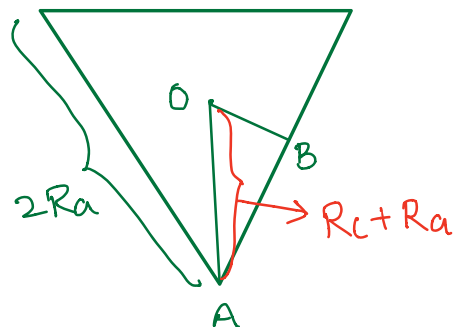
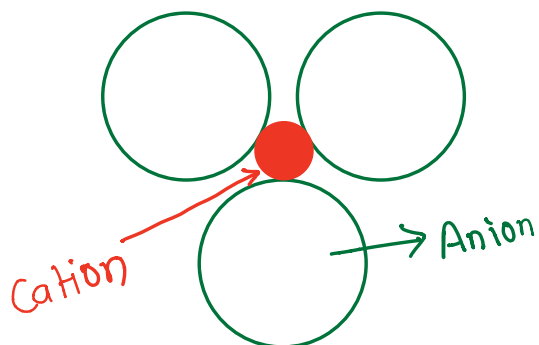


For CN-3 Triangular co-ordination



Here,

$$AB = R_a$$

$$AO = R_c + R_a$$

$$\cos 30^\circ = \frac{AB}{AO} = \frac{\sqrt{3}}{2}$$

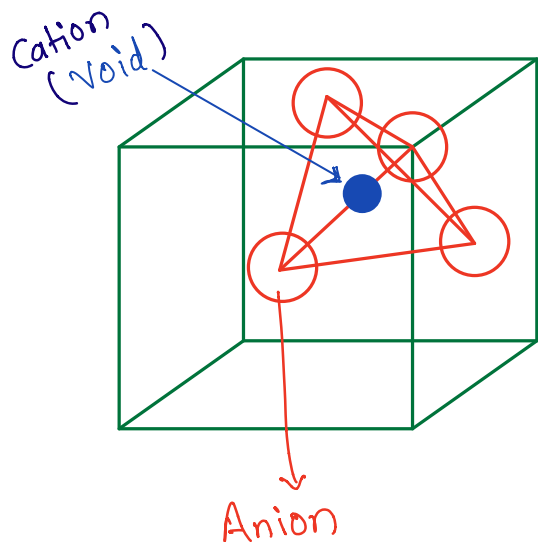
$$\Rightarrow \frac{AB}{AO} = \frac{R_a}{R_c + R_a} = \frac{\sqrt{3}}{2}$$

$$\frac{R_a}{R_c} + 1 = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \frac{R_c}{R_a} = \frac{2}{\sqrt{3}} - 1$$

$$\frac{R_c}{R_a} = 0.155$$

For CN-4 Tetrahedral co-ordination



$$R_c + R_a = \frac{1}{4} \times \text{Body diagonal} \\ = \frac{1}{4} \times a\sqrt{3} \quad \text{--- (1)}$$

In FCC

$$4R_a = a\sqrt{2} \quad \text{--- (2)}$$

$$a = \frac{4R_a}{\sqrt{2}}$$

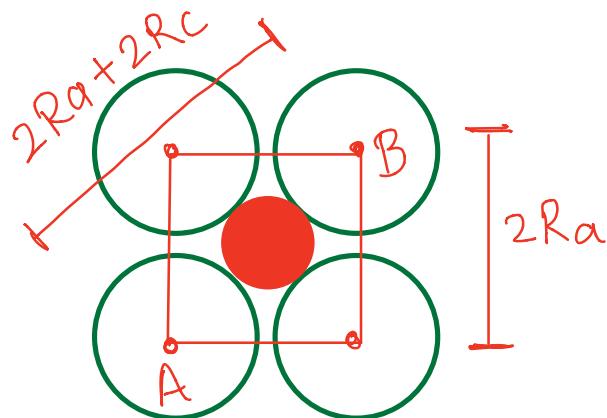
Therefore,

$$\text{equ}^n \text{ (1)} \Rightarrow R_c + R_a = \frac{1}{4} \times \frac{4R_a}{\sqrt{2}} \sqrt{3} \\ = \sqrt{\frac{3}{2}} R_a$$

$$\frac{R_c}{R_a} + 1 = \sqrt{\frac{3}{2}}$$

$$\frac{R_c}{R_a} = 0.225$$

For CN-6 Octahedral co-ordination



Here,

$$2R_a + 2R_c = \sqrt{(2R_a)^2 + (2R_a)^2}$$

$$= 2\sqrt{2} R_a$$

$$2R_a + 2R_c = 2\sqrt{2} R_a$$

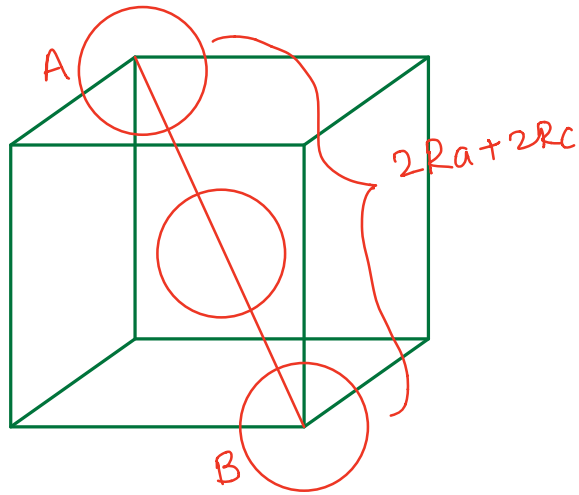
$$2R_c = 2\sqrt{2} R_a - 2R_a$$

$$= 2R_a (\sqrt{2} - 1)$$

$$\frac{R_c}{R_a} = \sqrt{2} - 1$$

$$\frac{R_c}{R_a} = 0.414$$

For CN-8 Cubic co-ordination



AB - Body diagonal

$$= a\sqrt{3}$$

$$AB = 2\sqrt{3} R_a$$

$$\therefore a = 2R_a$$

$$2R_a + 2R_c = 2\sqrt{3} R_a$$

$$\begin{aligned} 2R_c &= 2R_a\sqrt{3} - 2R_a \\ &= 2R_a(\sqrt{3} - 1) \end{aligned}$$

$$\frac{R_c}{R_a} = 0.732$$