

Part B- Structured Essay (110 marks)

- 1.(a)(i) Write the four main type of crystalline solids, giving two examples of each type.
(ii) In each case, indicate the type of bond present.
(iii) Relate the physical properties of the solids in (i) to the type of bonds in (ii). (25 marks)
- (b)(i) Distinguish between crystalline and amorphous solids in terms of bonding.
(ii) What do you understand by the term 'unit cell'?
(iii) Name the seven types of unit cells.
(iv) Define the term 'Coordination number'.
(v) Draw the diagrams for simple cubic, body- centred and face- centred cubic unit cells.
(vi) Calculate the the number of atoms per unit cell and indicate the coordination number for each of the three cubic lattices.
(vii) Draw the unit cell of zinc blende and calculate the number of Zn^{2+} ions and S^{2-} ions per unit cell. (40 marks)
- (c)(i) Write the basic difference between a stoichiometric defect and a non stoichiometric defect.
(ii) What is 'Frenkel defect'? Draw a lattice structure with Frenkel defect.
(iii) What is an 'F- centre? Draw a lattice structure with an F- centre. Write two properties associated with solids with F- centres. (20 marks)
2. (a)(i) Locate all the symmetry planes of H_2O and $PtCl_4^{2-}$ and categorise them.
(ii) Locate the inversion centre, if any, in the molecules/ions $C_5H_5^-$, *trans*- $CHClCHCl$ and SF_6 .
(iii) Determine, giving reasons, the point groups of HF and NO_3^- . (25 marks)