Reg. No…….. Name…… **22U557**

B.Sc. DEGREE END SEMESTER EXAMINATION: OCTOBER 2022

SEMESTER **5 : CHEMISTRY**

COURSE: **19U5CRCHE08: PHYSICAL CHEMISTRY - II**

(*For Regular - 2020 Admission and Supplementary - 2019 Admission)*

Time: Three Hours Max. Marks: 60

PART A
Answer All (1 mark each)

1. Give the relationship between δ and τ scales.
2. State Stark-Einstein law.
3. What is the condition for a molecule to be Raman active?
4. What is meant by base peak?
5. What is the selection rule for rotational spectroscopy?
6. Define chemical shift.
7. Write down the expression for rotational constant B.
8. Specify the type of molecular excitations occur when a molecule absorbs an electromagnetic radiation of wavelength 1000 nm.

(1 x 8 = 8)

PART B
Answer any 6 (2 marks each)

9. Explain Born-Oppenheimer approximation.
10. Sketch the normal modes of vibration of CO_2.
11. Explain the term coupling constant J.
12. Explain primary process and secondary process in photochemical reaction.
13. Why phosphorescence lasts for some more time even after the source of light is removed?
14. Predict the number of NMR signals of acetophenone.
15. What is meant by hot bands?
16. Give an example of auxochrome.

(2 x 6 = 12)

PART C
Answer any 4 (5 marks each)

17. State and explain the Frank-Condon principle.
18. Explain mutual exclusion principle with an example.
19. Why TMS is used as a standard reference in NMR spectroscopy?
20. Write a note on photosensitized reactions.
21. Differentiate between fluorescence and phosphorescence.
22. Explain how mass spectrometry is used for determining the molecular mass of a compound?

(5 x 4 = 20)

PART D

Answer any 2 (10 marks each)

23. (a) Discuss the basic principles of the Raman spectroscopy.
    (b) State and explain Beer- Lamberts law.
24. (a) In vibrational spectroscopy, how does an overtone differ from the fundamental?
    (b) Draw and discuss the high-resolution NMR of ethyl bromide.
25. (a) Define Quantum yield. Explain the high quantum yield for the hydrogen-chlorine reaction.
    (b) Write notes on (i) fundamental vibrational frequency (ii) overtones (iii) Fermi resonance
26. (a) Derive 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.
    (b) Draw the schematic NMR spectrum of (i) ultrapure ethanol (ii) acidified ethanol and highlights the difference between two.

(10 X 2 = 20)

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