

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U CHE5 B08 - PHYSICAL CHEMISTRY - II

(Chemistry - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)Answer *all* questions. Each question carries 2 marks.

1. What is meant by a pseudo first order reaction?
2. Write the integrated rate equation for a general third order reaction involving one reactant only.
3. Give an example for chemisorption.
4. State the phase rule. Define the term 'phase'.
5. What is a eutectic? Is it a chemical compound?
6. Give two examples for efflorescent substances.
7. What is the essential condition for a molecule to absorb microwave radiation?
8. What is the essential condition for a molecule to absorb infrared radiation?
9. What is the quantum mechanical selection rule for vibrational Raman spectroscopy?
10. What is meant by chemical equivalence of a set of nuclei? How many NMR signals would a set of three chemically equivalent nuclei yield?
11. Sketch the schematic ESR spectrum of the hydrogen atom.
12. What is fluorescence?

(Ceiling: 20 Marks)**Part B** (Short essay questions - Paragraph)Answer *all* questions. Each question carries 5 marks.

13. Explain the significance of Arrhenius parameters.
14. Calculate the activation energy of a reaction if its rate constant gets tripled due to an increase of temperature from 295 K to 305 K. (Hint: $k_2/k_1 = 3$)
15. Briefly discuss the adsorption theory of heterogeneous catalysis.

16. What is a condensed system? Explain how the phase rule is modified for applying to such a system. Draw a general phase diagram for a simple eutectic system A-B.
17. In the rotational spectrum of HF, the lines are 41.9 cm^{-1} apart. Calculate the moment of inertia and bond length in HF.
18. Explain the splitting of a signal into multiplets due to spin-spin coupling taking the example of the NMR spectrum of ethyl bromide.
19. Derive a relationship connecting absorbance of a solution and its concentration.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. Briefly explain how the method of thermal analysis utilizing cooling curves can be used to construct phase diagrams.
21. Discuss the theory of electronic spectroscopy of a diatomic molecule.

(1 × 10 = 10 Marks)
