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**Department of Sciences, Manipal University**

**I SEMESTER M.Sc END SEMESTER EXAMINATIONS, DEC 2015/JAN 2016**

SUBJECT: Inorganic chemistry-I [CHM-601] – (Make up)

**REVISED CREDIT SYSTEM**

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

**1. A.** Explain the six conditions for precipitation from a solution and six operations involved in gravimetric analysis.

**B. i)** Explain the band theory of metals using the molecular orbital approach. How do you distinguish metals, semiconductors and insulators on the basis of this theory?

**ii)** Justify the following statements:
**a)** Ice is less dense than water at zero degree Celsius.
**b)** Solubility of p-nitrophenol in water is more than that of o-nitrophenol.

**(6+4)**

**2. A. i)** What is hybridization? Explain $sp^3$ and $sp^3d^2$ hybridizations.

**ii)** Write two differences each between the following:
**a)** Equivalence point and end point **b)** Absolute error and relative error.

**B**. Give reasons for the following:
**a)** The C-Cl bond is polar but $CCl_4$ molecule is non-polar.
**b)** The bond angles decrease in the series: $NO_2^+$, $NO_2$ and $NO_2^-$
**c)** o-dichlorobenzene has a higher boiling point than p-dichlorobenzene.
**d)** Reaction between ionic compounds in aqueous medium is instantaneous while that between organic compounds is not. **(6+4)**

**3 A. i)** Sample of brass is analyzed to give the following percentages of copper: 80.12, 80.07, 80.35, 80.17. Calculate the absolute deviation and relative standard deviation.
**ii)**Discuss the geometry of the following isoelectronic species based on VSEPRT; $PF_5$, $SF_4$, $ClF_3$ and $[ICl_2]^-$

**B. i)** Sketch and explain the special features of the following:
**a)** Rock salt structure **b)** CCP structure in metals
**ii)** The gaseous KCl has a measured dipole moment of 10.0 D. The internuclear distance is 2.67 X $10^{-8}$ cm. Calculate the dipole moment of KCl if it were completely ionic.

**(6+4)**

**4.A**. **i)** How do London forces arise? Write the features of dipole-induced dipole interactions.
**ii)** Construct Born-Haber cycle for $MgCl_2$. Explain the enthalpy terms involved.

**B. i)** Account for the following:
**a)** Metallic bonding becomes stronger in the series Na, Mg, Al
**b)** Zig-zag structure is observed in solid HF
**ii)** Explain the four titration types classified by the type of reaction.

**(6+4)**

**5.A .i)** Explain the structure of xenon oxytetrafluride and hexaborane -10. Describe any two chemical properties of borazine.
**ii)** Write an explanatory note on the following;
**a)** Fullerenes **b)** Zeolite **c)** Chemical twins

**B. i)** Give reason;
**a)** Ionic mobility of $Li^+$ is less than that of other elements in group I A.
**b)** Lanthanides form amine complexes only in non-aqueous solvents.
**ii)** Differentiate between ionic and covalent hydrides. Give one chemical property for each of these hydrides.

**(6+4)**

**6.A. i)** Discuss the ion exchange process for the separation of lanthanides. What are crown ethers? List the factors influencing the extraction of metals by them.
**ii)** Differentiate the electronic spectra of lanthanides and transition metals. Write any two reactions of interhalogens and pseudohalogens.

**B**. **i)** Mention any two applications of the following;
**a)** Helium **b)** Calcium cyanamide **c)** Carbon black **d)** Chlorine trifluride
**ii)** How is sulfur nitride prepared? Explain any two of its chemical properties.

**(6+4)**