LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

FIRST SEMESTER – NOVEMBER 2009

CH 1807 - CONCEPTS IN INORGANIC CHEMISTRY

Date & Time: 06/11/2009 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

PART-A

*Answer **all** questions. Each question carries **two** marks (10x2=20)*

1. Comment upon the ONO angle in NO_2^+, NO_2, and NO_2^-.
2. Elements with large ionization energies tend to have large electron affinities as well. However, as a notable exception, fluorine has a lower electron affinity than chlorine. Offer a reasonable explanation.
3. Among the alkali halides the cesium chloride structure is found only in CsCl, CsBr, and CsI at ordinary pressure. Comment.
4. $Na_4XeO_6.8H_2O$ is a well defined crystalline solid, whereas the anhydrous compound is unknown. Give reason.
5. Platinum hexafluoride has an electron affinity more than twice as great as fluorine, yet when lithium metal reacts with it the product formed is LIF, not $Li^+PtF_6^-$. Comment.
6. For which of the compounds would you expect the melting point to be higher, CsF or BaF_2? Justify your answer.
7. A large enthalpy of salvation contributes toward a favorable enthalpy of solution. However, water soluble salts are known with both large and small hydration energies. Explain this observation.
8. Illustrate "apicophilicity" with an example.
9. Explain symbiosis with an example.
10. What are proton sponges? Mention their uses.

PART-B

*Answer **eight** questions. Each question carries **five** marks (8x5=40)*

11a. What is critical radius ratio? Mention its significance.
   b. Explain the geometrical method of calculating the size of an octahedral hole in a lattice of closest packed anions.
12a. Derive Born-Lande equation to compute the lattice energy of ionic compounds.
   b. What is Kapustinskii equation?
13. Write a note on Mulliken-Jaffe definition of electronegativity.
14. Explain the structural features of hydronium ion in gas phase.
15. If one considers only the number of groups/atoms bonded to the central atom BrF_3 would be trigonal and ICl_4 would be tetrahedral. However, none of these molecules has the structure assigned to it. Explain this observation.
16. Explain the structure and the H-C-H/F-C-F bond angles in CH_3F, CH_2F_2, and CHF_3.
17. What would happen when (a) a crystal of AgCl is doped with a small amount of $CdCl_2$ and (b) in the lattice of Cu_2S some Cu^+ ions are replaced by Cu^{2+}?

18. How is the working principle of a Bessemer converter in steelmaking rationalized in the light of Lux-Flood definition of acids and bases.
19. Explain the metallic proiperties of metal with the help of band theory.
20. Give an account of Pearson's classification of acids and bases.
21. Explain the concept of electronegativity in the light of MO theory using a polar molecule.
22. Present a comparative study of X-ray, neutron, and electron diffraction techniques.

PART-C

*Answer **four** questions. Each question carries **ten** marks (4x10=40)*

23. Construct the qualitative MO energy level diagram of NO_2^-. Compare it with that of BeH_2.

24a. Construct the qualitatice MO energy level diagram of CO and explain the higher electronegativity of O than that of C in this molecule.

b. Compare the MO energy level diagram of this molecule with that of N_2 and account for their properties.

25a. Explain the principle of X-ray diffraction.

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

26. With the help of neat unit cell diagrams explain the structures of rock salt, wurtzite, zinc blende, rutile, fluoride, and cesium chloride ionic crystal lattices.
27. Explain the classification of aprotic solvents and their acid-base properties.

28a. What are inclusion compounds? How are they classified?

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

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