

M. Sc. Chemistry
 School of Chemical and Life Sciences
 Semester I Examination 2019
 Paper Title: Inorganic Chemistry-I
 Paper Code: MCHCC-103

(Write your Roll No. at the top immediately on the receipt of this question paper)

Time: 3hrs

Max. Marks: 75

Attempt all questions. All parts of a question must be attempted in continuation.
 Start answer of a fresh question on a new page.

Q1. Answer ALL questions

15 x 1=15

- A. What are bent bonds? Give an example.
- B. BaF_2 is stabilized upon bending because _____.
- C. The first member of each group of nonmetal hydrides has a higher boiling point because _____.
- D. Draw the structure of *nido*-decaborane(14).
- E. What is Wade's rule?
- F. What is Solubility product?
- G. Thiocyanate coordinates to Hg^{2+} through _____ and thiocyanate coordinates to Zn^{2+} through _____.
- H. State Pauling's Electroneutrality Principle.
- I. Draw the structure of the anion of Zeise's salt.
- J. State whether O_2 gas is paramagnetic or diamagnetic. What happens to the magnetism of O_2 upon coordination to hemoglobin?
- K. Draw the π and π^* orbitals of CO.
- L. Draw the structure of protoporphyrin IX.
- M. What is the cause of sickle cell anemia?
- N. Copper overload causes _____ disease and it can be treated by _____ therapy.
- O. Write down the complete formula for the calculation of magnetic moment of lanthanide ions

Q2. Answer ANY THREE of the following:

3x5=15

- A. Using Walsh diagram, prove that the geometry of water molecule is bent.
- B. Predict the structures of the following molecules with the help of VSEPR:
 (i) SnCl_2 (ii) I_3^- (iii) I_3^+ (iv) SF_5 (v) $\text{O}=\text{CF}_2$.
- C. Discuss the structure of XeF_6 .
- D. Describe Bent's rule with relevant examples. Give one example of an exception to Bent's rule.
- E. Justify the following statement with proper examples:
 "Increased covalent bonding resulting from Fajan's type phenomena can lower the transition temperatures".

Q3. Answer ANY THREE of the following:

3x5=15

- A. What are carboranes? Describe their reaction with FeCl_2 and $\text{BrMn}(\text{CO})_5$.
- B. Describe the various concepts of acids and bases.
- C. Justify the fact that the solubilities of silver(I) halides in water decrease down the group of halogens whereas that of lithium increase down the halogens and LiF is by far the least soluble halide.
- D. Discuss solutions of alkali metals in liquid ammonia.
- E. What are molten salts? Give some example of room temperature molten salts.

Q4. Answer ANY THREE of the following:

3x5=15

- A. Describe various factors affecting CFSE with relevant examples.
- B. Explain the experimental measurement of CFSE for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$.
- C. Draw and discuss the MO diagram of HCl molecule.
- D. Draw the molecular diagram of PtCl_4^- , fill up the electrons and discuss its magnetism.
- E. "The fluoride ligands are classified as weak field ligands although they are negatively charged". Justify this fact with the help of a molecular orbital diagram.

Q5. Answer ANY THREE of the following:

3x5=15

- A. Describe lanthanide contraction. What are its outcomes?
- B. What are cytochromes? Compare the structures of cytochromes with hemoglobin.
- C. Describe dioxygen binding by hemerythrins.
- D. Describe the mechanism of hydrolysis of peptide by CPA.
- E. Draw the structure of vitamin B_{12} and coenzyme B_{12} . Describe briefly the reaction of vitamin B_{12} with ATP.

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