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CH/AC/OC/CAH 401

First Semester M.Sc. Examination, December 2018
Chemistry/Applied Chemistry/Organic Chemistry/Analytical Chemistry
(CBCS : 2016-17 Syllabus)
INORGANIC CHEMISTRY

Time : 3 Hours

Max. Marks : 70

Note : i) Answer Part **A** and **any four** questions from Part **B**.
ii) Figures to the **right** indicate marks.

PART – A

1. Answer **all** the following sub-divisions : **(9×2=18)**

- a) The limiting radius ratio of coordination number 4 (tetrahedral) is 0.225 – 0.414. What information may be derived from this ?
- b) Calculate the lattice energy of KF using Kapustinskii equation (Given $r^- = 133$ pm and $r^+ = 138$ pm).
- c) Which among dioxygen and peroxide ion has a greater bond length ? Give reasons.
- d) Oxides and fluorides of xenon are mainly known. Account for this.
- e) How does liquid N_2O_4 self-ionize ? Identify a solute which behaves as an acid in liquid N_2O_4 .
- f) What is the selectivity of alkali metal ions in complexation with cryptands ?
- g) What is precipitation from homogeneous solution ? Give an example.
- h) How demasking is achieved by replacement reaction ? Give an example.
- i) How does a redox indicator change its colour at the end point ?

PART – B

Answer **any four full** questions : **(4×13=52)**

2. a) Explain the bonding in NO molecule using MO theory. Calculate its bond order and explain the effects in terms of stability bond strength and bond length when one electron is removed from the molecule.
- b) Explain the rules to predict structures for molecules by VSEPR theory. Predict the structures of SF_4 , P_2F_5 and IF_7 .
- c) Discuss the structure of rutile. **(5+4+4=13)**

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3. a) Deduce the Born-Landé equation for lattice energy of an ionic compound.
- b) Explain Fajan's rules. How these rules are helpful in describing the gradual lowering in melting points ($^{\circ}\text{C}$) for LiF (872), LiCl (610) and LiI (445) ?
- c) Explain Landé's method for the determination of ionic radius. **(5+4+4=13)**
4. a) Discuss briefly upper rim and lower rim modifications of calixarenes.
- b) What are zeolites ? Discuss how the active sites are created in zeolites.
- c) What are interhalogens ? Discuss the structures of AB_3 type and AB_5 type interhalogens. **(5+4+4=13)**
5. a) Explain the reactions in molten salts.
- b) What is Pearson's concept of hard and soft acids and bases ? Discuss its application in complex formation.
- c) Write the preparation and structures of hypophosphorus, phosphorus and phosphoric acids. Explain their basicity and redox properties. **(4+4+5=13)**
6. a) Discuss the factors affecting the shape of titration curves in complexometric titrations.
- b) What is masking ? Discuss its application in qualitative analysis.
- c) Outline the indicator action of calmagite in the titration of Mg^{2+} with EDTA. **(4+4+5=13)**
7. a) What is synergistic extraction ? Discuss briefly the synergistic solvent extraction of nickel ion.
- b) How 't' and 'F' tests are used in comparison of analytical data ?
- c) What are the advantages and disadvantages of organic reagents used in gravimetric determination of metal ions ? Discuss with examples. **(4+4+5=13)**
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