LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2019**

16/17/18PCH1MC02/ PCH 1502 – CONCEPTS IN INORGANIC CHEMISTRY

Date: 01-11-2019 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

Part-A

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

1. What is the hybridisation and geometry of SO_4^{2-}?
2. Why is van der Waals radius larger than covalent radius?
3. Calculate the effective nuclear charge for Cu (Z=29).
4. What are clathrates? Give an example.
5. Account for the solubility of lithium halides based on hydration energy.
6. A unit cell of a cube contains anions at each corner and at the centre of the unit cell and cations at the centre of each face. What is the formula of the compound?
7. The radii of Cs^+ and Cl^- ions are 1.69 A^o and 1.81A^o, respectively. Find the coordination number of Cs^+ ions in CsCl ionic crystal.
8. Highlight the common features of hcp and ccp structure.
9. What are proton sponges? Give an example.
10. What are protic and aprotic solvents? Give an example**.**

Part-B

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

11. Define electron affinity. Explain the factors that govern electron affinity.
12. Discuss the significance and dependence of angular wave function on quantum numbers.
13. Compare the postulates of Bohr's theory and Sommerfeld theory for hydrogen and H-like species.
14. Discuss the band theory of metals in detail.
15. Explain the structure and hybridization of IF_7 and SF_6.
16. Explain the salient features and classification of self-assembly. How is it used in biological systems?
17. Construct Born-Haber cycle for the formation of CaF_2 to determine the lattice energy.
18. Compute the density of a crystal having a cubic structure.
19. Calculate the limiting ratio for an octahedral site.
20. Discuss HSAB principle with suitable examples.
21. Derive the relation between the edge length (A) of a cubic unit cell and radius (r) of the spherical atom present in the face centred cubic unit cell.

22. Give reasons for the following: (i) the melting point of $HgCl_2$ (276 ^oC) is less than that of $CaCl_2$ (722 ^oC).
(ii) $PbCl_2$ is more soluble in water than $PbCl_4$.

Part-C

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

23. i) Explain the periodicity of ionisation energy with examples.
ii) Calculate the amount of energy required to convert 1.5g of potassium atoms in the gaseous state to form potassium ions. Ionization energy of potassium is 419 kJ/mole and atomic mass of potassium is 39 a.m.u. (7+3)

24. Draw and explain the molecular orbital energy level diagram of NO and HCl.

25. i) Apply Bent rule and explain the hybridisation of PCl_3F_2.
ii) Write a brief note on the following i) levelling effect ii) conjugate acid and base. (5+5)

26. i) How is lattice energy determined theoretically?
ii) Highlight the factors that affect lattice energy. (5+5)

27. Discuss the structure and stoichiometry of (i) zinc blende (ii) calcium fluoride.

28. Explain the following types of reaction in liquid ammonia with suitable examples.
(i) Precipitation (ii) Complex formation (iii) Alkali metal

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