

ST. JOSEPH'S COLLEGE (AUONOMOUS), BENGALURU
M.Sc. CHEMISTRY : I SEMESTER
MIDSEMESTER TEST : AUGUST 2016
CH 7115 INORGANIC CHEMISTRY

Time : 1 1/2 hrs

Max. marks : 35

Part-A

Answer any **three** questions

2 x 3 = 6

- Which cation in each pair would be expected to form a chloride salt with the larger lattice energy, assuming similar arrangements of ions in the lattice? Explain your reasoning.
 - Na^+ , Mg^{2+}
 - Li^+ , Cs^+
- Write the expression for the Madelung series (first 4 layers) for sodium chloride.
- Give an example of super acid. Why it is called so?
- Define Hammett acidity function.
- Give solvent system definition of acid and base.

Part-B

Answer any **two** questions

12 x 2 = 24

- Differentiate 'B' strain and 'F' strain with suitable examples. (3)
 - Taking a suitable example explain symbiosis. (2.5)
 - Give an acid-base reaction in BrF_3 . (2.5)
 - What is the theoretical basis for hardness and softness? (2)
 - Give Drago-Wayland equation and explain the terms. (2)
- Relate the properties of diamond and graphite to their structures. (3)
 - Secondary amines are stronger bases than primary amines. Give reason. (1.5)
 - Give the structure of cycloocta sulphur (1.5)
 - What are spinals and inverse spinals? (3)
 - Taking SiO_2 as an example, explain the beta cristoballite structure. (3)
- Calculate the lattice energy (in units of kJ/mol) for ZnO in the wurtzite structure using the Born-Landé equation and also using a Born-Haber cycle. Compare the two answers and comment on any differences. Useful data: the Born exponent, n , = 8; the sublimation energy of zinc = 130.4 kJ/mol; and the standard heat of formation of zinc(II) oxide = -350.5 kJ/mol.
 $e = 1.602 \times 10^{-19}$
 $A = 1.641$ for the wurtzite structure
 $4\pi\epsilon_0 = 1.113 \times 10^{-10}$
 $d_0 = 75 + 124 = 199$ pm
 $n = 8$
 IE_1 & IE_2 for Zn = 906.3 kJ/mol & 1733 kJ/mol respectively.
 The dissociation energy for oxygen = 497 kJ/mol
 EA_1 & EA_2 for oxygen = 141 kJ/mol & -780 kJ/mol respectively
 - Draw the Lewis structure of ClO_2^- and calculate the formal charge of Cl in this ion.
 - Write the resonance structure of CO_3^{2-} .
 - Explain, why LiCl is more soluble in organic solvent.
 - Draw the thermodynamic cycle involved in the decomposition of a metal carbonate.

(4+2+2+2+2)

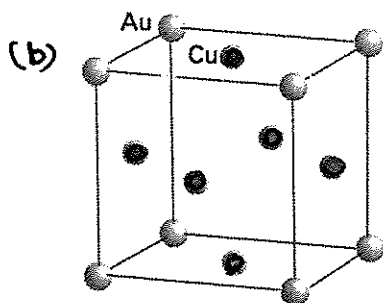
P. T. O

Part-C

Answer any **one** question

5 x 1 = 5

9. (a) Obtain the formula MX_n or M_nX for the structure derived from the hole filling in cubic close packed arrays of X with (i) half the octahedral holes filled by M (ii) One quarter of the tetrahedral holes filled by M.



An alloy of copper and gold has the given structure.

Calculate the composition of the given unit cell. Given that pure gold is 24 carat, what carat gold this alloy will be? (3+2)

10. a. $SO_3^{2-} + HF \leftrightarrow HSO_3^- + F^-$. The K_{eq} value of this reaction is 10^4 . How do you account for such large value of equilibrium constant? (2)
- b. Predict which way the following reactions will go (left or right) in the gas phase.
- $CuI_2 + 2CuF \rightarrow CuF_2 + 2CuI$
 - $AlI_3 + 3NaF \rightarrow AlF_3 + 3NaI$
 - $TiF_4 + 2TiI_2 \rightarrow TiI_4 + 2TiF_2$ (3)