

24U214

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Name :

Reg. No :

SECOND SEMESTER UG DEGREE EXAMINATION, APRIL 2025

(FYUGP)

CC24UCHE2MN106 - FUNDAMENTALS OF PHYSICAL CHEMISTRY

(Chemistry - Minor Course)

(2024 Admission - Regular)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer *all* questions. Each question carries 3 marks.

1. State the Second Law of thermodynamics in terms of entropy. [Level:1] [CO1]
2. How is the entropy of fusion of a substance related to its enthalpy of fusion ? [Level:2] [CO1]
3. Give the relationship between the internal energy change and enthalpy change in process. [Level:3] [CO1]
4. What is K_w ? [Level:1] [CO2]
5. Define phase equilibrium. [Level:1] [CO2]
6. Define common ion effect. [Level:1] [CO2]
7. Draw the graph for a zero order reaction. [Level:3] [CO3]
8. Define instantaneous rate of a reaction. [Level:1] [CO3]
9. State the difference between fluorescence and phosphorescence in terms of energy transitions. [Level:1] [CO4]
10. What is Lambert's Law, and how is it relevant to light absorption? [Level:1] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer *all* questions. Each question carries 6 marks.

11. What are the different types of thermodynamic systems? Discuss each type with examples. [Level:2] [CO1]
12. Discuss third law of thermodynamics. [Level:2] [CO1]
13. Define the terms pK_a and pK_b . How are they related to the strength of an acid and base? [Level:1] [CO2]

14. Explain the mechanism of buffer action. How do buffer solutions maintain the pH of a solution? [Level:2] [CO2]
15. Define half life of a reaction. Derive half life for first order reaction. [Level:1] [CO3]
16. Explain graphical method for the determination of order of a reaction. [Level:2] [CO3]
17. Explain the Grothus-Draper law and how it relates to the absorption of light by a substance in photochemistry. [Level:2] [CO4]
18. Briefly explain the process of photosensitization and its importance in photochemistry. [Level:2] [CO4]

(Ceiling: 36 Marks)

Part C (Essay questions)

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

19. Discuss the physical significance of Gibbs energy. Explain the criteria for spontaneity and equilibrium in terms of Gibbs energy change. [Level:2] [CO1]
20. (a) Given that the rate constant is $12 \text{ M}^{-1}\text{s}^{-1}$ at 345 K and the pre-exponential factor is $20 \text{ M}^{-1}\text{s}^{-1}$, calculate the activation energy [Level:2] [CO3]
- (b) The half-life of a first-order reaction was found to be 10 min at a certain temperature. What is its rate constant?

(1 × 10 = 10 Marks)
