

DEPARTMENT OF SCIENCES I SEMESTER M.Sc (CHEMISTRY) END SEMESTER EXAMINATIONS,

NOV/DEC 2016

SUBJECT: INORGANIC CHEMISTRY I [CHM 601]

REVISED CREDIT SYSTEM

Time: 3 Hours

Date: 27/12/2016

MAX. MARKS: 50

(6+4)

Instructions to Candidates:

- Answer ANY FIVE FULL questions.
- Draw diagrams and write equations wherever necessary.

1. A. i) Construct the Born-Haber cycle for Al_2O_3 and describe the enthalpy terms involved.

ii) Explain the three types of molecular dipoles with illustrative examples.

- iii) Describe the three methods of forming precipitates.
- B. i) How do London forces arise? Write the features of dipole-induced dipole interactions.
- ii) Distinguish between the following; a) Bonding and antibonding molecular orbitals
- **b**) Covalent and ionic bonds.
- 2. A. i) Sketch and explain the potential energy curve of a covalent compound.
 - ii) Define lattice energy. Describe the two main factors that influence it.
 - iii) Write two differences each between the following: a) Endpoint and equivalence point
 - **b**) Coprecipitation and postprecipitation.
 - **B**. Give reasons for the following;
 - i) In the solid state, single ionic molecules do not exist.
 - ii) The covalent compounds are neither hard nor brittle.
 - iii) Stability in metals is not attained through the inert gas structure.
 - iv) The solubility of p-nitrophenol in water is more than that of o-nitrophenol. (6+4)
- **3.** A. i) Describe the two main mechanisms of precipitate formation.
 - **ii**) The masses of seven coins are determined to be 3.080, 3.094, 3.107, 3.056, 3.112,
 - 3.174, and 3.198 g. Calculate the mean, average deviation, standard deviation, and variance.

- iii) Explain two disadvantages of instrumental methods used in chemical analysis.
- B. Explain the following terms; a) Radius ratio b) Coordinate covalent bondc) London forces d) Covalent network solids.
- **4. A. i**) Use MOELD to predict whether H₂⁺ and H₂⁻ exist? Determine their bond orders and electron configurations.

ii) What is hybridization? Explain salient features of sp and sp³d hybridizations.

iii) The dipole moment of HBr is 2.67 x 10^{-30} Cm and the internuclear distance is 141 pm.

Calculate the percent ionic character of the molecule. Predict whether an ozone molecule is polar.

B. i) The following replicate weighing were obtained; 29.8, 30.2, 28.6, and 29.7 mg.

Calculate the standard deviation of the individual values and the standard deviation of the mean. Express them as absolute and relative values.

ii) a) Describe the three types of determinate errors b) Explain the basis of complexometric titrations.

5. A. i) How is diborane prepared? Explain the structure and bonding in B_5H_9 and B_4H_{10} .

ii) What is nitrogen cycle? Explain the mechanism of nitrogen fixation by biological process.

iii) Explain the reaction of alkali and alkaline earth metals in liquid ammonia.

B. i) Give reasons; a) Cryptates are stronger complexing agents than crown ethers.

b) The magnetic properties of lanthanides are not affected by nature of ligands.

ii) What are interstitial hydrides? Give two examples. Why are they less dense than parent metals?

(6+4)

(6+4)

6. A i) What is lanthanide contraction? What are its consequences?

ii) Write an explanatory note on amorphous allotropes of carbon.

iii) What are interhalogen compounds? Why are they more reactive than halogens? Explain the structure of ClF₃

B. i) Why is it difficult to separate lanthanides? Explain the ion exchange method of their separation.

ii) Give reasons; a) The f-f transitions of actinides are more intense than those of lanthanides.

b) Zeolites are used as molecular sieves and in water purification. (6+4)

Page 2 of 2