SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U CHE2 B02 - THEORETICAL AND INORGANIC CHEMISTRY - II

(Chemistry - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours   Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Classical electromagnetic wave theory of light failed to explain black body spectra. Why?

2. What are the values of m and n in Rydberg formula for Balmer series of hydrogen spectra?

3. What is Bohrs frequency rule?

4. Write the time independent Schrodinger wave equation and explain the terms. When are they used?

5. Find the eigen value for wave function $\Psi = 3e^{3x}$; for the operator d/dx

6. Write the Schrodinger equation for electron in hydrogen atom in terms of laplacian polar coordinates.

7. Draw the radial probability distribution curve of 2s orbital.

8. What is Born-Oppenheimer approximation?

9. State variation theorem.

10. Write down Hamiltonian for H_2 molecule.

11. How does the MO theory explain the paramagnetism of O_2?

12. Calculate bond order of He^{2+} ion.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. Write Planck's radiation law and explain the terms involved.

14. If $A = 3x^2$ and $B = d/dx$; show that A and B do not commute.

15. Explain the quantum mechanical formalism of Heisenbergs Uncertainity principle.

16. State the Aufbau principle. What is the Aufbau order of energy levels?

17. What is LCAO principle?

18. Give three differences between bonding and antibonding molecular orbitals.

19. What is geometry of SF_6 molecule? How does the concept of hybridization explain geometry?

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

20. a) State and explain the de Broglie relation.
    b) Discuss the dual nature of electrons.
    c) What must be the velocity of a beam of electrons if they are to display a de Broglie wavelength of 10 nm?

21. Derive the wave function for a particle moving in one dimensional box of length a (Potential energy is zero within the box and on boundaries). Briefly explain one application of the particle in one dimensional box.

(1 × 10 = 10 Marks)

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