



UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part – I
Annual Examination - 2017

Roll No.

Subject: Chemistry-I
PAPER: A (Physical Chemistry)

TIME ALLOWED: 3 hrs.
MAX. MARKS: 40

NOTE: Attempt any TWO questions from each section including question # 1 that is compulsory. All questions carry equal marks.

Section-I

- Q 1. (a) Solve the following set of simultaneous equations: 02

$$3x + 2y = 4$$

$$4x + 7y = 1$$

- (b) Differentiate the followings: 03

$$y = (x^3 + 1)^9$$

- (c) Find the Integral; 03

$$\int 1/(a - x)^3$$

- Q 2. Prove that: $P_c V_c / T_c = 3/8 RT$ (4)

(a) How the collision number is related with average velocity and the temperature of the gas molecules. 02

(b) The molar heat capacity of an ideal gas at constant pressure is $12.47 \text{ J K}^{-1} \text{ mol}^{-1}$. Calculate the molar heat capacity of the same gas at constant volume. 02

- Q 3. (a) Derive kinetic equation for 3rd order reaction when the initial concentration of all reactants is same. Derive its units. 04

(b) Give different methods for measurement of order of reaction. 02

(c) Half-life of a substance in a first order reaction is 15 minutes. Calculate the rate constant. 02

- Q 4. (a) Derive Clausius-Clapeyron equation. 04

(b) What is entropy? Justify it is a state function. 02

(c) Calculate the entropy change involved in thermodynamic expansion of two moles of a gas from a volume of 5 litres to a volume of 50 litres at 303 K. 02

- Q 5. a) What is Viscosity? How it is used to determine the constitution of the compounds? 04

b) Define Dipole moment and derive its units. 02

c) What is powder method for the crystal structure determination by X-rays. 02

Section-II

- Q 6. (a) Derive Schrodinger wave equation for motion of a particle in one dimension. 04

(b) State Heisenberg uncertainty principle. What is its physical concept? 02

(c) Discuss dual nature of matter. 02

- Q 7. (a) State and Explain Nerst's distribution law. Give its limitations. 04

(b) What are abnormal colligative properties? 02

(c) The boiling point of a solution containing 0.20 g of a substance X in 20 g of Ether. Calculate the molar mass of X. ($K_b = 2.16 \text{ K Kg}^{-1}$). 02

- Q 8. (a) What is concentration cell. Give its classification. Derive EMF for electrolyte concentration cell without transference. 02,04

(b) How conductance is related with resistance and specific conductance? 02

- Q 9. (a) Describe the factors which differentiate between physical and chemical adsorption. 03

(b) Differentiate homogeneous and heterogeneous catalysis? 02

(c) Derive a relation for cryoscopic constant. 03



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TIME ALLOWED: 3 hrs.
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NOTE: Attempt any TWO questions from Section I and II. Question # 1 is compulsory.

Q.1: Answer the following:

(2 x 4 = 8)

- (i) Iodide ion has more polarizability than chloride ion. Comment the statement.
- (ii) Differentiate between soft and hard acid according to HSAB concept. Give one example in each case.
- (iii) NCl_5 does not exist, however PCl_5 exists. Justify the statement.
- (iv) What is bond order? How it can be calculated.

Section I

Q.2: What is metallic bond? Describe at least one theory to illustrate this type of bond.

(2, 6)

Q.3. (a) What is Common ion effect? Discuss its importance with reference to group II and III basic radical analysis.

(2, 4)

(b) What are limitations of Lewis acid base concept?

(2)

Q.4 (a) Predict and draw the shapes of H_2O and NH_3 molecules on the basis of VSEPR theory?

(3 + 3 = 6)

(b) Differentiate between hybrid and molecular orbital.

(2)

Q.5 What is diagonal relationship? Explain this relationship between Li and Mg.

(2, 6)

Section II

Q.6: (a) What is crystal field splitting phenomenon? Explain it with reference to octahedral geometry.

(2 + 4 = 6)

(b) Differentiate between Nuclear fission and fusion reaction.

(2)

Q.7. Define the term isomerism. Discuss its different types exhibited by coordination compounds.

(2 + 6 = 8)

Q.8 (a) What is artificial radioactivity? Illustrate it with suitable examples.

(2, 4)

(b) What is oxidation state of central metal ion in the following complex cations?

i. $[\text{Co}(\text{NH}_3)_6]^{+3}$ ii. $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{+2}$

(2)

Q.9 (a) Discuss classification of chromatography. Also justify that paper chromatography is a type of partition chromatography.

(4 + 2 = 6)

(b) Write down uses of radioactive isotopes in medicine?

(2)