23U207 (Pages: 2) Name: .....

Reg.No: .....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

(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 : 2

Part A (Short answer questions)

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

1. How did Einstein extend Plank's quantum theory?
2. 'Bohr theory failed to explain the fine atomic spectrum of hydrogen' Why?
3. What evidence supports the wave particle dual nature of electrons?
4. Find $(\hat{A} + \hat{B})f(x)$ if $\hat{A} = d/dx$; $\hat{B} = x$ and $f(x) = x^2$.
5. Determine the uncertainty in the velocity of a moving bullet of mass 10g whose uncertainty in position is 1.0×10^{-8} m.
6. When is a wave function said to be normalized?
7. Write the electronic configurations of the elements with atomic numbers 17 and 25.
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. Arrange the following in the decreasing order bond length, NO, NO^- or NO^+.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

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

13. Rydberg equation can be considered as a special case of Ritz combination principle. Explain.
14. Write the time dependent and time independent Schrodinger equation and explain the instances they are used.

15. Porphyrin can be considered as a planar molecule and can be approximated to be a square of side length 10 A. which has 26 pi electrons. Which will be the first transition of electron (from which level)?

16. Explain the physical significance of quantum numbers n, l, m and s.

17. What is LCAO principle?

18. Make comparison of of VB and MO theories.

19. Discuss shape of H_3O^+ ion on the basis of hybridization.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. Explain blackbody radiation and black body spectrum. Why classical Electromagnetic theory failed to explain black body spectrum?

21. a) What are quantum numbers?
    b) Discuss the significance of each quantum number.

(1 × 10 = 10 Marks)

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