MANIPAL
ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Reg. No.											

DEPARTMENT OF SCIENCES, I SEMESTER M.Sc., (P/C/M/G)
END SEMESTER EXAMINATIONS, February 2022
Inorganic Chemistry-I [CHM 5101]

Time: 2 Hours Date: 07.02.2022 MAX. MARKS: 40

Note: (i) Answer **any four full** questions.
(ii) Draw diagrams, and write equations wherever necessary

1.A. (i) Differentiate between mean deviation and standard deviation. Calculate the standard deviation for the following data:

7.720, 7.725, 7.736, 7.719, 7.742 and 7.751.

(ii) Write four conditions for the for quantitative estimation of precipitation in gravimetric analysis.

1.B. Derive Born-Lande equation for theoretical calculation of lattice energies. What conclusions can be drawn from the equation?

1.C. Discuss the geometry of molecules having

(a) 4 bonding pairs and 1 non-bonding pair

(b) 3 bonding pairs and 2 non-bonding pairs

(c) 3 bonding pairs and 2 non-bonding pairs [4+3+3]

2.A. (i) Explain the following;

(a) Determinate errors (b) Indeterminate errors

(ii) What is a secondary standard? How does it differ from a primary standard?

2.B Find the following compounds hybridization, geometry, magnetic nature and outer or inner orbital complex with the help of valence bond theory.

(a) $[Co(NO_2)_6]^{3-}$ (b) $[FeF_6]^{3-}$

2.C Explain based on MO theory as to why

(a) Hydrogen forms diatomic molecule while helium remains monoatomic?

(b) The bond order in O_2^- is less than that in O_2 which, in turn, is less than that in O_2^+ ? [4+3+3]

3.A. i) Explain closo, nido, arachno types of boranes with an example of each.

ii) Compare and contrast the properties of ionic and covalent hydrides.

3.B Discuss electron sea model of metallic bond and also explain the following properties using the same theory.
(i) Electrical and thermal conductivity (ii) Malleability, ductility and softness

3.C In an experiment, the concentration of zinc in a given sample was found to be 20.17 ppm. Taking the accepted value as 20.00 ppm, calculate the absolute error and determine the relative error in per cent as well as parts per thousand.

[4+3+3]

4.A. i) What is nitrogen cycle? Explain the sequence of steps involved in the nitrogen fixation by nitrogenase.

ii) Suggest the reason why the binary compounds of xenon are with fluoride and oxygen. Explain the structure of XeO_3 and $XeOF_4$.

4.B. i) Explain the bonding characteristic of Phosphazenes.

ii) What are Cryptands? Why are they better chelating agents than crown ethers?

4.C. Give reasons;

i) The 2^{nd} and 3^{rd} row d-block elements have similar properties.

ii) The absorption band of lanthanides are sharp line whereas that of transition metals are broad.

iii) Zeolite acts as shape selective catalyst.

[4+3+3]

5.A. i) Why is it difficult to separate lanthanides? Explain the ion exchange method for their separation.

ii) What is lanthanide contraction? What are its consequences?

5.B. Compare the aromaticity of borazine, boroxine and benzene. Justify your answer.

5.C. Give reason

i) Interhalogen compounds are more reactive than corresponding halogens

ii) MnO_4^- ion is dark purple colour.

iii) Variable oxidation states are not present in lanthanides.

[4+3+3]

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