VI\_9: **Zinc Blend (ZnS) structure:**

 The structure of ZnS is identical to diamond structure except that the two interpenetrating sub-lattices are occupied by different elements.

 The no of atoms: There are 8 atoms in the eight corners and 6 atoms of the face-centers. So, total no. of sulpher atoms = (1/8 x 8) + (1/2 x 6) = 4, as each eight corner atoms will be shared by eight other cell and each face centered atom will be shared by two cells.

 There are 8 tetrahedral voids at each corner of the cubic cell. Zn will exist in alternate void and the no. of Zn atoms=4. As Zn atom will lie on alternate tetrahedral void, there are 4 Zn atoms and hence four out of eight tetrahedral void will remain blank.



 ZnS is an ionic crystal and should be written as Zn2+, S2-

 Atomic radius of Zn2+ = 0.74 Å and that of S2- = 1.84 Å.

 

 As rs $>$ rZn , atoms with bigger radius (i.e., Sulpher) will make tetrahedral structure.

 Tetrahedral voids are formed on the body diagonal.

 Every Zn2+ is surrounded by 4 +, S2- ions and every +, S2- ion is surrounded by 4 Zn2+ ions. So the co-ordination number of both the ions is 4.

 

 For ZnS,

 4( rZn + rS ) = $\sqrt{3}$ a,

 or, a = $\frac{4}{\sqrt{3}}$ (( rZn + rS ), where rZn and rS are the radii of Zn2+ and S2- respectively. (As there are 4 ions each, we are multiplying by 4).

 Total volume of the four Zn2+ is {4 x $\frac{4}{3}$ $π$ rZn3} and that of the four S2- is {4 x $\frac{4}{3}$ $π$ rS 3}.

 

 

 Important compounds having this (ZnS like) structure are semiconductors In, Sn, and GaAs, CuCl, CdS,

AgI, ZnSe, SiC etc.

[The [crystalline](https://www.toppr.com/guides/chemistry/the-solid-state/crystalline-and-amorphous-solids/) solids are characterized by their space lattices and close packing of atoms. However, these [structures](https://www.toppr.com/guides/business-management-entrepreneurship/organizing/structure-of-organization/) have some gaps in their arrangement we call voids.

 A regular tetrahedron is one in which all four faces are equilateral triangles. In geometry, an equilateral triangle is a triangle in which all three sides are equal. The angles between the arms are 600.]

Method of drawing the structure:





