

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**B.Sc. DEGREE EXAMINATION – CHEMISTRY**FIRST SEMESTER – **APRIL 2022****UCH 1501 – BASIC CONCEPTS IN INORGANIC CHEMISTRY****(21 BATCH ONLY)**

Date: 15-06-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION - A**Answer ALL the Questions**

- 1. Define the following. (5 x 1 = 5 Marks)**
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|-------------------------------|----|-----|
| a) Isoelectronic species. | K1 | CO1 |
| b) Conjugate acid-base pairs. | K1 | CO1 |
| c) Octet rule. | K1 | CO1 |
| d) p-n Junction. | K1 | CO1 |
| e) Pseudohalogens. | K1 | CO1 |
- 2. Fill in the blanks. (5 x 1 = 5 Marks)**
- | | | |
|---|----|-----|
| a) Lithium and _____ are diagonally placed in the periodic table. | K1 | CO1 |
| b) Oxidation number of Mn in KMnO_4 is _____. | K1 | CO1 |
| c) The geometry of SnCl_2 is _____. | K1 | CO1 |
| d) N_2^+ is _____ magnetic in nature. | K1 | CO1 |
| e) The molecular formula of perchloric acid is _____. | K1 | CO1 |
- 3. Match the following. (5 x 1 = 5 Marks)**
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|-----------------------------|---|-----------------|----|-----|
| a) Dual nature of electron | – | Cyanide | K2 | CO1 |
| b) Lux-Flood base | – | Not exist | K2 | CO1 |
| c) Na in liq. NH_3 | – | de Broglie | K2 | CO1 |
| d) He_2 molecule | – | Oxide ion donor | K2 | CO1 |
| e) Pseudohalogen | – | Reducing agent | K2 | CO1 |
- 4. TRUE or FALSE (5 x 1 = 5 Marks)**
- | | | |
|---|----|-----|
| a) The actual outermost electronic configuration of Cu is $4s^2 3d^9$. | K2 | CO1 |
| b) Liquid ammonia is a protic solvent. | K2 | CO1 |
| c) The bond angle in octahedral geometry is 120° . | K2 | CO1 |
| d) Boron is used as a doping element in semiconductors. | K2 | CO1 |
| e) HF cannot be stored in glass bottles. | K2 | CO1 |

SECTION - B**Answer any TWO of the following in 100 words (2 x 10 = 20 Marks)**

- 5.** a) Explain the postulates of Bohr's theory. K3 CO2
 b) Discuss Mulliken-Jaffee concept of electronegativity.
- 6.** a) Explain Lewis theory of acids and bases with examples. K3 CO2
 b) Illustrate the Pearson's concept of hard and soft acids. Give examples.
- 7.** a) Explain the hybridization and geometry of H_2O and BeCl_2 . K3 CO2
 b) Compare VB and MO theories of covalent bond.
- 8.** a) Write the preparation, properties, and structure of dioxygen difluoride. K3 CO2
 b) Write a note on the strength and hybridisation of halous, halic and perhalic acids.

SECTION C

Answer any TWO of the following in 100 words

(2 x 10 = 20 Marks)

9. a) Illustrate the horizontal and vertical relationships in periodic table. K4 CO3
b) Account for the following:
i) ionization energy decrease down a group and increases across a period, whereas atomic radii increase down a group and decrease across a period.
ii) the removal of first electron from magnesium is difficult whereas the removal of second electron is much easier.
10. a) Write a note on disproportionation and double decomposition reactions. K4 CO3
b) Discuss the role of liquid ammonia as a solvent.
11. a) State Sidgwick-Powell theory and explain its role in the prediction of molecular shapes. K4 CO3
b) Fluorine is diamagnetic whereas oxygen molecule is paramagnetic. Explain.
12. a) Write a note on interhalogen compounds of iodine. K4 CO3
b) Explain the nature of conductors, insulators and semiconductors using band theory.

SECTION D

Answer any ONE of the following in 150 words

(1 x 20 = 20 Marks)

13. a) Illustrate the Pauling scale of electronegativity. K5 CO4
b) Comment on the anomalous behaviour of fluorine.
c) Balance the following redox reactions by oxidation number method.
(i) $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} \rightarrow \text{Mn}^{2+} + \text{CO}_2$ (acidic medium)
(ii) $\text{K}_2\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{SO}_2(\text{g}) \rightarrow \text{Cr}^{3+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$
14. a) Explain in detail about the hybridization and geometry of the following compounds using VSEPR theory. K5 CO4
i) SF_4 ii) PCl_3 iii) ClF_3 iv) ICl_4^- v) Cl_2O
b) Construct a qualitative MO energy level diagram for O_2 molecule. Write the MO electronic configuration and bond order for O_2 , O_2^+ , O_2^{2+} , O_2^- , O_2^{2-} molecules.

SECTION E

Answer any ONE of the following in 150 words

(1 x 20 = 20 Marks)

15. a) State and explain Pauling-Slater's rule. K6 CO5
b) Methane, ammonia and water are sp^3 hybridised. But bond angles are 109° , 107° & 104° respectively—explain.
c) Discuss the following reactions in liquid ammonia as solvent
i) Acid-base reaction ii) Ammonolysis iii) Precipitation iv) Complex formation
16. a) Construct the molecular orbital energy diagram for CO and NO molecules and calculate the bond order. K6 CO5
b) How is bleaching powder prepared? Explain a method of estimating the amount of chlorine present in bleaching powder.

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