

I Semester M.Sc. Degree Examination, February 2019  
(CBCS Scheme)  
C-101 : CHEMISTRY  
Inorganic Chemistry – I

Time : 3 Hours

Max. Marks : 70

**Instruction :** Answer Question No. 1 and **any five** of the remaining.

1. Answer **any ten** of the following : (10×2=20)
- What is a synergic effect and how does it correlate to metal-carbonyl bonding ?
  - Write the Kapustinskii's equation and give its significance.
  - $\text{FeCl}_3$  is soluble in ether while  $\text{AlCl}_3$  is not. Give reasons.
  - What are pyroxenes and amphiboles ? Give an example for each.
  - In what way  $\text{N}_2\text{O}_4$  autoionize ? How do  $\text{NOCl}$  and  $\text{NaNO}_3$  act in it ?
  - How is chloro-carborane  $\text{C}_2\text{B}_{10}\text{H}_{12}$  obtained ? Draw its possible isomers.
  - Give the meaning of symbiosis with an example.
  - Distinguish between isopoly and heteropoly acids. Give an example for each.
  - Acetic acid has a different leveling effect upon strong acids. Justify the statement.
  - Give the meaning of the terms : mass defect and binding energy.
  - Draw the structures of carbonyl clusters  $\text{Co}_4(\text{CO})_{12}$  and  $\text{Fe}_5(\text{CO})_9\text{C}$ .
  - The activity of sample of  $^{32}\text{S}$  reduced to 25% of its initial value after 180 days. Find the half-life of the isotope.
2. a) Explain why the bond angle in  $\text{H}_2\text{O}$  is  $104.5^\circ$ , whereas the same angle in  $\text{H}_2\text{S}$  is only  $92.1^\circ$ .
- b) What are the postulates of VSEPR model ? Based on it, explain the structures of  $\text{IF}_7$ ,  $\text{XeF}_6$ ,  $\text{ClF}_3$  and  $\text{I}_3^-$ . (4+6=10)

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3. a) How are  $S_4N_4$  and  $S_2N_2$  prepared? Explain the structure and bonding in  $S_4N_4$ ?
- b) Write briefly on the use of ZSM-5 in the conversion of methanol to gasoline.
- c) Outline the preparation, structure and bonding in  $P_3N_3Cl_6$ . (3+3+4=10)
4. a) Give the meaning of the term CD and explain its utility in determining the absolute configuration of metal complexes.
- b) Discuss the Pearson's concept of hard and soft acids and bases. Based on it, will  $Mg^{2+}$  react more strongly with  $CO_3^{2-}$  or  $S^{2-}$ ? (4+6=10)
5. a) Give a comprehensive note on Auger effect.
- b) Draw the nuclear binding energy curve and explain its significance.
- c) Write briefly on the structures and bonding in a dinuclear  $[Re_2Cl_9]^{2-}$ . (3+3+4=10)
6. a) State Bent's rule. Rationalize the bond angles in  $CH_2F_2$  ( $HCH = 111.9^\circ$  and  $FCF = 108.3^\circ$ ).
- b) Calculate the styx code and draw the structures of the following boranes:  $B_2H_6$ ,  $B_5H_9$  and  $B_{10}H_{12}$ .
- c) Discuss the applications of heteropoly acids of W and Mo. (3+3+4=10)
7. a) Distinguish between transient and secular equilibria.
- b) Write briefly on magnetic circular dichroism.
- c) How are silicates classified? Explain the structural features of beryl and muscovite mica silicates. (3+3+4=10)
8. a) Distinguish between fluorite and anti fluorite structure.
- b) Write the chemical reactions involved in a non-aqueous solvent  $BrF_3$ .
- c) Draw and explain MO energy level diagram for  $NO_2^-$  involving delocalized  $\pi$ -bonding. (3+3+4=10)