LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – APRIL 2010

CH 1807 - CONCEPTS IN INORGANIC CHEMISTRY

Date & Time: 27/04/2010 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

PART-A

*Answer **all** questions. Each question carries **two** marks (10 x 2 = 20 Marks)*

1. Arrange the group 15 hydrides NH_3, PH_3, AsH_3, and SbH_3 in the order of HMH angle and justify your answer.
2. Elements with large ionization energies tend to have large electron affinities as well. However, as a notable exception, nitrogen has a lower electron affinity than phosphorus. Offer a reasonable explanation.
3. Mention the crystal structures adopted by the sulfides of Li and Be.
4. $FeSiF_6.6H_2O$ is well defined crystalline solid, whereas the anhydrous compound is unknown. Give reason.
5. In the case of transition metal ions the heavier congeners (e.g., Mo and W) more readily form higher oxidation states than does the lighest congener (e.g., Cr). Comment.
6. Account for the large variation in the melting points of NaF (mp = 997 °C) and MgO (mp = 2800 °C).
7. Illustrate isolobel relationship with an example.
8. Compare and comment upon the behavior of perchloric acid and acetic acid in water.
9. SO_2 is both a Lewis acid and a Lewis base, whereas SO_3 is a strong Lewis acid and a very weak Lewis base. Explain.
10. What are green solvents? Cite two examples.

PART-B

*Answer **eight** questions. Each question carries **five** marks (8 x 5 = 40 Marks)*

11a. Explain the geometrical method of calculating the size of an octahedral hole in a lattice of closest packed anions.
   b. What is critical radius ratio?
12a. Derive Born-Lande equation to compute the lattice energy of ionic compounds.
   b. In the absence of crystal structure how would you evaluate the lattice energy?
13a. Write a note on Allen definition of electronegativity.
   b. How is this concept viewed in the light of MO theory?
14. Write a note on non-hydrogen bonded host structure with an example.
15. Explain the structure and bond angles in the isoelectronic series: CH_4, NH_3, and H_2O.
16. Explain the application of Bent's rule in the interpretation of structures of non-metal fluorides.
17. NiO is stoichiometric and pale green, on doping it with Li_2O the color changes to gray black and becomes a semiconductor. Explain this observation.
18. What are polyprotonic acids? Cite two examples. Explain the distribution diagram of such an acid.
19 Explain the salient features of band theory and account for the metallic properties of metals.

20. Explain the principle of Godschmidt classification of the elements.
21. Construct the qualitative MO energy level diagram for a polar molecule such as HCl and explain how the principle of conservation of atomic orbitals is achieved in this case?
22. Compare the merits and demerits of X-ray, neutron and electron diffraction techniques.

PART-C

*Answer **four** questions. Each question carries **ten** marks (4 x 10 = 40 Marks)*

23. Construct the qualitative MO energy level diagram of BeH_2. How does it differ from that of CO?

24a. Explain the principle of X-ray diffraction.

b. Explain the methodology of arriving at the molecular structure from the diffraction intensities.

25. With the help of neat unit cell diagrams explain the prominent structures of ionic crystal lattices.
26. Explain the acid-base behavior of the protonic solvents such as water, ammonia, and sulfuric acid.

27a. What are inclusion compounds? How are they classified?

b. Explain the structural features and applications of inclusion compounds.

28a. Explain the different kinds of crystal defects and the unique properties of such defects structures.

b. Write a note on interstitial compounds.

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