LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2018**

16/17/18PCH1MC02 – CONCEPTS IN INORGANIC CHEMISTRY

Date: 27-10-2018 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

Part-A

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

1. Compute the effective nuclear charge felt by 2p-electrons of bromine atom.
2. Highlight the application of Bent's rule in discussing the structure of covalent molecule.
3. Comment on the results of polarization in silver halides.
4. What is Madelung constant?
5. Will the bond order of NO^+ be higher or lower than NO? Give reasons.
6. Differentiate intrinsic and extrinsic semiconductors.
7. Define a self-assembly.
8. Comment on the stability of a cage or channel of a clathrate in the presence and absence of a guest molecule.
9. In aqueous solution, the ethyl-substituted amines have basicities in the following order. $NHEt_2$ > NH_2Et = NEt_3 > NH_3. Rationalize.
10. What are Brønsted-Lowry acids and bases?

Part-B

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

11. How does atomic radii vary in a group and period? How is it related with electron affinity and ionization energy?
12. Apply VB theory to explain the bonding in water and ammonia molecules.
13. Which phenomenon is termed as incipient covalency in ionic compounds? Explain.
14. Derive Born-Landé equation to compute lattice energy. How is a more accurate measure of lattice energy obtained?
15. Discuss the structure of XeO_3 using hybridization.
16. How does MO theory explain the stability and magnetic properties of O_2, O_2^-, O_2^{2-}, O_2^+, and O_2^{2+}.
17. Calculate the electronegativity of Pb using Allred-Rochow procedure (At. No. of Pb = 82, r_{Pb} = 1.53 Å).
18. What are non-commensurate structures? How are the clathrate hydrate structures classified?
19. Illustrate the measure of proton affinity and proton loss in the determination of acid-base strength.
20. Rationalize the following:

    i) formation of $CoCl_4^{2-}$ is favourable in molten salts than in an aqueous medium.

ii) alkali halides dissolve large amounts of the corresponding alkali metal.

21. Write a short note on superacids.

22. Explain the classification of clathrates.

Part-C

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

23. How does molecular orbital theory explain the bond order and the magnetic properties of CO and HF?

24a. Explain the efficiency of packing of ions in crystal lattice and the structure of ionic lattices with unit cell diagrams.

b. Give an account of the covalent character in ionic compounds in the light of Fajans' empirical rules. (5+5)

25. Explain band theory based on the conducting behavior of metals, insulators, and semiconductors.

26a. Explain the basic concept and classification of molecular self-assemblies.

b. Write a short note on the clathrate hydrate of gases. (5+5)

27a. What are the postulates of VSEPR theory.

b. What is limiting radius ratio? Mention its significance. Calculate the size of an octahedral hole in a lattice of closest packed anions. (5+5)

28a. Water exerts levelling effect on perchloric acid and hydrochloric acid, whereas acetic acid differentiates these two acids. Explain.

b. Highlight the advantages of ionic liquids in synthesis compared to the conventional solvents. (5+5)

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