LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – **NOVEMBER 2023**

UCH 1501 – BASIC CONCEPTS IN INORGANIC CHEMISTRY

Date: 01-11-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

Part-A

Answer ALL questions. **(10 × 2 = 20)**

1. What do you mean by inert-pair effect?
2. Mention the significance of de Broglie equation.
3. Find the oxidation number of P in NaH_2PO_4.
4. State Usanovich definition of acids and bases.
5. State octet rule and its exceptions.
6. Draw the electron-dot-structure of CCl_4 and CO_2.
7. Why does He_2 not exist?
8. What are superconductors?
9. Draw the structure of dichlorine monoxide.
10. What are pseudohalogens? Give an example.

Part-B

Answer any EIGHT questions. **(8 × 5 = 40)**

11. Discuss the horizontal and vertical relationships in the periodic table.
12. Illustrate the postulates of Bohr's theory.
13. Discuss Mulliken-Jaffee concept of electronegativity.
14. Explain Lewis theory of acids and bases with examples.
15. Classify the non-aqueous solvents and mention the use of sodium in liquid ammonia.
16. Explain Pearson's concept of hard and soft acids. Cite a few examples.
17. Illustrate the hybridization and geometry of PCl_5 and XeF_4 using VSEPR theory.
18. State Sidgwick-Powell theory and explain its role in the prediction of molecular shapes.
19. Construct a qualitative MO energy level diagram for O_2 molecule. Write the MO electronic configuration and bond order for O_2 and O_2^+molecules.
20. Fluorine molecule is diamagnetic whereas oxygen molecule is paramagnetic. Explain.
21. Write a note on interhalogen compounds of iodine.
22. Write the preparation, properties, and structure of dioxygen difluoride.

Part-C

Answer any FOUR questions. **(4 × 10 = 40)**

23. Explain the following

    i) Aufbau principle

    ii) Pauli's exclusion principle

    iii) Hund's rule.

24. Discuss the following reactions in liquid ammonia as a solvent

    i) Acid-base reaction ii) Ammonolysis iii) Precipitation iv) Complex formation

25. Balance the following redox reactions by oxidation number method.

    i) $H_2O_2 + Cr_2O_7^{2-}{}_{(aq)} \rightarrow O_{2(g)} + Cr^{3+}{}_{(aq)}$ (*Acidic medium*)

    ii) $MnO_4^- + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2$ (*Acidic medium*)

26a. Explain the hybridization and geometry of ICl_2^- and CO_3^{2-}.

b. Methane and ammonia are sp^3 hybridized. But bond angles are 109° and 107°, respectively. Explain. (5+5)

27a. Draw the M.O. diagram of carbon monoxide and write its bond order.

b. Compare and contrast valence bond and molecular orbital theories. (5+5)

28a. Write a note on the anomalous behavior of fluorine.

b. Explain a method of estimating the amount of chlorine present in bleaching powder. (5+5)

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