

Unit
1
The Solid State

Voids or Holes:

Placing third layer over second layer can be done in two ways.

- **Covering tetrahedral voids:**

In this case the spheres of third layer are exactly aligned with the spheres of first layer.

This gives AB AB pattern. It is called as Hexagonal close packed structure with condition number 12.

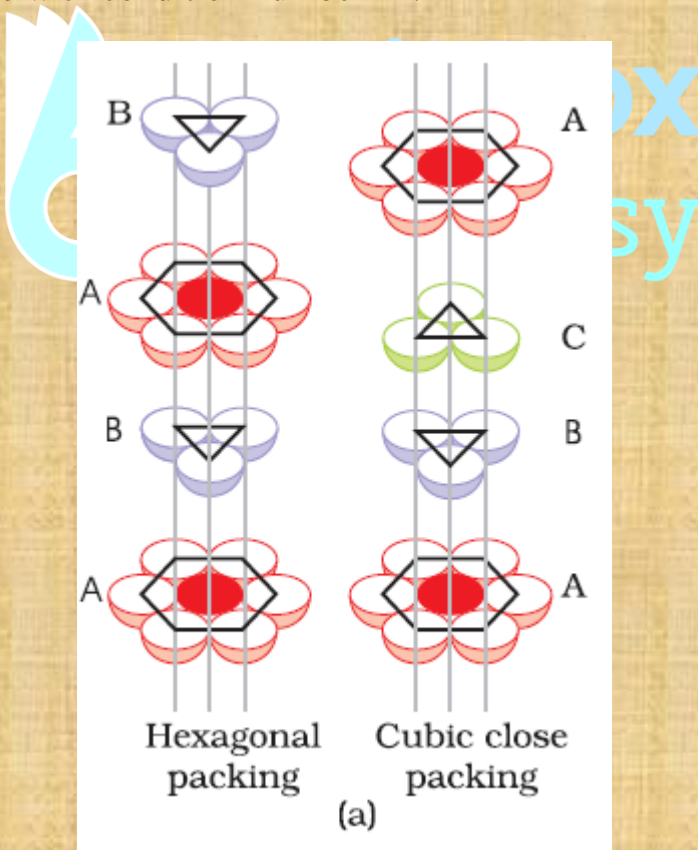


Fig. (a) Hexagonal cubic close-packing exploded view showing stacking of layers of spheres

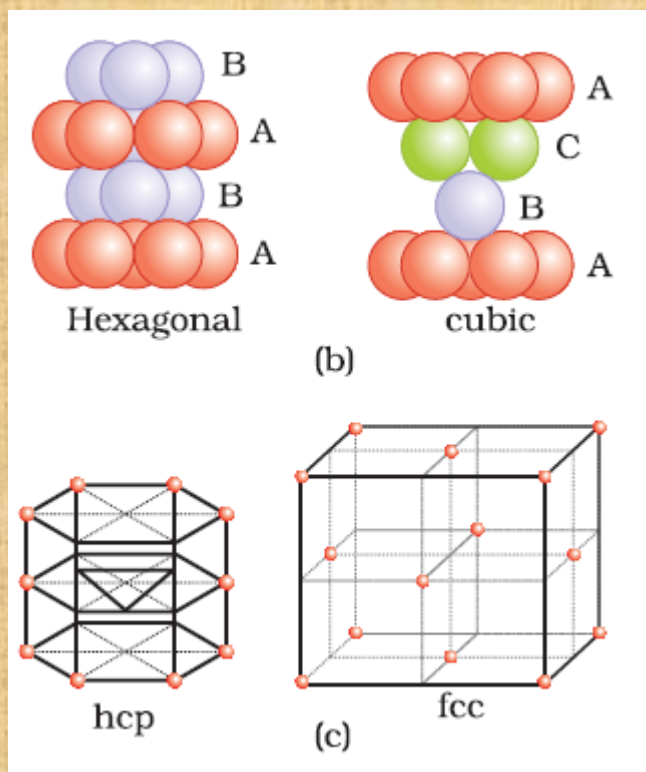


Fig. (b) four layers stacked in each case and (c) geometry of packing.

Covering octahedral void:

The spheres of third layer are not aligned with the spheres of first or second layer.

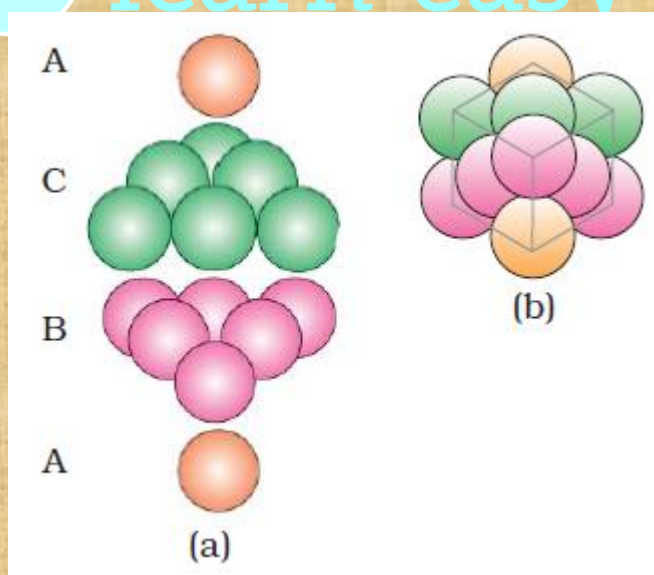


Fig. (a) ABCABC...arrangement of layers when octahedral void is covered (b) fragment of structure formed by this arrangement resulting in cubic closed packed (ccp) or face centred cubic (fcc) structure.

This gives ABC ABC pattern. It is called as Cubic close packed structure with coordination number 12.

Types of voids:

Tetrahedral void (or) Hole:

A tetrahedron is formed when the centres of four spheres are joined.

The no of tetrahedral voids in close packed structures are $2N >$

They can be located in body diagonal at $1/4^{\text{th}}$ distance from each corner.

