    (iii) Ionization enthalpy of nitrogen is more than that of oxygen. Give reason.   1

20. With the help of MOT write the energy level diagram of hydrogen molecule.
    What is its bond order and predict magnetic property.   3

21. Calculate the formal charge of each oxygen atom of ozone molecule.   3

22. a) Give any two differences between sigma and pi bonds.   2
    b) What is the magnetic nature of oxygen molecule?   1

23. Balance the following redox reaction by oxidation number method.   3
    $MnO_2 + Br^- \rightarrow Mn^{2+} + Br_2 + H_2O$ (Acid medium)

24. (i) Explain the laboratory preparation of dihydrogen.   2
    (ii) Give an example of ionic hydride.   1

25. Give any three points of differences between lithium and other alkali meatls.   3

26. (i) Write the molecular formula of silic.   1
    (ii) Write the partial structure of silicone.   1
    (iii) Name catalyst used in the gasoline production?   1

PART- D (IV & V)

IV. Answer Any FIVE questions   **5 × 5M = 25M**

27. a) An organic compound contains 69% carbon and 4.8% hydrogen, the remainder being oxygen.
    Calculate the masses of carbon dioxide and water produced when 0.20g of this substance is
    subjected to complete combustion.   3
    b) Give one example each for element and compound.   2

28. a) Write the significance of quantum numbers n,l & m.   3
    b) State Pauli's exclusion principle.   1
    c) Write the electronic configuration of copper (Z = 29).   1

29. a) The FM station of All India Radio, Hassan, broadcast on a frequency of 1020 kilohertz.
    Calculate the wavelength of the electromagnetic radiation emitted by transmitter.   3
    b) What is the maximum number of electrons present in third main energy level?   2

30. a) Give any three postulates of kinetic molecular theory of gases.   3
    b) On a ship sailing in Pacific Ocean where temperature is 23.4^0c, a balloon is filled with 2 L air.
    What will be the volume of the balloon when the ship reaches Indian Ocean where
    temperature is 26.1^0c?   2

31. a) The combustion of one mole benzene takes place at 298K and 1 atm. After combustion, $CO_2(g)$
    and $H_2O(l)$ are produced and 3267.0 kJ of heat is liberated. Calculate the standard enthalpy of
    formation of benzene.
    Given: Standard enthalpy of formation of $CO_2(g)$ and $H_2O(l)$ are -393.5 kJ mol^{-1} and
    -285.0 kJ mol^{-1} respectively.   3
    b) Write the mathematical expression for First law of thermodynamics   1
    c) Give an example of isolated system.   1

32. a) What are the values for $\Delta_r H^0$ and $\Delta_r S^0$ for reaction to be spontaneous at all temperatures? 2

b) Write the relation between 3

(i) Enthalpy (H) and Internal energy (U)

(ii) Cp and Cv

(iii) Free energy (G), Enthalpy(H) and Entropy (S)

33. a) The following concentrations were obtained for the formation of NH_3 from N_2 and H_2 at equilibrium at 500K. $[N_2] = 1.5 \times 10^{-2}M$, $[H_2] = 3.0 \times 10^{-2}M$ and $[NH_3] = 1.2 \times 10^{-2}M$. Calculate the equilibrium constant. 3

b) Define common ion effect? 1

c) What is the relationship between $[H_3O^+]$ and $[OH^-]$ for neutral solution? 1

34. a) What is acid and bases according to Arrhenius concept? 2

b) Give an example for (i) solid-vapour equilibrium (ii) liquid-vapour equilibrium 2

c) Write the equilibrium constant Kc expression for $H_2 + I_2 \rightleftharpoons 2HI$ 1

V. Answer Any FIVE questions   **2 × 5M = 10M**

35. a) For the molecule $CH_3CH_2CH_2OH$ 3

i) Identify functional group

ii) Write the bond line formula

iii) Write the succeeding homologue

b) Explain inductive effect with a suitable example. 2

36. a) An organic compound contains 69% carbon and 4.8% hydrogen, the remainder being oxygen. Calculate the masses of carbon dioxide and water produced when 0.20g of this substance is subjected to complete combustion. 3

b) What are nucleophiles? Give an example. 2

37. a) Explain the mechanism of chlorination of methane. 3

b) Write the Newman's projections of ethane. 2

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I – PUC – CHEMISTRY (34): MODEL QUESTION PAPER 2

Time: 3 hours 15 minutes   **Maximum Marks: 70**

Instructions:
1. The question paper has four parts: A, B, C and D. All parts are compulsory.
2. Write balanced chemical equations and draw labeled diagrams wherever required.
3. Use log tables and the simple calculators if necessary.
       (Use of Scientific Calculators is not allowed)

PART- A

I. Answer ALL of the following.   **10 × 1M = 10M**
(Answer each question in one word or one sentence)
1. Express 0.001023 into scientific notation.
2. Define critical temperature.
3. Give the example which acts as Lewis base as well as Bronsted base.
4. How does electro negativity related to atomic size.
5. What is the oxidation state of oxygen in peroxide?
6. Which alkali metal is act as strong reducing agent?
7. Write the formula of in-organic benzene.
8. What is dry ice?
9. Complete the reaction $NH_4CNO \xrightarrow{\text{Heat}} ?$
10. Write the name of the chain isomer of n-Butane.

PART- B

II. Answer Any FIVE questions   **5 × 2M = 10M**

11. Calculate the average atomic mass of chlorine using the following data.

	% Natural abundance	Molar mass
^{35}Cl	75.77	34.9689
^{37}Cl	24.23	36.9659

12. Draw the graph of pressure versus volume of a gas at different temperatures to illustrate the Bolye's law
13. Give any two conditions for hybridization of atomic orbitals.
14. Explain the reactivity second group elements towards hydrogen.
15. How many sigma and pi bonds are in carbon monoxide?
16. Write the structural isomers of an alkene with molecular formula. C_4H_8.
17. What are the characteristics for any ring system to be called as aromatic compound?
18. a) Which oxide of nitrogen in higher concentration will retard the rate of photosynthesis in plants?
    b) Name the compound formed when carbon monoxide binds to haemoglobin.

PART- C

5 × 3M = 15M

19. Why Beryllium exhibit anomalous behavior form the rest of the elements in the group.   3

20. With the help of hybridization explain the structure of methane.   3

21. a) What is bond enthalpy? How it is related to the bond order?   2
    b) Write the resonance structure of CO_2.   1

22. a) Give any two differences between bonding and anti bonding molecular orbitals.   2
    b) What is the dipole moment of BeF_2?   1

23. Balance the following redox reaction by half reaction method.   3
    MnO_4^-(aq) + I^-(aq) →MnO_2 (s) + I_2 (s) : Basic medium

24. (i) Give the reactions to show amphoteric nature of water.   3
    (ii) Mention any one method of removal of temporary hardness of water.   1

25. How caustic soda is commercially prepared from brine by Castner-Kellner cell.   3

26. Give the example of element of group 14   3
    (i) shows maximum catenation capacity
    (ii) used as semiconductor
    (iii) which reacts with water

PART- D (IV & V)

5 × 5M = 25M

27. a) Match the following: 3

	A		B
(i)	Electric current	(a)	S
(ii)	Amount of substance	(b)	kg
(iii)	Time	(c)	A
		(d)	mol

    b) Define molarity. Write the expression to calculate the molarity of the solution for the
       given mass and volume.   2

28. a) Give any three postulates of Bohr's model for hydrogen atom.   3
    b) Calculate the mass of a photon with wavelength $5.0A^0$.   2

29. a) Sketch the shapes of Px and dz^2.   2

   b) identify the property exhibited by $_{19}K^{40}$ and $_{20}Ca^{40}$.   1

   c) Write the orbital (box) type electronic configuration of p^4 and d^4 according to

   Hund's rule of maximum of multiplicity.   2

30. a) Derive ideal gas equation using gas laws.   3

   b) At 25^0c and 760 mm of Hg pressure a gas occupies 600 mL volume. What will be its pressure

   at a height where temperature is 10^0c and volume of the gas is 640 mL.   2

31. a) If water vapour is assumed to be a perfect gas, molar enthalpy change for vapourization of

   1 mole of water at 1 bar and 100^0c is 41 kJ mol^{-1}. Calculate the internal energy change when

   I mole of water is vaporized at 1 bar pressure and 100^0c.   3

   b) State Hess's law of constant heat summation.   1

   c) What is the value for standard enthalpy of formation of an element.   1

32. a) Calculate ΔG^0 for conversion of oxygen to ozone, $- O_2(g) \rightarrow O_3$ (g) at 298K. If Kp for the this

   conversion is 2.47×10^{-29}.   2

   b) What is thermo chemical equation? Write the thermo chemical equation for the molar

   combustion of ethanol (Given: $\Delta_r H^0 = -1367$ kJ mol^{-1})   2

   c) What is the value of ΔG in a spontaneous process?   1

33. a) For the equilibrium 2NOCl (g) $\rightleftharpoons$ 2NO(g) + Cl_2(g), the value of the equilibrium constant Kc

   is 3.75×10^{-6} at 1069K. Calculate the Kp for the reaction at this temperature?   3

   b) Write any two general characteristics of equilibria involving physical process.   2

34. a) The pH of the blood is 7.4. Calculate the $[H^+]$ 2

   b) Derive the Henderson-Hasselbalch equation for acid buffer.   3

V. Answer Any FIVE questions   **2 × 5M = 10M**

35. a) For the following bond cleavage, use curved arrows to show electron flow, mention the type of

   bond cleavage, and reactive intermediate formed.   3

$$CH_3CH_2O\text{-}OCH_2CH_3 \longrightarrow CH_3CH_2\overset{\bullet\bullet}{O} + \overset{\bullet\bullet}{O}CH_2CH_3$$

   b) Give the hybridization and geometry of carbocation.   2

36. a) 0.2033 g of an organic compound on combustion gave 0.3780 g of CO_2 and 0.1288 g H_2O. In a

   separate experiment 0.1877 g of the compound on analysis by Dumas method produced 31.7mL of

   nitrogen collected over water at 14^0C and 758 mm pressure. Determine the percentage composition

   of the compound. (Aqueous tension of water at 14^0C = 12 mm pressure).

   [ANS: C=50.7%, H = 7.04% N= 19.7% and O = 22.55%.]   3

   b) What are nucleophiles? Give an example.   2

37. a) Explain the mechanism of addition of HBr to propene in the presence of peroxide catalyst.   3

   b) Write the structures of cis and trans isomers of But-2-ene.   2

I – PUC – CHEMISTRY (34): MODEL QUESTION PAPER 3

Time: 3 hours 15 minutes   **Maximum Marks: 70**

Instructions:
1. **The question paper has four parts: A, B, C and D. All parts are compulsory.**
2. **Write balanced chemical equations and draw labeled diagrams wherever required.**
3. **Use log tables and the simple calculators if necessary.**
   (Use of Scientific Calculators is not allowed)

PART- A

I. Answer ALL of the following.   **10 × 1M = 10M**
(Answer each question in one word or one sentence)

1. What is limiting reagent?
2. How does viscosity varies with temperature?
3. Give an example of acidic buffer.
4. Which of the following ion is iso electronic with Na^+
   a) Ca^{2+} b) Mg^{2+} c) Zn^{2+}
5. Define reduction based on electron transfer.
6. Write the molecular formula of plaster of Paris.
7. The maximum co-valency of boron is 4. Why.
8. What type of hybridized carbon atom present in diamond?
9. Write the IUPAC name of $CH_2 = CH – CO – CH_3$
10. Name the catalyst used in Friedel – Craft's reaction.

PART- B

II. Answer Any FIVE questions   **5 × 2M = 10M**

11. Define molar volume. what is its value at STP
12. What is the compressibility factor? What is its value for ideal gas?
13. Write any two postulates of VSEPR theory.
14. Write the chemical reactions for the formation of
    a) Bleaching powder from milk of lime
    b) Quick lime form lime stone
15. How many carbon atoms are present in Buckminsterfullerene? What is the hybridization of each carbon atom in it?
16. Explain ozonolysis of propene.
17. Write the resonance structures and resonance hybrid structure of benzene.
18. Name any two gases responsible for Green house effect.

PART- C

III. Answer Any FIVE questions   **5 × 3M = 15M**

19. (i) What is electron gain enthalpy? How it vary across a period in the periodic table.   2
    (ii) Name the most electronegative element in the periodic table.   1

20. Give the conditions for the linear combination of atomic orbitals to form molecular orbitals. 3

21. a) What is hydrogen bonding? What type of hydrogen bonding is present in o-nitrophenol? 2
    b) Mention the shape of ammonia molecule based on VSEPR theory. 1

22. a) Write any two drawbacks of the octet theory. 2
    b) Write the Lewis dot structure of CO molecule. 1

23. Balance the following redox reaction by half reaction method. 3
    $Fe^{2+}(aq) + Cr_2O_7^{2-}(aq) \rightarrow Fe^{3+}(aq) + Cr^{3+}(aq)$: Acidic medium

24. (i) Calculate the strength of 20 volume of solution of hydrogen peroxide. 2
    (ii) What is the molecular formula of heavy water. 1

25. Give any one biological importance of each 3
    (i) Sodium
    (ii) Magnesium
    (iii) Calcium

26. Give the differences between diamond and graphite with respect to structure, hybridization and electrical conductivity. 3

PART- D (IV & V)

IV. Answer Any FIVE questions **5 × 5M = 25M**

27. a) N_2 and H_2 react with each other to produce ammonia according to the equation 3

$$N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3\,(g)}$$

   i) Calculate the mass of ammonia produced if 2.0×10^3 g of N_2 reacts with 1.0×10^3 g of H_2.
   ii) Will any of the two reactants remain unreacted?
   iii) If yes, which one and what would be its mass?
   b) State and illustrate law of multiple proportions. 2

28. a) Mention the conclusion drawn from the observation of Rutherford's α-ray scattering experiment. 3
    b) Write all the possible values of l,m & s when n = 2 2

29. a) Calculate the energy associated with the first orbit of He^+ (Z = 2, R_H = 2.18 X 10^{-18}J) 2
    b) What is a black body? 1
    c) Name the spectral region in which the Lyman series are present. 1
       What is the colour of the first spectral line of the Balmer series? 1

30. a) Using Dalton's law of partial pressure derive an expression for partial pressure of a gas in terms of mole fraction. 3
    b) With a suitable example explain dipole-dipole forces 2

31. a) Calculate the lattice enthalpy of sodium chloride using Born-Haber cycle. 3

b) Give one example each for intensive and extensive property. 2

32. a) What is entropy? How does entropy changes in a spontaneous process? 2

b) The molar enthalpy of combustion of benzene is -3264.6 kJ mol^{-1}.

Calculate the amount of heat energy liberated when 39 grams of benzene is burnt in excess of air.

[Given: Molar mass of benzene is 78 g mol^{-1}] 2

c) What is free expansion? 1

33. a) The value for the Kc for the reaction $2A \rightleftharpoons B + C$ is 2×10^{-3}.

At a given time the composition of reaction mixture is $[A] =]B] = [C] = 3 \times 10^{-4}$M.

In which direction the reaction will proceed? 2

b) Write the conjugate acid and base of water. 2

c) The equilibrium constant for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI$g) is K.

What is the equilibrium constant for the reaction $HI(g) \rightleftharpoons \frac{1}{2} H_2(g) + \frac{1}{2} I(g)$? 1

34. a) The pKa of acetic acid and pKb of ammonium hydroxide are 4.76 and 4.75 respectively.

Calculate the pH of ammonium acetate solution. 2

b) State Le Chatelier's principle? What is the effect of pressure on the following equilibria.

$CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$ 2

c) Write the solubility product expression for $BaSO_4$. 1

V. Answer Any FIVE questions   **2 × 5M = 10M**

35. a) 0.6723 g of an organic) compound gave on combustion 1.530g of carbon dioxide and 0.625 g

of water. Find the percentage of carbon and hydrogen in the compound. 3

b) Explain why an organic liquid vaporises at room temperature below its boiling point

in its steam distillation. 2

36. a)Explain Kjeldahl's method for the estimation of nitrogen in the organic compound? 3

b) Define (i) Resonance stabilization energy. (ii)Theoretical plate. 2

37. a) Explain the mechanism of Friedel – Craft's alkylation of benzene to get toluene. 3

b) Complete the following reaction. 1 + 1

$$CH_3 - CH = CH_2 + H_2O + (O) \xrightarrow[273K]{dil \cdot KMnO_4}$$

What happens to the colour of $KMnO_4$ during the reaction 'a'.

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