

C 21781

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Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS-UG) DEGREE EXAMINATION, APRIL 2022

Chemistry

CHE 2B 02—THEORETICAL AND INORGANIC CHEMISTRY—II

(2016—2018 Admissions)

Time : Three Hours

Maximum : 80 Marks

Section A (One word)*Answer all questions.**Each question carries 1 mark.*

1. Write the eigen value equation.
2. Give the expression for the Hamiltonian operator for a particle in a three-dimensional box.
3. Which rule is violated if the electronic configuration of an element is written as $1s^2 2s^3$?
4. The number of periods in modern periodic table is _____.
5. Arrange the following in the increasing order of their size : O^{2-} , F^- , Ne, Na^+ .
6. Sketch the d_{xy} orbital.
7. The number of valence electrons in PF_5 is _____.
8. The shape of IF_7 is :
9. Which of the following is paramagnetic : B_2 or C_2 ?
10. Give an example of ion-induced dipole interaction.

(10 × 1 = 10 marks)

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

11. What is the condition for an operator to be Hermitian ?
12. State Hund's exclusion principle.
13. Write the Schrödinger wave equation and explain the terms.

Turn over

14. What is electronegativity ? Which element has second highest electronegativity ?
15. Why the first element in a group shows anomalous properties ?
16. Give any two applications of Born-Haber cycle.
17. What is meant by solvation enthalpy ? Give its significance.
18. Illustrate the formation of a co-ordinate bond.
19. Explain the origin of polarity of covalent bond.
20. Draw the resonance structures of BO_3^{3-} .
21. Which of the following has greater bond length : O_2 or O_2^+ ? Give reason.
22. What are inter and intra molecular hydrogen bonding ? Give examples.

(10 × 2 = 20 marks)

Section C (Paragraph)

Answer any **five** questions.

Each question carries 6 marks.

23. State the postulates of Quantum Mechanics.
24. Draw and explain the radial distribution curves of 1s, 2s and 2p orbitals.
25. Give an account of Pauling's and Mullikan scale of electronegativity.
26. Explain the factors that affect ionization enthalpy. How it varies along a period and group ?
27. State Fajan's rule and explain its applications.
28. Write the postulates of VSEPR theory and apply it to predict the shapes of CCl_4 , NH_3 and H_2O .
29. Draw the MO level diagram of CO and explain its properties.
30. Explain the metallic properties of metals based on valence bond theory.

(5 × 6 = 30 marks)

Section D (Essay)

Answer any **two** questions.

Each question carries 10 marks.

31. Apply Schrödinger equation to hydrogen atom and obtain solutions.

32. a) What are quantum numbers ? Discuss the significance of each.
b) State Slater's rules. Explain its applications.
33. a) Explain the Born-Haber cycle of NaCl and mention its applications.
b) Explain the shape of H_3O^+ and C_2H_4 .
34. Write notes on : i) Ion-dipole ; ii) Dipole-dipole ; iii) Ion-induced dipole and induced dipole-induced dipole interactions.

(2 × 10 = 20 marks)