

8691/MH

CS-2057
INORGANIC CHEMISTRY-I
(Common for B.Sc., B.Sc. Biotech.)
(Semester-VI)

Time Allowed : 3 Hours]**[Maximum Marks : 26**

Note :- Candidates are required to attempt five questions in all selecting two questions each from Section A and B while Q.No. IX of Section C is compulsory.

SECTION-A

- I. (a) Define HSAB Principle. Discuss the applications of hard-soft acid-base principle. 2
- (b) $[\text{AgI}_2]^-$ is stable but $[\text{AgF}_2]^-$ is unstable. Why? 1
- (c) Classify the following into hard, soft and borderline acids and bases : 1
- $\text{I}^-, \text{CO}, \text{Ni}^{2+}, \text{CO}_2, \text{Ag}^+, \text{NH}_4^+, \text{SO}_3^{2-}, \text{BH}_3, \text{H}_2\text{O}, \text{NO}_3^-$
- II. (a) How electro-negativity can be used to explain hardness and softness of acids and bases? 2
- (b) Draw stepwise structural arrangement observed in associative mechanism in square-planar substitution. 2

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| III. | (a) | Compare roles of Ca^{2+} and Zn^{2+} at the active sites of enzymes. In what ways is Ca^{2+} advantageous over alkali metal ions ? | 2 |
| | (b) | Explain Cooperativity in haemoglobin. Discuss its mechanism. | 2 |
| IV. | (a) | What is meant by Nitrogen fixation ? What are the main fundamental requirements of biological N_2 fixation ? | 2.5 |
| | (b) | What is Bohr effect ? Explain with the help of graph. | 1.5 |

SECTION-B

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| V. | (a) | What are Silicones ? How are cross-linked silicones prepared ? Give two important applications of silicones. | 2 |
| | (b) | Discuss the general features of $d\pi - p\pi$ model for bonding in $(\text{NPCL}_2)_3$. | 2 |
| VI. | (a) | What are homomorphous and heteromorphous π -systems ? Explain. | 2 |
| | (b) | Write a brief account of (i) Silicone oils, (ii) Silicone rubbers, and (iii) Silicone resins. | 2 |
| VII. | (a) | What happens when one of the Ph_3P ligand in Wilkinson catalyst is replaced by Me_3P in the hydrogenation of olefins ? | 2 |
| | (b) | Classify bonding in organometallic compounds. Give examples of each type. | 2 |

- VIII. (a) Describe bonding in metal carbonyls. How does IR spectroscopy help in explaining bonding in metal carbonyls ? 2
- (b) Write IUPAC names of the following : 2
- (i) $\text{Zn}(\text{C}_2\text{H}_5)_2$
- (ii) $\text{CH}_3-\text{SnH}_2\text{Cl}$
- (iii) $\text{Fe}(\eta^5-\text{C}_5\text{H}_5)_2$
- (iv) $\text{Mn}[(\eta^3-\text{C}_6\text{H}_5)(\text{CO})_4]$.

SECTION-C (Compulsory Question)

- IX. (a) What is Symbiosis ? Discuss theoretical basis of hardness and softness.
- (b) What is Porphyrin ? Draw the structure of Heme.
- (c) Write a brief account of $\text{Na}^+ - \text{K}^+$ pump.
- (d) Why do polyphosphazenes chain prefer a cis-trans conformation to a trans-trans conformation ?
- (e) N_2 is isoelectronic with Co, yet it is a poor σ -donor compared to Co. Explain. (5x2=10)