D 103739 **(Pages : 2)** **Name.....**

Reg. No.....

SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2024

Chemistry

CHE 2B 02—THEORETICAL AND INORGANIC CHEMISTRY—II

(2019—2023 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A (Short Answers)

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

1. Derive the de Broglie equation.
2. State and explain Einstein's photoelectric equation.
3. Write any *four* demerits of Bohr's theory of the atom.
4. How are matter waves different from electromagnetic waves ?
5. What is blackbody radiation ?
6. What is meant by a well-behaved wave function ?
7. Write the values of all four quantum numbers *n, l, m* and *s* for the two electrons present in the 2*s* orbital of nitrogen atom.
8. Explain the term Hermitian operator.
9. What is Born-Oppenheimer approximation ?
10. What are antibonding molecular orbitals ?
11. Predict the hybridization and geometry of PCl_5 and IF_7.
12. Write the co-efficients of the atomic orbitals involved in *sp* hybridization.

(Ceiling of marks : 20)

Turn over

Section B (Paragraph)

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

13. The kinetic energy of a moving electron is 4.55×10^{-25} Joules. Calculate its wave length.
14. Discuss the atomic spectra of hydrogen using Bohr's model.
15. Compare the radial distribution plots of 1*s*, 2*s* and 2*p* orbitals.
16. Give the postulates of quantum mechanics.
17. Draw the MO diagram of CO molecule. Calculate the bond order and explain its magnetic behaviour.
18. Describe the LCAO method of constructing molecular orbitals. Illustrate the combination of *s*-*s* and *p*-*p* orbitals.
19. Discuss the salient features of hybridization.

(Ceiling of marks : 30)

Section C (Essay)

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

20. Give the complete solution of particle in a one-dimensional box.
21. Compare VB and MO theories of chemical bonding.

(1 × 10 = 10 marks)