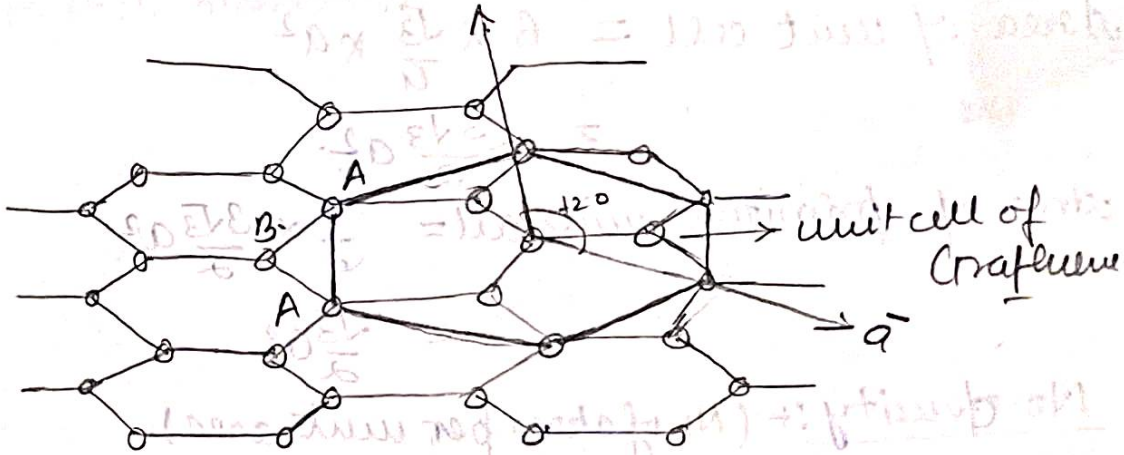
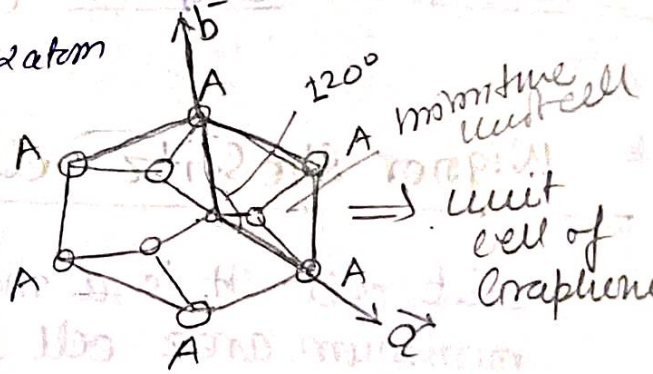
Graphene Structure :=>

* It is 2D structure.



→ It consist of carbon atom.
→ It is a layered str and each carbon atom is covalentaly bonded with three carbon atom
→ It is 2D. Hexagonal structure.
→ It do not have any unit cell. (since A and B can't be considered as two lattice point.
→ If they are at the same lattice point surrounding would be identical and A & B should share the same lattice point.
→ It lattice is simple Hexagonal with 2 atom basis.
→ Unit cell of Graphene has hexagonal form
→ a → lattice parameter
$\gamma = 120°$ (For Hexagon)

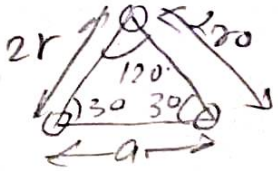


(i) No. of atom per unit cell.

$$4 + \frac{1}{3} \times 6 = 6.$$

(ii) Cordination number is = 3 :-

(iii) Nearest neighbour distance.



$$\boxed{2r = a\sqrt{3}.}$$

(iv) No. of second nearest neighbour are - 6

(v) Distance of second nearest neighbour is - $a\sqrt{2}$.

(vi) Area of unit cell $= 6 \times \frac{\sqrt{3}}{4} \times a^2$

$= \frac{3\sqrt{3}}{2} a^2$.

(vii) Area of primitive unit cell $= \frac{1}{6} \times \frac{3\sqrt{3}}{2} a^2$

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

(viii) No. density :- (No of atom per unit area).

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

(ix) A.P.F. $= \frac{6 \times \pi r^2}{\frac{3\sqrt{3}}{2} a^2} = \frac{2 \times \pi \times r^2}{\frac{\sqrt{3}}{2} \times 4r^2 \times 3} = \frac{\pi}{3\sqrt{3}}$ [disk area $= \pi r^2$

$\simeq 60\%$.

(x) Packing + Loose packed.

(xi) Example - Graphene. (only).

* Wigner Seitz cell :- Wigner Seitz cell is primitive unit cell. It is a minimum volume cell in 3D and minimum area cell in 2D.

Lattice

direct lattice

Reciprocal lattice.