

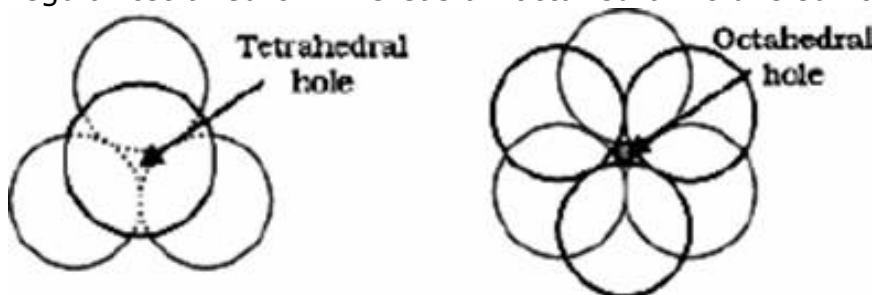
## Solid State

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**Q. 1.** (i) What are voids? (ii) How a tetrahedral void is different from octahedral void? (iii) Draw structure of tetrahedral and octahedral void.

**Ans .** (i) Atoms and ions are spherical in shape. A crystal is formed by close packing of atoms or ions. Since, spheres touch each other only at points, and some empty space is left between them. This space is called void or hole.

(ii) A tetrahedral void is surrounded by four spheres (atoms), which lie at vertices of regular tetrahedron whereas an octahedral void is surrounded by six spheres (atoms).



**Q . 2.** The density of an atom is  $7.2 \text{ g cm}^{-3}$ . It has bcc structure. The edge length is 288 pm. The number of atoms of element 208g of element has is.

**Ans.**

$$\text{Volume of unit cell} = (288 \text{ pm})^3 = 28.8 \times 10^{-24} \text{ cm}^3$$

$$\text{Volume of 208 g of element} = \frac{\text{mass}}{\text{density}} = \frac{208}{7.2} = 28.8 \text{ cm}^3$$

$$\frac{\text{Volume of element}}{\text{Volume of unit cell}} = \frac{28.8 \text{ cm}^3}{28.8 \times 10^{-24} \text{ cm}^3} = 1 \times 10^{24}$$

$\therefore$  In bcc unit cell has 2 atoms

$$\therefore \text{Total number of atoms in 208 g of element} = 2 \times 1 \times 10^{24} = 2 \times 10^{24} \text{ atoms}$$

**Q. 3.** Define (i) Schottky defect (ii) Frenkel defect (iii) Point defects (iv) Interstitials (v) Vacancy

**Ans. (i) Schottky defect** – It is caused when cation and anion both are missing from crystal. The number of missing cations and anions are equal in order to maintain electrical neutrality. The density of substance having Schottky defect decreases.

**(ii) Frenkel defect** – It is caused due to shifting of ion from its position to an interstitial position. The density of substance is not affected.

**(iii) Point defect** – These defects are caused due to deviation from ideal arrangement around point or atom in a crystalline substance. They arise due to error at a single point

**(iv) Interstitials** – Atoms or ions which occupy interstitial positions in a crystal are called interstitials.

**(v) Vacancy** – When any of the constituent particles is missing from crystal lattice, the unoccupied position is called vacancy.