

C 43159

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Name.....

Reg. No.....

**SECOND SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2023**

Chemistry

CHE 2B 02—THEORETICAL AND INORGANIC CHEMISTRY—II

(2019—2022 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answers)*Answer any questions up to 20 marks.**Each question carries 2 marks.*

1. State Heisenberg uncertainty principle.
2. What is the work function for photo electric effect ?
3. Derive de Broglie's relationship.
4. Write the Rydberg relation for hydrogen spectrum. Calculate the wave number of second line in Baimmer series.
5. Write any *four* postulates of Bohr model of hydrogen atom.
6. What are eigen functions and eigen values ?
7. Write the Schrodinger wave equation of hydrogen atom using spherical polar co-ordinates.
8. Draw the potential energy diagram for H₂ molecule formation.
9. What is Hamiltonian operator ?
10. Calculate the bond order of N₂ molecule.
11. What is Hybridization ?
12. Draw the shapes of PCl₅ and IF₇ molecules.

[Ceiling of marks: 20]

Turn over

Section B (Paragraph)

Answer questions up to 30 marks.

Each question carries 5 marks.

13. Draw the molecular orbital diagram of CO molecule. Calculate its bond order ?
14. Define LCAO of central atom. Explain sp hybridization of BeH_2 and sp^2 hybridization of BH_3 using LCAO approximation.
15. Derive an expression for energy for a particle in a one dimensional box.
16. What is Born Oppenheimer approximation ? What is its significance ?
17. Briefly describe the importance of variation theorem in quantum mechanics.
18. Describe Stern-Gerlach experiment. What is its significance in determining atomic structure ?
19. Derive the expression to determine Bohr radius and energy of electron in the K shell ($n = 1$) of hydrogen atom.

[Ceiling of marks : 30]

Section C (Essay)

*Answer any **one** question.*

The question carries 10 marks.

20. Write the postulates of quantum mechanics. Derive time independent Schrodinger wave equation for particle in one dimensional box. Draw the radial probability distribution curves of $1s$, $2s$ and $2p$ orbitals.
21. What is quantum mechanical concept of chemical bonding ? Explain bonding in following species
 - (a) H_2 molecule using VB theory.
 - (b) H_2^+ ion using MO theory.

(1 × 10 = 10 marks)