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Department of Sciences, Manipal University

I SEMESTER M.Sc END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: Inorganic chemistry-I [CHM-601]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 26.11.2015 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL questions**.
- Write diagrams, equations or examples wherever necessary

1. A. i) Sketch and explain potential energy curves for the formation of an ionic solid and a covalent molecule.
ii) Write two differences each between the following: **a)** Random and systematic error **b)** Coprecipitation and postprecipitation.

B. Define and discuss the special features of following bond parameters;
a) Bond energy **b)** Bond angle **c)** Bond length **d)** Bond order **(6+4)**

2. A. i) Identify six types of precipitates by pointing out similarities and distinctive features
ii) Describe hybridization involving multiple bonds. Explain sp^2 and sp^3d hybridizations

B. Account for the following:
a) Bond angles decrease in the series CH_4, NH_3 and H_2O
b) Dipole moment of NH_3 is higher than that of NF_3
c) Cis-dichloroethene has higher boiling point than trans-dichloroethene
d) Covalent compounds dissolve readily in non-polar solvents while ionic compounds are soluble in polar solvents. **(6+4)**

3. A. i) The internuclear distance of HCl molecule is 127 pm and the actual dipole moment of the molecule is found to be 3.44×10^{-30} Cm. Calculate the percent ionic character of HCl
ii) Describe each of the following terms;
a) Bond dissociation energy and bond energy **b)** Heteronuclear and homonuclear bonds
c) Bond moment and dipole moment **d)** Induced dipole and instantaneous dipole.

B. **i)** Sketch and explain the special features of the following
a) Cesium chloride structure **b)** HCP structure in metals
ii) Results from six replicate determinations for iron in aqueous samples of a standard solution containing 20.00 ppm of iron(III) are 19.4, 19.5, 19.6, 19.8, 20.1 and 20.3. Calculate the mean, median, average deviation and standard deviation. **(6+4)**

4. A. **i)** Explain the significance of radius ratio in ionic compounds. Describe why covalency is favored if the positive ion does not have a noble gas electron configuration.
ii) Construct Born-Haber cycle for CaO. Explain the enthalpy terms involved.

B. i) Discuss the geometry of the following isoelectronic species based on VSEPRT; NH_3, H_2O, HF and NH_4^+
ii) Justify the following statements
a)But for the existence of hydrogen bonding the present life on earth would not have existed.
b)Noble gases exist in the liquid and solid states under certain conditions. (**6+4)**

5. A. **i)**What is nitrogen fixation? Explain any two natural nitrogen fixation processes. Describe the applications of zeolites in different fields.
ii) Describe the structure and bonding in diborane. Explain the electronic spectra of lanthanides. How do the electronic spectra of lanthanides differ from those of transition metals?

B. Explain the following with relevant reasons;
i) Cohesive energy of I A group elements is lesser than that of II A group elements.
ii) Fullerenes are used as anti-oxidants.
iii) Borazine is known as inorganic benzene.
iv) Cerium shows stable + 4 oxidation state in the lanthanide series. **(6 + 4)**

6. A i) What is lanthanide contraction? Discuss its consequences. Why do Be and Mg form covalent hydrides whereas other elements in the group form ionic hydrides?
ii) Explain the structure of xenon dioxydifluride and chlorine trifluride. Describe the preparation of borazine and cyanogen.

B. **i)** Write reactions of alkali metals in liquid ammonia. Explain the structure of fullerene and diamond.
ii) Highlight the special characteristics of the following:
(a) Pseudohalogens and interhalogens
(b) Pyrosilicates and chain silicates

(6+4)

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