LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – NOVEMBER 2015

CH 1813 - CONCEPTS IN INORGANIC CHEMISTRY

Date : 05/11/2015 Dept. No. Max. : 100 Marks

Time : 01:00-04:00

Part-A

Answer ALL questions. **(10 × 2 = 20)**

1. How does ionization energy vary among the elements, C, N, and O?
2. Arrange the following acids in the increasing order of acid strength and justify your answer. $HClO$, $HClO_2$, $HClO_3$, $HClO_4$.
3. What are the factors influencing lattice energy?
4. How is ionization potential related with the solubility of an ionic compound?
5. Arrange the following compounds in the increasing order of melting point: NaCl, $MgCl_2$, and $AlCl_3$.
6. How is hybridisation related to the geometry of a molecule?
7. Sketch the LCAO of ethylene?
8. What are Keesom forces?
9. How is layer structure formed by graphite?
10. What is meant by leveling effect?

Part-B

Answer any EIGHT questions. **(8 × 5 = 40)**

11. Discuss the electronic configuration of Cu using Slater's rule.
12. How are atomic radius and ionization energy related to each other? How do they vary along a group in the periodic table?
13. Calculate the relationship between edge length (a) and radius (r) of a spherical atom in the ccp and simple cubic packing of ions.
14. Explain the salient features and drawbacks of modern periodic table.
15. Write a note on stoichiometric defects.
16. In a cubic close packed structure of mixed oxides, the lattice is made up of oxide ions, one eighth of tetrahedral voids are occupied by divalent ions (A^{2+}), while one-half of octahedral voids are occupied by trivalent ions (B^{3+}). What is the formula of the oxide?
17. Explain valence band and conduction band.

18a. How is it possible to liquefy noble gases despite the fact that they have zero dipole moment? **(3)**

b. Account for the stability of helical structure of protein molecules. **(2)**

19. Briefly explain the conducting behaviours of n-type and p-type semiconductors.
20. How does MO theory explain the magnetic properties of O_2 molecule?
21. Discuss the formation and properties of supra molecular assemblies.
22. What are (i) super acids (ii) non-polar solvents? Cite an example for each.

Part-C

Answer any FOUR questions. **(4 × 10 = 40)**

23. Construct Born-Haber's cycle for the formation of NaCl and discuss the terms involved in calculating the lattice energy.
24. Write a brief note on Fajan's rule and mention any three applications in explaining the variation of the properties of ionic and covalent compound.
25. Discuss the stoichiometry and crystal structure of the unit cell of (i) NaCl (rock salt) (ii) ZnS (zinc blende) **(5+5)**
26. What is VSEPR theory? Predict the geometry of the following ions: ClO^-, ClO_2^-,ClO_3^- and ClO_4^-
27. Sketch and explain the molecular orbital energy level diagram of CO and NO.

28a. How is pKa of a weak monobasic acid determined?

b. Discuss HSAB principle. **(5+5)**

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