C 81768 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2020

Chemistry

CHE 2B 02—THEORETICAL AND INORGANIC CHEMISTRY–II

Time : Three Hours Maximum : 80 Marks

Section A (One word)

Answer **all** *questions.*

Each question carries 1 *mark.*

1. Give an example of a linear operator.
2. Write the electronic configuration of Cr^{3+}.
3. Arrange the following elements in the increasing order of their ionization energy :

   Li, Be, B, C
4. The most electronegative element among Group 16 elements is ————.
5. Sketch the d_z^2 orbital
6. The number of valence electrons in BeF_2 is ————.
7. The hybridization of NH_4+ is ————.
8. Which among the following is polar : CO_2, CO, BF_3 ?
9. What is the bond order of H_2^+ ion ?
10. The 4s orbital has ———— number of nodes.

(10 × 1 = 10 marks)

Section B (Short answers)

Answer any **ten** *questions.*

Each question carries 2 *marks.*

11. What is meant by a well-behaved function ?
12. Represent radial distribution function of 2s and 2p orbitals.
13. What are Laplacian operators ? Give an example.
14. Define electron gain enthalpy. Arrange Cl, Br, F, I in the increasing order of electron gain enthalpy.
15. What is diagonal relationship ? Give an example.
16. State Born-Lande equation and explain the terms.

Turn over

17. Write any four properties of ionic compounds.
18. Explain the shape of XeF_2 based on VSEPR.
19. How is percentage of ionic character calculated ?
20. Represent the resonance structure of NO_3^-
21. Compare bonding and anti-bonding orbitals.
22. He_2 molecule does not exist. Why ?

(10 × 2 = 20 marks)

Section C (Paragraph)

Answer any **five** *questions.*
Each question carries 6 *marks.*

23. State the postulates of quantum mechanics.
24. Write the Schrödinger wave equation in spherical co-ordinates and explain the terms.
25. Explain Pauling's scale of electronegativity.
26. How elements are divided into s, p, d and f blocks in the periodic table ?
27. State Slaters rule. Mention its applications.
28. Represent Born-Haber cycle of the formation of an ionic compound. Give its significance.
29. Write briefly on band theory of metallic bonding.
30. Distinguish between inter and intramolecular hydrogen bonding taking suitable examples.

(5 × 6 = 30 marks)

Section D (Essays)

Answer any **two** *questions.*
Each question carries 10 *marks.*

31. Apply time independent Schrödinger wave equation to a particle in a one-dimensional box.
32. a) What are quantum numbers ? Explain the significance of each.
    b) State Fajan's rules. Explain its applications.
33. a) What is hybridization ? Explain the geometry of PCl_5 and IF_7 based on hybridization.
    b) Enumerate the limitations of Valence Bond Theory.
34. Draw the MO level diagram of O_2 and O_2^{2-} and compare their bond energy and magnetic property.

(2 × 10 = 20 marks)