Reg. No ..... Name **24U560**

B.Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2024

SEMESTER 5 : CHEMISTRY

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

(For Regular 2022 Admission and Supplementary 2021/2020/2019 Admissions)

Time : Three Hours Max. Marks: 60

PART A

Answer All (1 mark each)

1. How many normal modes of vibrations are possible for the H_2O molecule?
2. Why are anti Stokes lines less intense than the stocks lines in the Raman spectrum?
3. Give an example for fluorescence.
4. How many peaks will obtained in the proton NMR spectrum of methyl acetate? Why?
5. Explain the general broadness of spectral bands in UV-visible spectroscopy?
6. What do you mean by chromophore? Give two examples.
7. Define base peak in mass spectroscopy.
8. Calculate the wavelength of a radiation that has an energy 4.95×10^{-19} J.

(1 x 8 = 8)

PART B

Answer any 6 (2 marks each)

9. State the principle of mutual exclusion.
10. Discuss the significance of Franck-Condon principle in explaining the intensities of spectral lines in electronic spectroscopy.
11. State the principle of mutual exclusion
12. Explain Bathochromic shift taking a specific example?
13. What is referred to as electron ionisation mass spectrometry.
14. Calculate the energy of one mole of a photon whose wavelength is 400 nm.
15. Briefly explain Born-Oppenheimer approximation.
16. Explain hyperchromic shift taking a specific example?

(2 x 6 = 12)

PART C

Answer any 4 (5 marks each)

17. Explain the terms bathochromic and hypsochromic shift with suitable examples.
18. Discuss the anharmonic oscillator model of the vibrating diatomic molecule. How is the selection rule for vibrational transitions modified for an anharmonic oscillator?
19. Discuss the complementary character of IR and Raman spectroscopy.
20. The quantum yield for the photo decomposition of hydrogen bromide is to explain this on a mechanistic basis.
21. Discuss briefly the nature of fragmentation that can happen in a mass spectrometric experiment?
22. Nuclear spin-spin splitting is observed in 2-methylpropane, but not in 1-chloro-2,2-dimethyl propane. Explain why?

(5 x 4 = 20)

PART D

Answer any 2 (10 marks each)

23. a) Derive an expression for the rotational energy of a diatomic rigid rotator. (5 marks)
    b) Explain the terms chromophores and auxochromes. (5 marks)
24. a) Define quantum yield? Explain abnormal quantum yield giving at least two examples b) State grotthus draper Law and Einstein's Law of photochemical equivalence.
25. What is chemical shift in NMR spectroscopy? Which are the different scales used for expressing chemical shift? Explain the factors affecting chemical shifts in NMR spectroscopy?
26. Sketch the normal modes of vibration of H_2O and CO_2 and determine which are IR active and Raman active. Give explanation.

(10 x 2 = 20)