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Name...

Reg. No....................................

SECOND SEMESTER (CBCSS–UG) DEGREE EXAMINATION, APRIL 2022

Chemistry

CHE 2B 02—THEORETICAL AND INORGANIC CHEMISTRY—II

(2019—2020 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answers)

Answer questions up to 20 marks.
Each question carries 2 marks.

1. What type of metals are used in photoelectric cells ? Give an example.

2. State de Broglie's relation and explain terms in it.

3. Give any three limitations of Bohr Theory.

4. Explain term Hermitian operator.

5. Give time dependent Schrodinger wave equation.

6. Draw radial probability distribution curve of 2s orbitals.

7. Explain term bond order. Mow is bond order related to bond strength?

8. Draw molecular orbital diagram of He_2^+ and calculate bond order.

9. What is the change in hybridization when : (i) NH_3 changes to NH_4^+ ; and (ii) BF_3 to BE_4^-.

10. Write any two qualities of hybrid orbitals.

11. Write the shape and hybridization of PCl_5 molecule.

12. Hybrid orbitals are stronger than that from a pure orbital. Explain.

Section B (Paragraph)

Answer questions up to 30 marks.
Each question carries 5 marks.

13. Calculate K. E of electron emitted from surface of potassium metal by light of wavelength 3000 Å. The threshold frequency of potassium is $5 \times 10^{14} S^{-1}$ and $h = 6.626 \times 10^{-34} Js$.

14. Discuss how Bohr Theory explains formation of line spectrum of hydrogen atom.

15. A particle is confined in a 3D box with sides a = b = 1.5c. : (a) Write expression for wave function and energy ; and (b) Predict the degeneracy of first four energy levels.

Turn over

16. What are Laplacian and Hamiltonian operators ?

17. Describe LCAO method for constructing molecular orbitals. Sketch molecular orbitals formed by combination of two *s* orbitals and two *p* orbitals.

18. Mention features that distinguish bonding and antibonding molecular orbitals.

19. Explain orbital hybridization on basis of quantum mechanical principles.

Section C (Essay)

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

20. Discuss briefly concept of particle in ID box. Using Schrödinger equation predicts its energy and wave function.

21. (a) Compare valence band theory and molecular orbital theory.

    (b) Draw molecular orbital diagram of NO and calculate B.O.

$(1 \times 10 = 10$ marks)