BOARD OF INTERMEDIATE EDUCATION, KARACHI

REVISED MODEL QUESTION PAPER OF

CHEMISTRY PAPER – I (ANNUAL 2023)

SECTION – A (Multiple Choice Questions)

Note: This section consists of 17 part questions and all are to be answered. Each question carries one mark. (17 Marks)

Q.1

(i) Which of the following samples of substances contains the same number of atoms as that of 20g Calcium:
(a) 16g S (b) 20g C
(c) 19g K (d) 24g Mg

(ii) Principal and azimuthal quantum number values for 3d orbital are:
(a) n = 2, ℓ = 1 (b) n = 3, ℓ = 2
(c) n = 3, ℓ = 3 (d) n = 2, ℓ = 3

(iii) VBT tells us about all of the following facts except:
(a) Bond length (b) Bond strength
(c) Bond energy (d) Bond order

(iv) One bond angle in NH_3 molecule reduces from 109.5° to 107° because of the following type of repulsion:
(a) Bond pair – Bond pair (b) Bond pair – Lone pair
(c) Lone pair – Lone pair (d) Active pair – Inactive pair

(v) Gas is more ideal at:
(a) 100°C and 1 atm (b) 0°C and 1 atm
(c) 0°C and 2 atm (d) 100°C and 200 atm_2

(vi) The principle involves in the liquefaction of gas is:
(a) Charles law (b) Henry law
(c) Joule Thomson effect (d) Le-Chatlier's principle

(vii) Which of the following molecules possesses strongest London forces:
(a) H_2 (b) He
(c) CH_4 (d) Ne

(viii) A big crystal can be cut or split into smaller size of identical shape; this phenomenon is called:
(a) Anisotropy (b) Cleavage
(c) Symmetry (d) Isomorphism

(ix) If the radius of Zn^{+2} ion is 0.74A° and S^{-2} ion is 1.84A°, the radius ratio of ZnS should be:
(a) 0.74 (b) 1.84
(c) 0.40 (d) 2.48

(x) Kp = Kc when Δn is equal to:
(a) zero (b) 1
(c) -1 (d) 2

(xi) The unit of rate constant for the first order reaction is:
(a) Ms^{-1} (b) s^{-1}
(c) $M^{-1}\ s^{-1}$ (d) $M^{-2}\ s^{-1}$

(xii) Which of the following set is categorized into partially miscible liquid pair:
(a) Benzene and water (b) Methanol and water
(c) Phenol and water (d) Benzene and toluene

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(xiii) Conjugate base of HCO_3^- is:

(a) H_2CO_3 (b) CO_3^{-2}

(c) H^+ (d) H_2O

(xiv) Milk is an example of this type of colloid:

(a) Gel (b) Aerosol

(c) Emulsion (d) Foam

(xv) Which of the following enthalpy change is always negative:

(a) Enthalpy of formation (b) Enthalpy of decomposition

(c) Enthalpy of combustion (d) Enthalpy of reaction

(xvi) Which of the following is not a state function of a system?

(a) Pressure (b) Enthalpy

(c) Internal energy (d) Work done

(xvii) Galvanized rod of iron is coated with:

(a) Nickel (b) Zinc

(c) Chromium (d) Carbon

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SECTION – B (Short Answered Questions)

Note: Attempt any nine (09) parts questions. Each question carries 04 marks.

(36 Marks)

Q.2

(i) Define the term Stoichiometry. In a laboratory experiment if 135g aluminum is allowed to react with excess of sulphur, it gives 300g of aluminum sulphide (Al_2S_3) as given in the following equation. Determine the %age yield of Al_2S_3. (atomic mass of Al is 27 and S is 32)

$$2Al + 3S \rightarrow Al_2S_3$$

(ii) Sodium hydroxide (NaOH) reacts with phosphoric acid (H_3PO_4) to form sodium phosphate (Na_3PO_4) and water by the reaction.

$$3NaOH + H_3PO_4 \longrightarrow Na_3PO_4 + 3H_2O$$

If 100g of NaOH and 100g of H_3PO_4 are mixed for the reaction under specific conditions, determine the mass of sodium phosphate formed. (Atomic mass of P is 31)

(iii) State Pauli's rule and write the electronic configuration of the following species:

* Ca^{+2} (Z = 20) * Br^{-1} (Z = 35) * Cu(Z = 29)

(iv) How can you differentiate between sigma and pi bond. Why p-p sigma bond is stronger than s-s and s-p.

(v) State Dalton's law of partial pressure. Give its two applications.

OR

Calculate the molar mass of a given gas whose diffusion rate is 2.83 times the diffusion of methane (CH_4).

(vi) What is a Liquid crystal? Give its two properties and two uses.

(vii) Explain why metallic solids conduct electricity and molecular solids possess low melting point.

(viii) Silver sulphate (Ag_2SO_4) is used for medicinal purpose to fill wounds. Its solubility in water at 25°C is 1.43×10^{-2} mol/dm^3. What will be its Ksp?

(ix) What is meant by Homogenous and Heterogeneous Catalysis? Give one example of each.

(x) Define acid and base in terms of:
* Lowry Bronsted theory * Lewis theory
Give examples of them

(xi) What are exothermic and endothermic reactions? Give example of each.

(xii) What is meant by primary battery? Draw a labeled diagram of Dry cell and write the redox reaction in it.

(xiii) Balance any one of the following equations by ion electron method.

$MnO_4^- + SO_3^{-2} \longrightarrow MnO_4^{-2} + SO_4^{-2}$ (basic medium)

$Cr_2O_7^{-2} + I_2 \longrightarrow Cr^{+3} + IO_3^-$ (acidic medium)

(xiv) Define molarity and molality? Calculate the mole fraction of a solution prepared by mixing 360g glucose and 900g water.

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SECTION – C (Detailed Answer Questions)

Note: Answer any two questions. All questions carry equal marks. (32 Marks)

Q.3 (a) State the main postulates of Bohr's atomic theory and derive an expression for the frequency of radiation of hydrogen atom from the following given values.

$$K.E = \frac{Ze^2}{8\pi\epsilon_o r} \qquad P.E = \frac{-Ze^2}{4\pi\epsilon_o r} \qquad r = \frac{\epsilon_o\, n^2h^2}{\pi mze^2}$$

(b) What is an Ideal gas? What are the causes of deviation of real gas from ideal behavior? Derive expressions for determining the density and molecular mass of an ideal gas by using general gas equation.

Q.4 (a) State the main postulates of electron pair repulsion theory and predict the geometry of BF_3, NH_3 and CO_2 molecules.

(b) State law of mass action. Explain the use of Kc in predicting the extent of reaction. If Kc for the reaction at 727°C is 4.2×10^{-3}, calculate its Kp.

$$CH_{4(g)} + 2H_2S_{(g)} \rightleftharpoons CS_{2(g)} + 4H_{2(g)}$$

Q.5 (a) What do ideal and non ideal solution mean? State Raoult law and derive its mathematical expression.

(b) State and explain Hess's law of constant heat summation? Calculate the enthalpy of combustion of propane (C_3H_8) at 25°C by the given information.

$$C_3H_{8(g)} + 5O_{2(g)} \longrightarrow 3CO_{2(g)} + 4H_2O_{(l)}\ (\Delta H° = ?)$$

ΔHf of C_3H_8 = (– 104 KJ/mol)
ΔHf of $CO_{2(g)}$ = (– 393.5 KJ/mol)
ΔHf of $H_2O_{(l)}$= (– 2858 KJ/mol)