Information about Cube :-

Alternate :-

(i) No. of alternate Faces = 2

(ii) No. of alternate Corner = 4

(iii) no. of alternate edges = 4

Contribution of a atom in a Unit Cell :-

(1) Atom present at Corner. = 1/8

8 room ek Common.

(2) Atom present at Face centre = 2/1

(3) Atom present at edge centre. = 1/4

(4) Atom present at body centre = 1

Ques. To determine empirical formula of following.

Ques (1) A → present at each corner of cube

B → — " — at — " — face centre of cube

Sol. $A \longrightarrow 8 \times \frac{1}{8} = 1$

$B \longrightarrow 6 \times \frac{1}{2} = 3$ $\Rightarrow AB_3$

Q.2. In above Ques, if one of the A atom is missing from one corner the — " —

Sol. $A \longrightarrow 7 \times \frac{1}{8} = \frac{7}{8}$; $B \longrightarrow 6 \times \frac{1}{2} = 3$

$A\frac{7}{8}\ B_3 \Rightarrow A_1 B_{2\frac{1}{4}}$ Ans.

Q.3. A → at each corner + each face centre of cube

B → — " — edge centre + Body centre.

Sol. $A \rightarrow 8 \times \frac{1}{8} + 6 \times \frac{1}{2} \Rightarrow A = 4$

$B \rightarrow 12 \times \frac{1}{4} + 1 \times 1 \Rightarrow B = 4$

$\Rightarrow A_4 B_4 \Rightarrow AB$

Q.4. In above Que; if all the atoms along one body diagonal are removed. then formula

Sol: 2 Corners & 1 Body centre are missing.

$$A \rightarrow \overset{3}{\cancel{6}} \times \frac{1}{\cancel{8}_{4}} + \overset{3}{\cancel{6}} \times \frac{1}{\cancel{2}} \Rightarrow A = \frac{3}{4} + 3$$

$$A = \frac{15}{4}$$

$$B \rightarrow \overset{3}{\cancel{12}} \times \frac{1}{\cancel{4}} + 0 \Rightarrow B = 3$$

$\rightarrow A_{\frac{15}{4}}\ B_3$

$A_{15}\ B_{12}$

$A_5\ B_4$

Primitive Cubic / Simple Cubic U.C.

(S.C.)

Atoms are present only at corners

is k/a Primitive / Simple Cubic U.C.

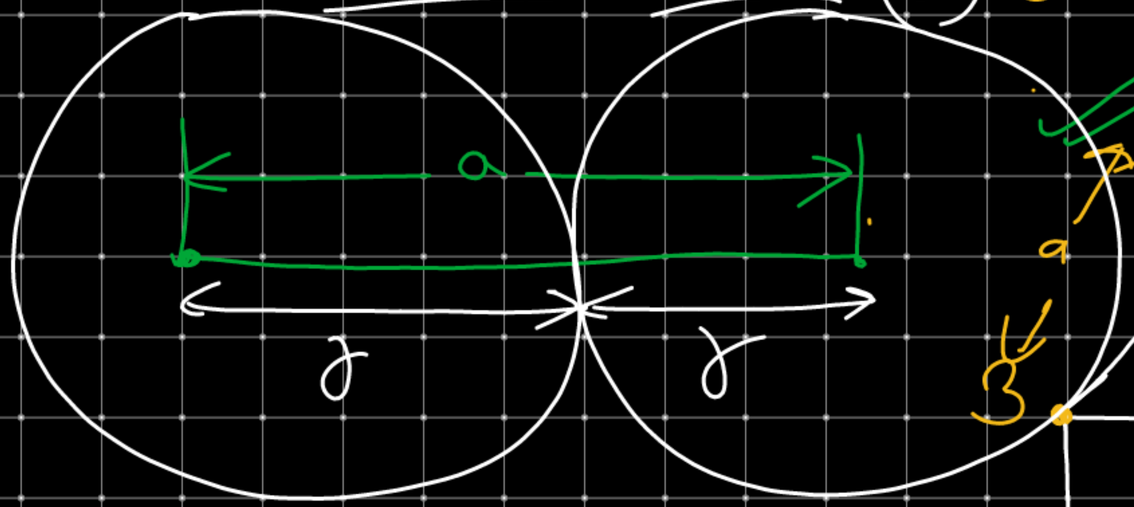
(1) Effective no. of atoms present / Unit cell

(Z)

$$Z = 8 \times \frac{1}{8} = 1 \text{ atom / U.C.}$$

(2) Relation B/w edge length and radius

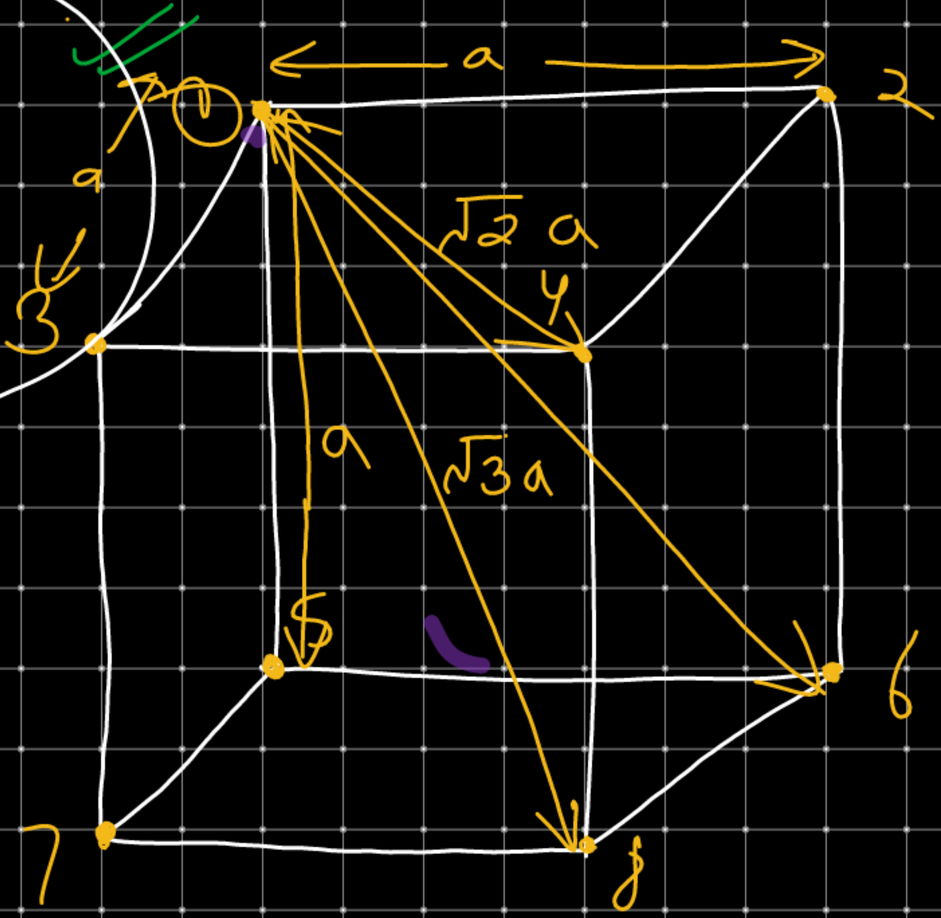
(a)



$$2r = a$$

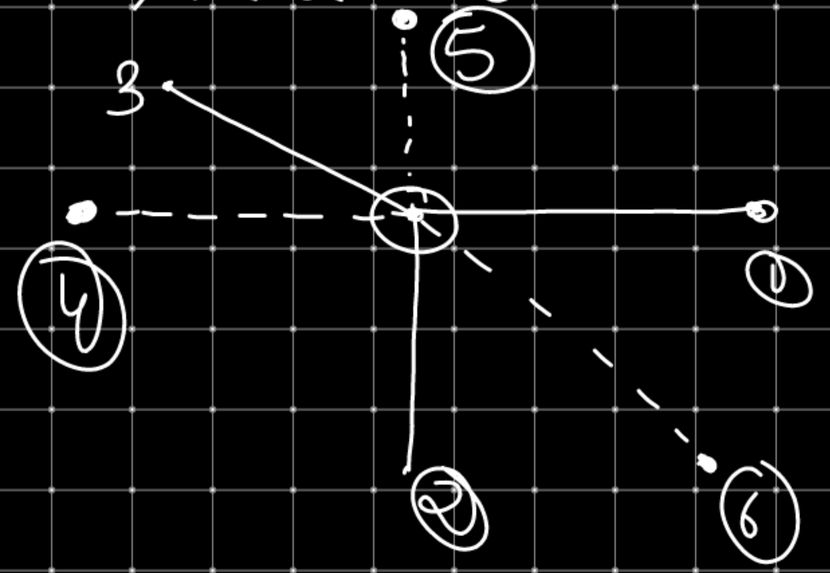
or $$\boxed{r = a/2}$$

(b)



(3) Co-ordination Number :- (C.N.)

Nearest number of atom.



C.No. = 6

nearest distance blw two atoms = a

(4) Packing efficiency (P.E.) :-

$$P.E. = \frac{\text{Volume Covered by atoms / U.C.}}{\text{Total Volume of Cube.}} \times 100$$

$$P.E = \frac{Z \times \frac{4}{3}\pi r^3}{a^3} \times 100$$

$$P.E. = \frac{1 \times \frac{4}{3}\pi r^3}{a^3} \times 100$$

$$\{a = 2r\}$$

$$P.E = \frac{\frac{4}{3}\pi r^3}{2r \times 2r \times 2r} \times 100$$

$$\boxed{P.F. = \frac{\pi}{6}}$$

$$P.E = \frac{\pi}{6} \times 100 = \frac{3.14}{6} \times 100$$

$$P.E. = \frac{314}{6} \Rightarrow 52.33$$

$$\boxed{P.E = 52.33}$$

$$P.E. = 52.4\%$$

$$\text{Void} = 100 - 52.4$$

$$\text{Void} = 47.6\%$$