

**SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2018**

(CUCBCSS-UG)

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. The radial probability is \_\_\_\_\_ at the nucleus.
2. The Laplacian operator,  $\nabla^2 =$  \_\_\_\_\_.
3. The second ionization energy is \_\_\_\_\_ than the first ionization energy.
4. Electron gain enthalpies of noble gases are \_\_\_\_\_.
5. The Born-Landé equation is \_\_\_\_\_.
6. The geometry of  $\text{NH}_3$  is \_\_\_\_\_.
7. The ionic crystal will dissolve only when the solvation energy overcomes the \_\_\_\_\_.
8. If all the electrons in a molecule are paired, the substance is \_\_\_\_\_.
9. The higher the bond order, \_\_\_\_\_ is the bond.
10. In aqueous solution,  $\text{HF}$  dissociates to form \_\_\_\_\_ ion.

(10 × 1 = 10 marks)

**Section B (Short Answer)***Answer any ten questions.**Each question carries 2 marks.*

11. What is meant by well-behaved wave function?
12. The atomic orbital 2s exists, but 2d does not. Explain why?
13. What is meant by eigen function and eigen value of an operator?
14. Electron gain enthalpy of Fluorine is lower than that of Chlorine. Justify.
15. The size of  $\text{Cl}^-$  is greater than that of Cl, while that of  $\text{Na}^+$  is less than that of Na atom. Give reason.

16. State Fajans rules.
17. What are the factors favouring the formation of ionic bond?
18. In  $\text{PCl}_5$  axial bonds are longer than that of equatorial bonds. Explain.
19. The dipole moment of  $\text{CO}_2$  is zero, while that of water is 1.84 D. Why?
20. Compare the bond energy of NO molecule,  $\text{NO}^+$  ion and  $\text{NO}^-$  ion.
21. Why ortho nitrophenol is more volatile than para nitrophenol?
22. Differentiate Bonding and Anti bonding molecular orbitals.

(10 × 2 = 20 marks)

### Section C (Paragraph)

Answer any five questions.

Each question carries 6 marks.

23. Briefly describe the postulates of quantum mechanics.
24. Write a note on quantum numbers and their significance.
25. Sketch the radial probability distribution curves for 2s, 3p and 3d orbitals. Explain.
26. Briefly describe Slater's rule and its applications.
27. Compare the properties of ionic and covalent compounds?
28. Discuss the hybridization and structure of  $\text{XeF}_6$ .
29. Draw and explain molecular orbital diagram of  $\text{B}_2$  molecule.
30. Write briefly on different types of induction and dispersion forces.

(5 × 6 = 30 marks)

### Section D (Essays)

Answer any two questions.

Each question carries 10 marks.

31. Set up and solve the Schrödinger wave equation for a particle in a three dimension box and get expression for the wave function and energy.
32. (i) Describe the different electronegativity scales.  
(ii) How does ionization energy of elements vary along a period and down a Group. Give reason.
33. Write a note on Born-Haber cycle and its application.
34. Describe the theories of metallic bond. How is the metallic properties explained, based on the theories?

(2 × 10 = 20 marks)