LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **APRIL 2023**

16/17/18UCH1MC01 – BASIC CONCEPTS IN INORGANIC CHEMISTRY

Date: 06-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

Part-A

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

1. Comment on the dual nature of electron.
2. State periodic law.
3. Mention the oxidation number of manganese in potassium permanganate.
4. What are protic and aprotic solvents?
5. State octet rule.
6. Draw the electron-dot-structure of H_2O and NH_3.
7. Why does He_2 not exist?
8. State Meissner effect.
9. Draw the structure of BrF_5.
10. What are pseudohalogens?

Part-B

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

11. Account for the following:

    (a) Ionization energy decreases down a group and increases across a period, whereas atomic radius increases down a group and decreases across a period.

    (b) Removal of first electron from magnesium is difficult whereas the removal of second electron is much easier.
12. Explain the postulates of Bohr's theory.
13. Discuss Mulliken-Jaffe concept of electronegativity.
14. Explain Bronsted-Lowry theory of acids and bases with examples.
15. Illustrate the Pearson's concept of hard and soft acids with examples.
16. State Sidgwick-Powell theory and explain its role in the prediction of molecular shapes.
17. What are the postulates of valence bond theory?
18. Construct a qualitative MO energy level diagram for O_2. Write the MO electronic configuration for O_2^{2+-}.

19. How does band theory of metals explain the conducting property of metals, insulators and semiconductors?

20. Nitrogen molecule is diamagnetic while oxygen molecule is paramagnetic. Explain on the basis of MO diagram.

21. Discuss the anomalous behavior of fluorine in group-17.

22. Write a note on interhalogen compounds of iodine.

Part-C

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

23a. Explain the trends of the following in a period and group.

i) Electron affinity ii) Electronegativity

b. What is meant by isoelectronic species? Arrange the following ions in the order of increasing size and justify your answer. Cl^-, Na^+, Mg^{2+}, Ca^{2+}, S^{2-} and K^+. **(5+5)**

24. Discuss the following in liquid ammonia as solvent. **(4 x 2.5)**

i) Acid-base reaction ii) Ammonolysis

iii) Complex formation iv) Alkali metals

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

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

$Cr_2O_7^{2-}{}_{(aq)} + SO_{2\,(g)} \rightarrow Cr^{3+}{}_{(aq)} + SO_4^{2-}{}_{(aq)}$

26. Explain the hybridization and geometry of the following compounds using VSEPR theory. **(4 x 2.5)**

i) SF_6 ii) $PbCl_2$ iii) BrF_5 iv) PCl_3

27a. Distinguish *n*- and *p*-type semiconductors.

b. Illustrate the piezo- and pyroelectric crystals. **(5+5)**

28a. Write the preparation, properties, and structure of dioxygen difluoride.

b. Write a note on oxidation state and strength of oxoacids of halogens. **(6+4)**

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