



**FC-302001**

Seat No. \_\_\_\_\_

**M. Sc. (Sem. II) Examination**

**June / July - 2021**

**MSC1C201 : Inorganic Chemistry**

**(New Course)**

**Time : 2 Hours]**

**[Total Marks : 50**

- Instructions :** (1) Answer only three (3) questions.  
(2) The examination will be for two (02) hours.  
(3) Q. No. 9 is compulsory and carries 14 marks.  
(4) Answer any two questions from questions No. 1 to 8. Each question carries 18 marks.

- 1 (a) Discuss the Walsh-diagram for  $AB_2$  type of the molecule.  
(b) Explain the simple Huckel theory.
- 2 (a) Explain the VSEPR theory.  
(b) Write a short note on Pariser-Parrpople approximation.
- 3 (a) In a molecule  $AB_5$  ( $D_{3h}$ ) central atom A has S, P and d orbitals. What are the orbitals available on A which will form  $\sigma$  bonds with B ?  
(b) For  $SF_6$  ( $Oh$ ) molecule, by using SALC, by applying five steps, show that six S-F bond vectors transform as  $A_{1g} + E_g + T_{1g}$ .
- 4 (a) Following bonds were observed in the vibrational spectrum of  $PD_3$  ( $C_{3v}$ )

IR $cm^{-1}$	Raman $cm^{-1}$
1698	1678 (Pol)
1694	1694 (d-pole)
808	808 (Pol)
730	728 (d-Pol)

Assign these bands to their corresponding irreducible representation.

- (b) Find out hybridization for  $\pi$  bonding for  $PtCl_4^{2-}$  ( $D_{4h}$ )

- 5 (a) Explain the structure and bonding in OMC at acetylene.  
(b) Explain  $\pi$  bonding structure and bonding in ferrocene.
- 6 (a) Discuss the role of organometallic compound in catalytic reaction.  
(b) Explain the classification and properties of OMC of transition metals.
- 7 (a) Explain :  
(i) Solvent effect  
(ii) Steric effect  
(b) Explain the tunnelling effect.
- 8 (a) Discuss 'Marcus-Hush theory and derive Marcus equation.  
(b) Define unstable oxidation state and its application.
- 9 Answer the following questions in short :  
(1) According to Bent's rule, more electronegative substituent prefer hybrid orbital having which character ?  
(2) Why the USIP of electrons of 2s orbital in nitrogen atom is lower than that of oxygen atom ?  
(3) In SCF method, why the columbic term (J) is double ?  
(4) For the tetrahedral molecule, what will be the difference in the hybridization of  $[\text{Zn}(\text{CN})_4]^{2-}$  with  $\text{MnO}_4^-$ .  
(5) For a molecule with point group  $C_{3v}$ , write down a representation which is totally symmetric ?  
(6) Give the point group of  $\text{SF}_6$ .  
(7) When two metal atoms are within the bonding distance of one carbon atom, they are called \_\_\_\_\_ type of complex.  
(8) What is the oxidation state at Cr in dibenzene chromium ?  
(9) Total number of active vibration in non linear molecule will be \_\_\_\_\_.  
(10) What is the main difference between inner sphere and outer sphere reaction ?  
(11) Define - Hapticity.  
(12) Write the use of "Silicon Oil."  
(13) Define - Hydrated electrons.  
(14) Give the order of energy of nucleophilic attraction.