QP CODE: 22100033

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, JANUARY 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

2017 Admission Onwards

04E59B8A

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

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

1. Give the mathematical expression for the wavelength of matter waves.
2. What is meant by an Eigen function?
3. Give the expression for energy of a particle confined to moving inside a one dimensional box.
4. Write the Schrodinger wave equation, in cartesian coordinates.
5. Comment on the symmetry of MO formed by the combination of two 1s atomic orbitals.
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 1000 nm.
8. Give the selection rules governing the transition between vibrational energy levels.
9. Comment on the relative intensities of Stokes and Anti-Stokes lines in Raman spectrum.
10. What are auxochrome?
11. What is TMS? Give its structure.
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. Write notes on black body and black body radiation. Explain Planck's distribution law.
14. Explain the Compton Effect.

15. Pictorially represent and discuss the important features of the radial probability distribution curves of 1s, 2s, and 3s orbitals of hydrogenic atoms.

16. Pictorially represent and discuss, in terms of LCAO method, the combination of 2p atomic orbitals.

17. In vibrational spectroscopy, how does an overtone differ from the fundamental?

18. Sketch the fundamental vibrational modes of CO_2 specifying their activity in IR region.

19. Explain the Franck-Condon principle, in the context of electronic spectroscopy.

20. Discuss the factors that affect chemical shifts in NMR spectroscopy.

21. Draw and explain the ^{1}HNMR spectrum of ethanol.

(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, $^{12}C^{16}O$, consists of a series of equally spaced lines separated by 3.8451cm^{-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)