Closest packed plane in

sc – 100
bcc – (110)
fcc = 111

In all plane mon closest plane of all cubic crystal are.

① fcc (111) which A.P.f is. = $\pi/2\sqrt{3}$ = 96.6%

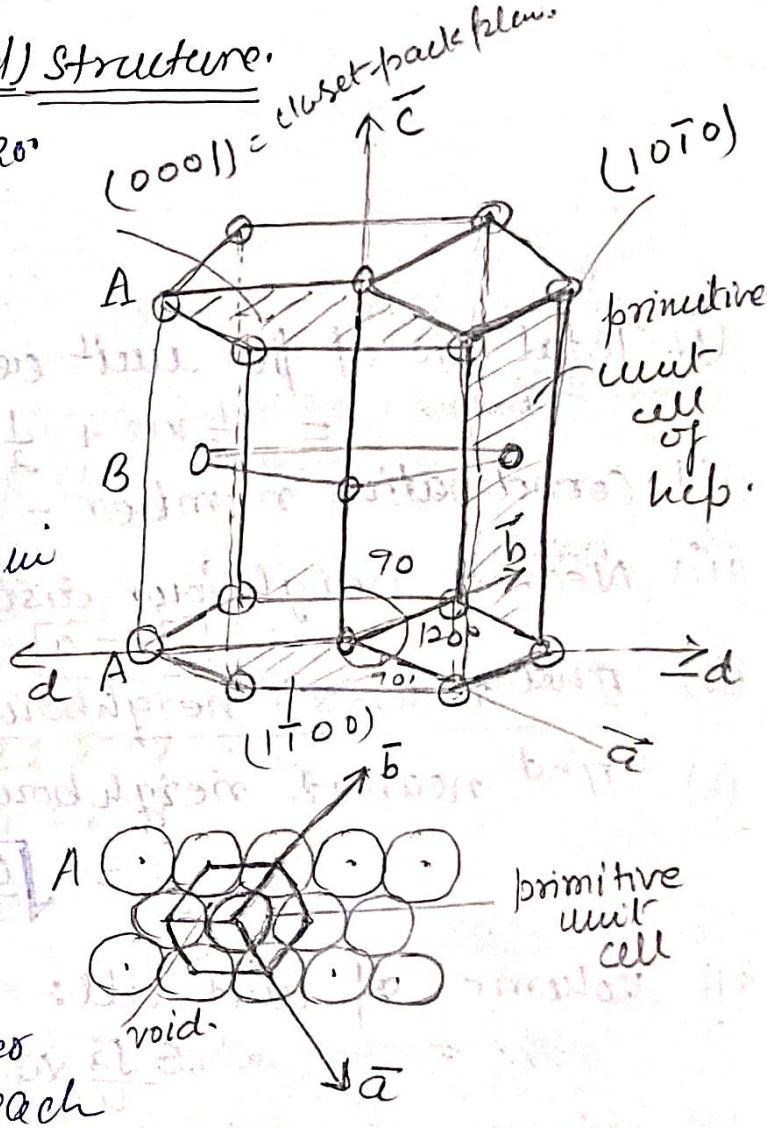
Maximum distance volume covered in 3D is 74%

* hcp (Hexagonal close packed) Structure.

$a = b \neq c$, $\alpha = \beta = 90°$, $\gamma = 120°$

* hcp lattice (crystal) is not Bravais lattice. But We can consider this crystal system in term of simple hexagonal crystal.

In hcp each body centered atom in lowest upper plane is surrounded by 6 atom.



* The three void are touch each other if we put any atom either on (1,3,5) position or (2 4,6) position.

If we put B layer above the A layer the center of atom touch each other. Then ABABAB type of staking is form in hcp.

If we put 3rd layer atom on center of AB then the structure of 2,4,6 position will be ABC, ABC, ABC is known as fcc.

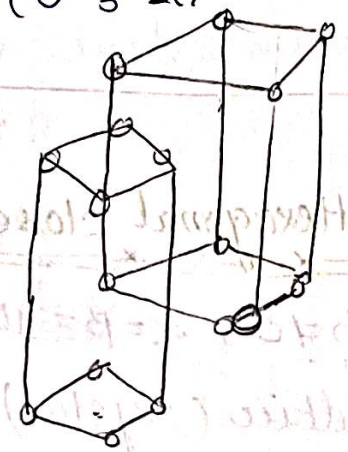
(i) No of atom per unit cell = 2.

(ii) No of atom in primitive unit cell = 2.

(iii) Effective atom per unit cell is density = 1

Note:- The lattice of hcp can be consider as simple Hexagonal if we choose 2 atoms basis. If 1 atom is at (0,0,0) the position of other atom is at $(\frac{1}{3}, \frac{2}{3}, \frac{1}{2})$.

This is interpenetration of two simple Hexagonal cell.



(i) Total no. of per unit cell.

$= \frac{1}{6} \times 12 + \frac{1}{2} \times 2 + 3 = 6.$

(ii) Coordination number = 6 + 3 + 3 = 12.

(iii) Nearest neighbour distance.

$\boxed{2r = a}$

(iv) IInd nearest neighbour = 2.

(v) IInd nearest neighbour distance

$\frac{c}{a} = \sqrt{\frac{8}{3}} = 1.633$; c is height.

(vi) Volume of unit cell :-

$6 \frac{\sqrt{3}}{4} \times a^2 \times c = \frac{3\sqrt{3}}{2} a^2 c$

(Six equilateral triangle area)

(vii) Volume of primitive unit cell is $\frac{\sqrt{3}}{2} a^2 c$ { $\frac{1}{3}$ of V.

(viii) Number density : $\frac{4}{\sqrt{3} a^2 c}$