LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

SECOND SEMESTER – **APRIL 2023**

UCH 2502 – CHEMICAL BONDING AND MAIN GROUP ELEMENTS

Date: 03-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

Part-A

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

1. Write Born-Lande equation and mention the terms involved in it.
2. Define solvation energy.
3. Mention the criteria for selecting a unit cell.
4. Why are F-centers coloured?
5. Comment on the stability of clathrates.
6. Mention the conditions for the formation of hydrogen bond.
7. Why are alkali metals generally kept in kerosene?
8. Draw the structure of beryllium chloride in the gaseous and solid states.
9. How are nitrides classified?
10. Draw the structure of sodium nitroprusside.

Part-B

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

11. Explain the properties of ionic compounds.
12. Illustrate the Fajans' rule and covalent character in ionic compounds.
13. Write the differences between crystalline and amorphous solids.
14. Sketch the following types of crystal lattice.
    (i) simple cubic (ii) fcc (iii) bcc.
15. What are the consequences of hydrogen bonding on the properties of compounds?
16. Define hydrates and clathrates. How are they formed? Give examples.
17. Illustrate the extraction of beryllium from its principal ore.
18. Discuss the anomalous behavior of beryllium.
19. Explain the oxoacids of phosphorus.
20. Explain the preparation and properties of diborane.
21. Write a short note on three dimensional silicates.
22. Draw the structure of zinc blende and wurtzite.

Part-C

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

23a. Explain the factors that affect the formation of an ionic compound.

b. Construct Born-Haber cycle for the formation of a salt, MX, and calculate the lattice energy of MX from the data given below.

Heat of formation of MX = –550 kJ mol^{-1}
Heat of sublimation of M = +80 kJ mol^{-1}
Heat of dissociation of X_2 = +155 kJ mol^{-1}
Ionization energy of M = +374 kJ mol^{-1}
Electron affinity of X = –343 kJ mol^{-1} (5+5)

24a. Illustrate the crystal structure of sodium chloride.

b. Explain salient features of Schottky and Frenkel defects with examples. (5+5)

25a. Identify the cation which will have greater polarizing power. Justify your answer.
i) Na^+ or Mg^{2+} ii) Cu^{2+} or Ca^{2+} iii) Pb^{2+} or Pb^{4+}
b. Write a short note on catenation. (6+4)

26a. Write a note on London dispersive forces and liquefaction of gases.
b. Write a note on ion dipole-dipole interaction. (5+5)

27a. Discuss the biological importance of alkali metals.
b. How does the basic strength of hydroxides of alkali metals vary down a group? (5+5)

28a. Explain the extraction of boron.
b. Draw the structure of HNO_2, HNO_3, $H_2N_2O_2$ and HN_3. (6+4)

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