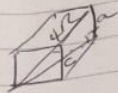


Model answer BCC APF

BCC Vol of unit cell

Face of cube 

Diagonal $c^2 = a^2 + a^2$
 $c = \sqrt{2a^2} = \sqrt{2} a$



$$(4R)^2 = a^2 + c^2$$
$$= a^2 + (\sqrt{2}a)^2$$

$$16R^2 = a^2 + 2a^2$$
$$16R^2 = 3a^2$$

$$\frac{16R^2}{3} = a^2$$

$$\sqrt{\frac{16R^2}{3}} = a$$

$$\frac{4R}{\sqrt{3}} = a$$

$$\text{Volume of unit cell} = a^3 = \left(\frac{4R}{\sqrt{3}} \right)^3$$



$$= \sqrt{2}a = \sqrt{2}a$$

$$(4R)^2 = a^2 + c^2$$

$$= a^2 + (\sqrt{2}a)^2$$

$$16R^2 = a^2 + 2a^2$$

$$\frac{16R^2}{3} = a^2$$

$$\sqrt{\frac{16R^2}{3}} = a$$

$$\frac{4R}{\sqrt{3}} = a \quad R = \frac{\sqrt{3}a}{4}$$

$$\text{Volume of unit cell} = a^3 = \left(\frac{4R}{\sqrt{3}}\right)^3$$

$$\text{APF} = \frac{\text{Vol atoms}}{\text{Vol cell}} = \frac{2 \left(\frac{4}{3}\pi R^3\right)}{\left(\frac{4R}{\sqrt{3}}\right)^3}$$
$$= 2 \left(\frac{4}{3}\pi \left(\frac{\sqrt{3}a}{4}\right)^3\right)$$

$$= \frac{\sqrt{3}\pi}{8} = 0.68$$

$$= \frac{\sqrt{3}\pi a^3}{8} = \frac{\sqrt{3}\pi \left(\frac{4R}{\sqrt{3}}\right)^3}{\left(\frac{4}{\sqrt{3}}R\right)^3}$$