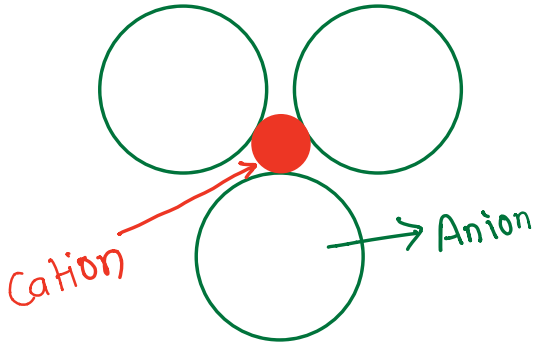
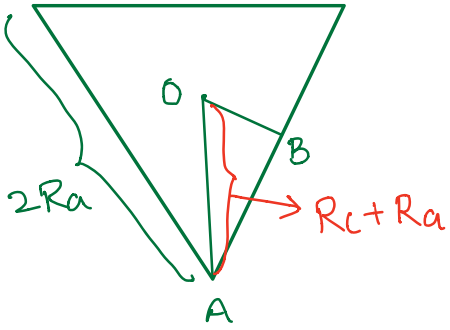
For CN-3 Triangular co-ordination





Here,

$AB = Ra$

$AO = Rc + Ra$

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

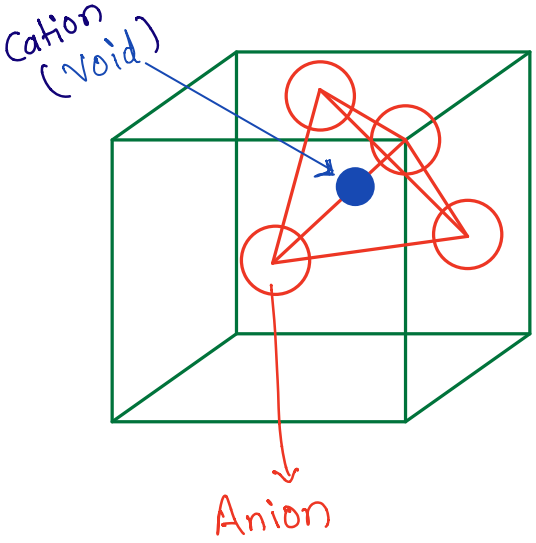
$$\Rightarrow \frac{AB}{AO} = \frac{Ra}{Rc+Ra} = \frac{\sqrt{3}}{2}$$

$$\frac{Ra}{Rc} + 1 = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \frac{Rc}{Ra} = \frac{2}{\sqrt{3}} - 1$$

$$\boxed{\frac{Rc}{Ra} = 0.155}$$

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,

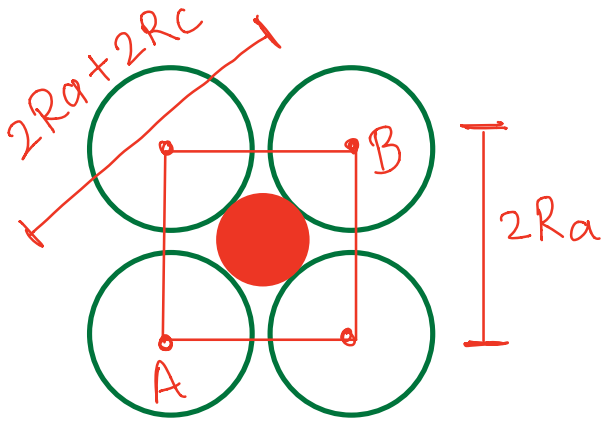
$$\text{equn (1)} \Rightarrow R_c + R_a = \frac{1}{4} \times \frac{4R_a\sqrt{3}}{\sqrt{2}}$$

$$= \sqrt{\frac{3}{2}}\, R_a$$

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

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

For CN-6 Octahedral co-ordination



Here,

$$2Ra + 2Rc = \sqrt{(2Ra)^2 + (2Ra)^2}$$

$$= 2\sqrt{2}\,Ra$$

$$2Ra + 2Rc = 2\sqrt{2}\,Ra$$

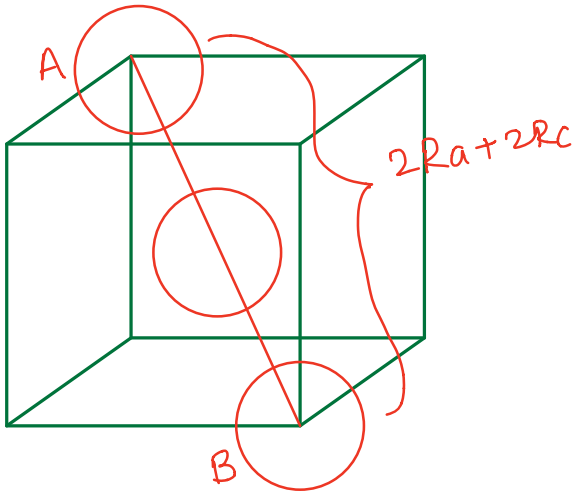
$$2Rc = 2\sqrt{2}Ra - 2Ra$$

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

$$\frac{Rc}{Ra} = \sqrt{2}-1$$

$$\boxed{\frac{Rc}{Ra} = 0.414}$$

For CN-8 Cubic co-ordination



AB – Body diagonal

$= a\sqrt{3}$

$AB = 2\sqrt{3}\,Ra$

$\therefore \quad a = 2Ra$

$2Ra + 2Rc = 2\sqrt{3}\,Ra$

$2Rc = 2Ra\sqrt{3} - 2Ra$

$= 2Ra\,(\sqrt{3} - 1)$

$$\frac{Rc}{Ra} = 0.732$$