

BSc DEGREE EXAMINATION MAY 2018
(Sixth Semester)

Branch – CHEMISTRY

PHYSICAL CHEMISTRY - II

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 For the reaction of the type $aA + bB \rightarrow lL + mM$ write down the rate equation in terms of active masses of A, B, L and M.
- 2 Give an example for pseudo uni-molecular reaction.
- 3 What are consecutive reactions?
- 4 Suggest a method for the study of kinetics of hydrolysis of methyl benzoate by alcoholic potash under equimolar conditions of the substrates.
- 5 The frequency factor of a first order gas phase reaction is $1.3 \times 10^{13} \text{ s}^{-1}$ and activation energy is $33 \text{ kcal. mol}^{-1}$. Calculate the rate constant of the reaction at 57°C .
- 6 Define the second law of photochemistry.
- 7 For HCl molecule the electronic charge is 4.8×10^{-10} esu and the bond length is 1.38 \AA . Calculate its dipole moment.
- 8 Differentiate paramagnetism and diamagnetism.
- 9 Define the terms phase and components.
- 10 Identify the number of degrees of freedom at the triple point in the phase diagram of water.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Describe the characteristics of the first order reaction.
OR
b What are the factors influencing the rate of a chemical reaction? Explain.
- 12 a How will you study the kinetics of inversion of cane sugar reaction experimentally?
OR
b What do you mean by steady state approximation? Apply it in the study of kinetics of $\text{H}_2 - \text{Br}_2$ reaction.
- 13 a Discuss the collision theory of bimolecular reactions.
OR
b Explain the various photophysical phenomena took place while a substance interacted with electromagnetic radiation with the help of Jabalonski diagram.
- 14 a Explain Clausius – Mosotti and Debye equations.
OR
b Define the following terms: (i) Magnetic permeability (ii) Magnetic susceptibility (iii) Magnetic moment (iv) Magnetogyric ratio.

- 15 a Describe the phase diagram of carbon dioxide.
OR
b Explain the use of lead – silver phase diagram in the Pattinson's process for desilverisation of lead.

SECTION - C (30 Marks)Answer any **THREE** Questions**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 Derive the rate expression for the second order reaction of the type
 $A + B \rightarrow \text{Product}$.
- 17 a) 5 mL of ethyl acetate was added to a flask containing 100 mL of 0.1 M HCl placed in a thermostat maintained at 30°C. 5 mL of reaction mixture was withdrawn at different intervals of time and after chilling, titrated against a standard alkali. The following data were obtained.
- | | | | | | |
|-------------------------|------|-------|------|-------|----------|
| Time (min) : | 0 | 75 | 119 | 183 | ∞ |
| mL of alkali consumed : | 9.62 | 12.10 | 13.1 | 14.75 | 21.05 |
- From the above data, show that the hydrolysis of ethyl acetate follows first order kinetics. (6)
- b) What are chain reactions? Give their characteristics. (4)
- 18 a) What is energy of activation? Mention its significance with the aid of energy profile diagrams for exothermic and endothermic reactions. (5)
- b) What do you mean by quantum yield of a photochemical reaction? Classify the photochemical reactions on the basis of their quantum yield. Give example for each category. (5)
- 19 a) How will you determine Cl-C-Cl bond angles in ortho, meta and para-dichlorobenzenes? (5)
- b) Discuss the applications of magnetic susceptibility measurements. (5)
- 20 How will you classify two component systems with formation of compounds? Give examples and apply Gibbs phase rule for the FeCl_3 – water system.

Z-Z-Z

END