

19U514

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Name:

Reg.No:

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2021

(CBCSS - UG)

CC19U CHE5 B08 - PHYSICAL CHEMISTRY-II

(Chemistry - Core Course)

(2019 Admission - Regular)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Define threshold energy of a reaction.
2. For a certain reaction, it takes 3 minutes for the initial concentration of 1 mol L^{-1} to become 0.5 mol L^{-1} and another 3 minutes to become 0.25 mol L^{-1} . What is the rate constant of the reaction?
3. What is meant by a catalytic poison?
4. State the phase rule. Define the term 'phase'.
5. Distinguish between the terms 'triple point' and 'eutectic point' in phase studies.
6. Define upper critical solution temperature.
7. How many vibrational modes of CO_2 are infrared-active? How many peaks will they totally yield in an IR spectrum of CO_2 ?
8. What does the term bending vibrations mean?
9. What are hyperchromic and hypochromic shifts?
10. Sketch the schematic PMR spectrum of acetaldehyde and identify the peaks.
11. Sketch the schematic ESR spectrum of the hydrogen atom.

12. What is meant by chemiluminescence?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. A second order reaction in which $a = b$ is 20% complete in 40 s. Calculate its time for half-change.
14. Draw a labeled potential energy diagram for (i) an exothermic reaction and (ii) an endothermic reaction, in accordance with the activated complex theory of reaction rates.
15. Explain the term adsorption with suitable examples.
16. Draw the phase diagram of the ferric chloride-water system and indicate the invariant points in it and the equilibria involved at these points.
17. Give the expression for the rotational energy of a diatomic molecule treated as a rigid rotator. Show that the spectral lines for such a molecule are equally spaced.
18. Explain the term chemical shift in NMR spectroscopy.
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. (a) Discuss the phase diagram of the sulphur system.
(b) Justify the statement: "A eutectic mixture has a definite composition and a sharp melting point; however, it is not to be regarded as compound."
21. Arrive at expressions for (i) the moment of inertia and (ii) expression for rotational energy of a rigid diatomic molecule.

(1 × 10 = 10 Marks)
