QP CODE: 19102432

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Reg No : .....

Name : .....

BSc DEGREE (CBCS) EXAMINATION, OCTOBER 2019

Fifth Semester

Core Course - CH5CRT08 - PHYSICAL CHEMISTRY - II

B.Sc Chemistry Model I ,B.Sc Chemistry Model II Industrial Chemistry ,B.Sc Chemistry Model III Petrochemicals

2017 Admission Onwards

3DD96E15

Maximum Marks: 60

Time: 3 Hours

Part A

Answer any ten questions.

Each question carries 1 mark.

1. Find the maximum number of emission lines obtained when the excited electrons undergo transitions from sixth level to the ground state of hydrogen atom.
2. Give the significance of an Eigenvalue equation in quantum mechanics.
3. Give the significance for normalization in quantum mechanics.
4. State the Born interpretation of the wavefunction.
5. Give the basic principle of the LCAO method.
6. What is the wavenember of radiation used by an FM radio transmitter broadcasting at 90 MHz.
7. Specify the type of molecular excitations occur when a molecule absorbs an electromagnetic radiation of wavelength 1000 nm.
8. In terms of vibrational spectroscopy, define the zero point energy.
9. Stokes lines are much more intense than Anti-stokes lines.Give reason.
10. Give two examples of chromophores.
11. Specify two nuclei having half integral spin.
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. Find the energy per photon and the energy per mole of photons of radiation of wavelength (a) 600 nm (red) (b) 550 nm (yellow) (c) 400 nm (blue).
14. Write a note on the wave-particle duality of electron.

15. A hydrogen atom, treated as a point mass, is confined to a one-dimensional square well of length 1.0 nm. How much energy does it have to give up to fall from the first excited state to the ground state?

16. Pictorially represent the σ, σ^*, π and π^* – MO's. Discuss their physical interpretation.

17. Compare and contrast the simple harmonic oscillator and the anharmonic oscillator.

18. Discuss the condition in which two vibrational modes can couple. What are the consequences of this coupling? Illustrate with an example.

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

20. Explain the term chemical shift. How is it expressed?

21. How will you distinguish between 1-chloropropane and 2-chloropropane using the NMR spectroscopy.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. List and describe the significance of the quantum numbers needed to specify the internal state of a hydrogenic atom.

23. Discuss the solution of the Schrodinger wave equation for the hydrogen molecule-ion. Obtain expressions for the normalized MO wavefunctions and the probability density, and pictorially represent them.

24. (a) Arrive at expressions for (a) moment of inertia and (b) rotational energy of a rigid diatomic molecule.

(b) Evaluate the rotational constant of 2HCl (masses of 2H and Cl are 2.0141 mu and 34.969 mu, respectively)

25. Discuss the basic principles of the Raman spectroscopy, and summarise its important applications.

(2×10=20)