(II) No. of nearest neighbour or co-ordination number.

$$4+4+4 = 12$$

⇒ Close pack structure.

* fcc is called cubic close packed crystal.

(III) Nearest neighbour distance

$$2r = \frac{\sqrt{2}a}{2} = \frac{a}{\sqrt{2}}.$$

(IV) Next nearest neighbour = 6.

(V) Next nearest neighbour distance = a.

(VI) Volume of unit cell = a^3.

(VII) Volume of primitive unit cell = $a^3/4$.

(VIII) Number density = $4/a^3$.

(IX) Packing fraction = $\frac{4 \times \frac{4}{3}\pi r^3}{(2\sqrt{2}r)^3} = \frac{\pi}{3\sqrt{2}}$

$= 0.74 \Rightarrow 74\%$

(X) Packing is closed

(XI) Examples are- Copper, Au, Ag etc.

Planner density (Areal density) of different Planes :→

	Properties.	SC	bcc	fcc.
(i)	No. of atoms on (1, 0, 0)-plane. or {1,0,0}	1	1	2
(ii)	Area of (100) plane	a^2	a^2	a^2
(iii)	Density	$1/a^2$	$1/a^2$	$2/a^2$
(IV)	A.P.F = $\frac{\text{Area of the atom in that plane}}{\text{Area of plane}}$	$\frac{1 \times \pi r^2}{a^2} = \frac{\pi}{4} = 0.78$. $= 78\%$	$\frac{3\pi r^2}{16r^2} = \frac{3\pi}{16}$ 59%	$\frac{2 \times \pi r^2}{4 \times 2r} = \frac{\pi}{4}$

Q. In fcc with $a = 2A^\circ$ calculate no. of atom on 1 mm^2 area of 100 plane of fcc.

Soln:-

$$a = 2A^\circ = 2 \times 10^{-7} mm.$$

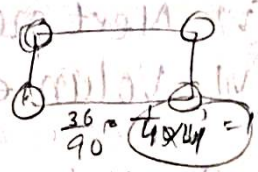
$$a^2 = 4 \times 10^{-14} mm^2 = \underline{2 \text{ atom}}$$

No. of atom on 1 mm^2 area.

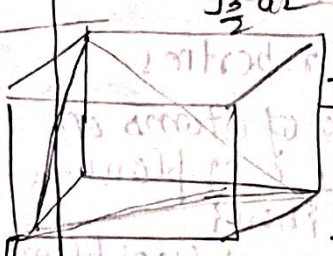
$$= \frac{1}{4 \times 10^{-14}} \times 2.$$

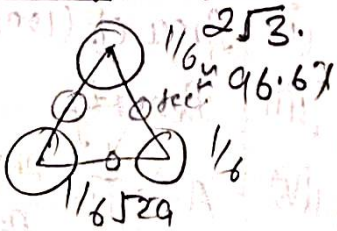
$$= 0.5 \times 10^{+14}.$$

No. of atom 1 mm^2 area $= 5 \times 10^{13}$. Ans.



	Properties.	S.C.	bcc	fcc
(i)	No. of atom on (1,0,0) plane or {1,0,0}	1	2	2
(ii)	Area of plane	$\sqrt{2}a^2$	$a^2\sqrt{2}$	$a^2\sqrt{2}$
(iii)	Density	$1/\sqrt{2}a^2$	$\sqrt{2}/a^2$	$\sqrt{2}/a^2$
(iv)	A.P.F.	$\frac{1 \times \pi r^2}{\sqrt{2} \times 4r^2}$ $\pi/4\sqrt{2}$	$\frac{2 \times \pi r^2 \times 3}{\sqrt{2} \times 16 r^2}$ $\frac{3\pi}{8\sqrt{2}}$	$\frac{2 \times \pi r^2}{\sqrt{2} \times 4 \times r \times r}$ $\frac{\pi}{4\sqrt{2}}$
(i) (111)	No. of atom on	1/2	1/2	$\frac{1}{2} + \frac{1}{2} + 1 = 2$
(ii)	Area of plane	$\frac{\sqrt{3}}{2}a^2$	$\sqrt{3}/2\, a^2$	$\frac{\sqrt{3}}{2}a^2$
(iii)	Density	$\frac{1}{2}\frac{\rho}{\sqrt{3}a^2} = \frac{1}{\sqrt{3}a^2}$	$1/\sqrt{3}a^2$	$\frac{1}{\sqrt{3}}a^2$
(iv)	A.P.F.	$\frac{\frac{1}{2} \times \pi r^2}{\frac{\sqrt{3}}{2} \times 4r^2} = \frac{\pi}{4\sqrt{3}}$	$\frac{\pi r^2 \times 8}{\frac{\sqrt{3}}{2} \times 16 r^2} = \frac{\sqrt{3}\pi}{16}$ $= \frac{\pi}{\sqrt{3}}$	$\frac{\pi}{2\sqrt{3}}$.





Area of triangle $= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4} \times 2a^2 = \frac{\sqrt{3}}{2}a^2$

Area of triangle $= \frac{1}{2}a^2$