

QP CODE: 22101782



Reg No :

Name :

B.Sc DEGREE (CBCS) SPECIAL SUPPLEMENTARY EXAMINATIONS, MAY 2022

Fifth Semester

CORE COURSE - CH5CRT08 - PHYSICAL CHEMISTRY - II

Common for B.Sc Chemistry Model I, B.Sc Chemistry Model II Industrial Chemistry & B.Sc Chemistry Model III Petrochemicals

2019 Admission Only

9F95041A

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. If a proton and an electron are moving with the same velocity, what would be the ratio of their wavelengths?
2. Give the significance of an Eigenvalue equation in quantum mechanics.
3. If the energy of the ground state of one-dimensional box is E, what would be the energy of its first excited state?
4. What is the value of angular momentum of a 1s electron?
5. Atomic orbitals are monocentric whereas molecular orbitals are polycentric. Give reason.
6. Give the relationship between the energy of a radiation with its (a) frequency (b) wavelength.
7. Specify the type of molecular excitations occur when a molecule absorbs an electromagnetic radiation of wavelength 200 nm.
8. In terms of vibrational spectroscopy, define the zero point energy.
9. Comment on the relative intensities of Stokes and Anti-Stokes lines in Raman spectrum.
10. What do you mean by hypsochromic shift?
11. What is meant by the term 'spin flipping'?
12. Which type of chemical species is studied in the ESR spectroscopy?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*





13. Explain the Rayleigh-Jeans law and the ultraviolet catastrophe.
14. Discuss Einstein's explanation for the experimental results of the photoelectric effect.
15. Discuss the significance of radial and angular part of the wavefunction of a hydrogenic atom.
16. Summarize the important features of MO theory.
17. In the context of vibrational spectroscopy, what do mean by overtones and hot bands?
18. Sketch the fundamental vibrational modes of CO₂ specifying their activity in IR region.
19. Explain the origin of the Frank-Condon principle and how it leads to the appearance of vibrational structure in an electronic transition.
20. TMS has several advantages over other substances which have been used as the NMR standards. Substantiate the statement.
21. Discuss the factors that affect chemical shifts in NMR spectroscopy.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Discuss the postulates of quantum mechanics.
23. Discuss the important features of MO theory and LCAO method. Illustrate the formation of the σ , σ^* , π and π^* – MO's.
24. (a) Derive an expression for the energy of a rigid rotator.
(b) The pure rotational spectrum of a gaseous molecule, ¹²C¹⁶O, consists of a series of equally spaced lines separated by 3.8451 cm⁻¹. Calculate the internuclear distance of the molecule, if the reduced mass of the molecule is 1.1383 x 10⁻²⁶ kg.
25. Discuss the basic principles of the Raman spectroscopy, and summarise its important applications.

(2×10=20)

