[This question paper contains 4 printed pages.]

4725 *Your Roll No.* .....

B.Sc. (G) / III **AS**

CHEMISTRY – Paper IX

(Physical Chemistry)

Time : 2 Hours *Maximum Marks : 25*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any **four** *questions.*
Question No. 1 *is compulsory.*

1. Answer any **five** :

(a) The rate of a chemical reaction is almost double for every 10° rise of temperature whereas the number of collisions increase only by 2–4% for the same rise of temperature.

(b) What are the units of rate constant for a first order reaction ?

(c) Quantum yield of the primary process in all photochemical reaction is one.

(d) The standard electrode potential of hydrogen electrode is taken as zero at all temperatures.

P.T.O.

(e) Quinhydrone electrode is not suitable for pH measurement in strongly alkaline solution.

(f) Congruent and incongruent melting points.

(1.4×5)

2. (a) State Nernest distribution law and with its help explain how multistep extraction of a solute is more effective than a single step extraction for a given volume of extracting solvents ? (3)

(b) An organic acid is distributed between 500 ml each of a solvent A and water. In water the acid is dissociated while in solvent A its normal molecules are present. The concentration of the acid in the aqueous layer is 6.0 gm and in the layer of solvent A it is 0.72 gm. If the partition coefficient of the acid between solvent A and water is 0.16, calculate the degree of dissociation of the acid in the aqueous layer. (3)

3. (a) Define the term phase, component and degrees of freedom. (2)

(b) Discuss the application of phase rule to lead-silver system. What is its significance. (4)

4. (a) Derive an expression for a second order reaction, starting with equal concentration of the reactant. (3)

(b) The half-life for first order reaction is 2.5×10^3 sec. How long will it take for 20% of the reactant to be left behind ? (3)

5. (a) State and explain the Law of Einstein of photochemical equivalence. What are the courses of high and low quantum yield ? (3)

(b) A substance was irradiated with a radiation of 240 nm wave length such that it absorbed 6×10^{16} quanta per second. After irradiating for 20 minutes, 0.003 moles of the substance had reacted. What is the quantum yields of the reaction ? (3)

6. (a) Define E.M.F. of a cell. Derive the relationship between cell potential and ΔG, ΔH and ΔS of the cell reaction. (3)

(b) For the following cell

$Zn/Zn^{2+}(aq)\ (a = 0.1) \parallel\ Cu^{2+}(aq)(a = 0.01)|Cu$

Write the cell reaction and calculate the emf at 298 K.

$\left(E^0_{Zn^{2+},Zn} = -0.762\,V\ ;\ E^0_{Cu^{2+},Cu} = 0.337\,V\right)$ (3)

Values of some physical constants :

Avogadro number $N = 6.06 \times 10^{23}$

Planck constant $h = 6.627 \times 10^{34}$ JS

Velocity of light $= 3 \times 10^{8}\ ms^{-1}$

$1\ nm = 10^{-9}\ m$