MANIPAL UNIVERSITY

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DEPARTMENT OF SCIENCES, I SEMESTER M.Sc (P/C/M/G))
END SEMESTER EXAMINATIONS, December, 2017

Subject: Inorganic chemistry I [CHM 4101]

(REVISED CREDIT SYSTEM-2017)

Time: 3 Hours Date: 19.12.2017 MAX. MARKS: 50

Note: (i) Answer all **FIVE FULL** questions

(ii) Draw diagrams, and write equations wherever necessary

1. A. i) Write a technical note on electronegativity and bond polarity. Draw a graph of percentage ionic character versus electronegativity difference and explain the tendency to form different types of bonds.

ii) Describe the hcp structure in metals, bcc structure in ionic compounds and trigonal bipyramid structure in covalent molecules.

B. Give reasons for the following;

i) Solid ice is less dense than liquid water at 0°C

ii) Mercury, paraffin oil and honey are viscous

iii) Hydrogen bonding is critical to the existence of life on the earth

iv) Solubility of p-nitrophenol in water is more than that of o-nitrophenol.

(6+4)

2. A. i) Distinguish between the following;

a) Random and systematic errors **b)** Accuracy and precision **c)** Absolute and relative error **d)** Equivalence point and endpoint

ii) The masses of seven coins are 3.080, 3.094, 3.107, 3.056, 3.112, 3.174, and 3.198. Calculate median, standard deviation, relative standard deviation, and variance.

iii) Calculate the percentage ionic character of HCl if the internuclear distance is 127 ppm and the measured dipole moment is 3.44×10^{-30} Cm.

B. Give reasons for the following;

i) It is not possible to prepare a sodium hydroxide solution whose molarity is known precisely.

ii) Weak acids are not often titrated against weak bases

iii) If nucleation predominates, a precipitate containing a large number of small particles results

iv) Tartaric acid is used in the gravimetric determination of nickel in the steel

(6+4)

3. A. i) Explain the bonding in ethene and ethyne using hybridization concept. Describe the geometry of PF_5 and NH_4^+ using VSEPR theory.

ii) Explain the following;

a) O_2^+ is more stable than O_2 while N_2^+ is less stable than N_2.

b) CN^- has shorter bond distance than CN while O_2^- has longer bond distance than O_2.

B. i) Why is it difficult to separate lanthanides? Discuss the ion exchange process of lanthanide separation.

ii) Explain the features of saline and interstitial hydrides. Give an example of each.

(6+4)

4. A. i) What are tectosilicates and pyrosilicates? Explain the formation of 3C-2e bond in boranes with an example.

ii) Explain the structural features of XeF_4, B_5H_{11} and ClF_3

B. i) What is enriched uranium? Describe the separation of uranium isotopes.

ii) Account for the following;

a) Tetrahedral SiO_4 units are joined by sharing oxygen at corners in silicates.

b) Cryptates are stronger complexing agents than crown ethers.

(6+4)

5. A. i) What are chemical twins? Give an example. Explain the electronic spectra and complexes of lanthanides.

ii) Explain the reactions of alkali and alkaline earth metals with liquid ammonia.

iii) Distinguish the following; (Any two points)

a) Borazine and benzene **b)** Pseudohalides and halides

B. i) Write an explanatory note on crystalline allotropes of carbon.

ii) Explain the following;

a) The f-f transition of actinides are more intense and broad.

b) Zeolites are used as molecular sieves and selective catalysts. **(6+4)**

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