3.

Simple cubic crystal

→ It is a primitive cell
→ It has an atom at each of its corners
→ No. of atoms per unit cell = $8 \times \frac{1}{8}$

$\qquad\qquad\qquad\qquad\qquad$ = 1 atom

→ Coordination number = 6
→ Atomic radius $r = a/_2$, where a is length of the side of cube.

We know $a = 2r$

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

Volume of cubic unit cell = $a^3 = (2r)^3$

$\qquad\qquad\qquad\qquad\qquad\qquad$ = $8r^3$

simple cubic contains only one atom $\left(V = \frac{4}{3}\pi r^3\right)$

$$\text{packing efficiency} = \frac{\text{volume of one atom}}{\text{volume of cubic unit}}$$

$$= \frac{\frac{4}{3}\pi r^3}{8r^3} \times 100$$

$$= \frac{\pi}{6} \times 100$$

$$= 52.4\%$$

void space = 47.6%