

**M.Sc. CHEMISTRY**  
**Third Semester (Repeat)**  
**INORGANIC CHEMISTRY-III**  
**(MSC - 302)**

**Duration: 3Hrs.**

**Full Marks: 70**

Part-A (Objective) =20  
Part-B (Descriptive) =50

**(PART-B: Descriptive)**

**Duration: 2 hrs. 40 mins.**

**Marks: 50**

**Answer any four from Question no. 2 to 7**  
**Question no. 1 is compulsory.**

1. What is vitamin B<sub>12</sub>? Draw the structure of 5'- deoxyadenosylcobamin and give an account of its structural aspects. (1+5+4=10)
2. (a) Explain the Toxicity of organo-mercuric compounds.  
(b) Write briefly about hydroformylation reaction with RhH(CO)(PPh<sub>3</sub>)<sub>3</sub>. (5×2=10)
3. Describe the preparation, reactivity and bonding in Metal Carbene complexes. (3+3+4=10)
4. (a) Explain the interaction between the heme and dioxygen.  
(b) Write the mechanism of oxygen transport and co-operativity. (5×2=10)
5. (a) Explain the structure of (LiCH<sub>3</sub>)<sub>4</sub>.  
(b) Explain the preparation and use of Organo-silicon compounds. (5×2=10)
6. (a) What are the theories of trans effect?  
(b) Explain outer sphere and inner sphere mechanism using examples.  
(c) Write the mechanism for acid hydrolysis of octahedral complexes. (3+4+3=10)



7. (a) Explain Rutile structure and perovskite structure with examples.

(b) A compound formed by element A and B has a cubic structure in which A atoms are at the corners of the cube and B atoms are the face centres. Derive the formula of the compound.

(c) CsCl has cubic structure. Its density is  $3.99\text{g/cm}^3$ . What is the distance between  $\text{Cs}^+$  and  $\text{Cl}^-$  ions? (At. Mass of Cs= 133)

(d) What are the electrical properties of solids?

(4+2+2+2=10)

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Duration: 20 minutes

Marks – 20

(PART A - Objective Type)

I. Choose the correct answer:

1×20=20

- The difference in the corrin ring and the porphyrin ring is the missing of one-  
(a) = C = group (b) ≡ C – group  
(c) = CH – group (d) = CH<sub>2</sub> group
- Calcium fluoride crystallizes in fluorite structure. The coordination number for the cation and anion respectively-  
(a) 6,6 (b) 6,4 (c) 4,6 (d) 8,4
- In the CsCl structure, the number of ions in a unit cell is-  
(a) 2 (b) 4 (c) 6 (d) 8
- Out of the following cyclopentadiene compounds, oxidation occurs very easily in case of-  
(a)  $(\eta^5\text{-C}_5\text{H}_5)_2\text{Fe}$  (b)  $(\eta^5\text{-C}_5\text{H}_5)_2\text{Co}$   
(c)  $(\eta^5\text{-C}_5\text{H}_5)_2\text{Ru}$  (d)  $(\eta^5\text{-C}_5\text{H}_5)_2\text{Co}^+$
- Zinc selenide crystallizes in zinc blende structure. The number of Zn and Se present in its unit cell are-  
(a) 8 (b) 6 (c) 4 (d) 12
- Out of the following compounds which compound has only  $\sigma$ -bonded ligands?  
(a)  $\text{W}(\text{CH}_3)_6$  (b)  $(\eta^5\text{-C}_5\text{H}_5)_2\text{Fe}$   
(c)  $\text{K}[\text{PtCl}_3(\text{C}_2\text{H}_4)]$  (d)  $(\text{CO})_5\text{W}(\text{R})(\text{OMe})$
- The correct order of following carbonyl compounds according to decreasing  $\nu_{\text{CO}}$  stretching frequency is-  
(a)  $\text{Mn}(\text{CO})_6^+ > \text{Cr}(\text{CO})_6 > \text{Crdien}(\text{CO})_3 > \text{V}(\text{CO})_6^-$   
(b)  $\text{Crdien}(\text{CO})_3 > \text{Cr}(\text{CO})_6 > \text{V}(\text{CO})_6^- > \text{Mn}(\text{CO})_6^+$   
(c)  $\text{Cr}(\text{CO})_6 > \text{V}(\text{CO})_6^- > \text{Mn}(\text{CO})_6^+ > \text{Crdien}(\text{CO})_3$   
(d)  $\text{V}(\text{CO})_6^- > \text{Mn}(\text{CO})_6^+ > \text{Crdien}(\text{CO})_3 > \text{Cr}(\text{CO})_6$
- In Hemocyanins the O<sub>2</sub> is in the-  
(a) O<sub>2</sub><sup>+</sup> state (b) O<sub>2</sub><sup>-</sup> state  
(c) O<sub>2</sub><sup>2-</sup> state (d) None of the above
- The replacement of Co by Rh metal catalysts resulted in development of hydrogenation process at-  
(a) lower temperature and higher pressure (b) lower temperature and lower pressure  
(c) higher temperature and higher pressure (d) higher temperature and lower pressure

- The release of alkane in  $\beta$ -Hydrogen transfer reaction is-  
(a) An elimination process (b) A reductive process  
(c) A Reductive elimination process (d) An Oxidative elimination process
- Multicenter bonds are formed by nontransition elements with organic ligands when-  
(a) valence shell of M is less than half filled and the M<sup>n+</sup> cation is strongly polarizing.  
(b) valence shell of M is less than half filled and the M<sup>n+</sup> cation is strongly non-polarizing.  
(c) valence shell of M is more than half filled and the M<sup>n+</sup> cation is strongly polarizing.  
(d) valence shell of M is more than half filled and the M<sup>n+</sup> cation is strongly non-polarizing.
- The organometallic compounds of nontransition compounds are hydrolysed by water and facilitated by  
(a) the presence of empty orbitals on the metal and the non-polarity of M-C bond.  
(b) the absence of empty orbitals on the metal and the non-polarity of M-C bond.  
(c) the absence of empty orbitals on the metal and the polarity of M-C bond.  
(d) the presence of empty orbitals on the metal and the polarity of M-C bond.
- The co-ordination number of the Ba<sup>2+</sup> ions in barium fluorides is 8. The co-ordination number of the fluoride ion is  
(a) 8 (b) 4 (c) 1 (d) 2
- Tick the correct statement.  
(a) Alkylboranes are not hydrolysed by water but are pyrophoric.  
(b) Alkylboranes are hydrolysed by water and are pyrophoric.  
(c) Alkylboranes are not hydrolysed by water and are not pyrophoric.  
(d) Alkylboranes are hydrolysed by water and are not pyrophoric.
- In Hemethyrin the uptake of O<sub>2</sub> is accompanied by-  
(a) One electron process (b) Two electron process  
(c) Three electron process (d) Four electron process
- For a typical cell, the concentration ratio for  $[\text{Na}^+]_{\text{outside}} / [\text{Na}^+]_{\text{inside}}$  is-  
(a) 10 (b) 15 (c) 25 (d) 35
- When the group Q = -CHO, R = -CH<sub>3</sub> then the heme in cytochrome is-  
(a) Heme 'a' (b) Heme 'b'  
(c) Heme 'c' (d) None of the above
- The ionic radius is smaller than atomic radius for-  
(a) Neon (b) Nitrogen  
(c) Sodium (d) Sulfure
- The number of corner-shared oxygen atoms present in each tetrahedron of  $[\text{Si}_3\text{O}_9]^{6-}$ -  
(a) 0 (b) 1 (c) 2 (d) 4
- The correct decreasing order of relative trans effect-  
(a)  $\text{C}_2\text{H}_4 > \text{NO}_2 > \text{Br}^- > \text{Cl}^-$  (b)  $\text{NO}_2 > \text{C}_2\text{H}_4 > \text{Br}^- > \text{Cl}^-$   
(c)  $\text{C}_2\text{H}_4 > \text{NO}_2 > \text{Cl}^- > \text{Br}^-$  (d) None of these