

## FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(Supplementary – 2018 Admission)

## CHEMISTRY

## ACHE5B08T: PHYSICAL CHEMISTRY - II

Time: 3 Hours

Maximum marks: 80

**PART A: Answer all the questions. Each carries 1 mark.**

- 1 State and explain Beer- Lambert law.
- 2 Explain the rule of mutual exclusion.
- 3 What are Schoenflies symbols for proper axis of rotation and improper axis of rotation?
- 4 Define bioluminescence.
- 5 What is the basic principle of chromatography?
- 6 State the phase rule and explain the terms involved.
- 7 If the half-life of a first-order reaction  $A \rightarrow B$  is 2 minutes how long it will take [A] to reach 10% of its initial concentration?
- 8 What are micelles? Give one application.
- 9 Give two examples each for first and second-order reactions.
- 10 Predict the number of signals in the PMR spectra of p-xylene and methyl acetate.

**(10 × 1 = 10 Marks)****PART B: Answer any ten questions. Each carries 2 marks.**

- 11 How many operations does a proper axis of rotation generate?
- 12 Explain the term incongruent melting point.
- 13 When a monochromatic light is passed through 5 cm length of a 0.075 M solution of a substance, the emergent intensity is found to be half of the initial intensity. Calculate the molar extinction coefficient of the substance.
- 14 Discuss the phase diagram of the sulphur system.
- 15 Explain the term chemical shift in NMR spectroscopy.
- 16 What is the principle of gas chromatography? For what purpose gas chromatography is used?
- 17 Bring out the essential difference between fluorescence and phosphorescence giving importance to the mechanisms of the two phenomena.
- 18 The IR absorption peak for HBr is found at 3770  $\text{cm}^{-1}$ . Calculate the force constant of the H-Br bond. [H=1.008 amu; Br=79.30 amu]

**(PTO)**

- 19 Give Arrhenius equation and explain its significance?
- 20 What are the types of emulsions formed? Give an example of an emulsifying agent.
- 21 What is meant by selection rule? Give the selection rules for:  
(a) rotational spectra and                      b) vibrational spectra
- 22 Explain the characteristics of a mathematical group.

(10 × 2 = 20 Marks)

**PART C: Answer any five questions. Each carries 6 marks.**

- 23 Explain Langumir adsorption isotherm.
- 24 Discuss the effect of temperature on reaction rate on the basis of collision theory.
- 25 Write note on: (i) Electrophoresis    (ii) Coagulation    (iii) Dialysis    (iv) Tyndall effect
- 26 Explain chromophore and auxochrome. Distinguish between bathochromic shift and hypsochromic shift.
- 27 Discuss Stark-Einstein law and explain the term quantum yield of a photochemical reaction. Explain why the quantum yield of the hydrogen-chlorine reaction is very high.
- 28 How does HPLC chromatography work? Why HPLC is known as the best method of chromatography?
- 29 Explain the general broadness of spectral bands in UV-visible spectroscopy. State Franck-Condon principle and explain it with regard to electronic transitions in a diatomic molecule.
- 30 What is the mobile phase in gel permeation chromatography? Explain its working?

(5 × 6 = 30 Marks)

**PART D: Answer any two questions. Each question carries 10 marks.**

- 31 Write a note on elements of symmetry of molecules illustrating each of them?
- 32 (a) Discuss the significance of the terms chemical shift and spin-spin splitting in NMR spectroscopy with illustrative examples. Discuss the factors that influence chemical shifts in PMR spectroscopy.  
(b) Briefly discuss the concept of group frequencies with regard to the IR spectra of organic compounds
- 33 Explain the mechanism of enzyme action. Briefly discuss the Michaelis-Menten equation with respect to the kinetics of enzyme catalysis.
- 34 With the help of the phase diagram for the lead-silver system, explain what is meant by Pattinson's process of desilverization of lead.

(2 × 10 = 20 Marks)