


Crystal lattice & Unit cell.

* Crystal lattice or space lattice.

⇓
repeating arrangement of
called as lattice points. (atoms, molecule or ions)
in space.

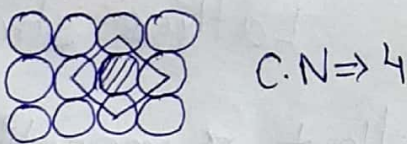
~~Unit cell~~ → ~~The repeating unit~~.

* Types of crystal lattice

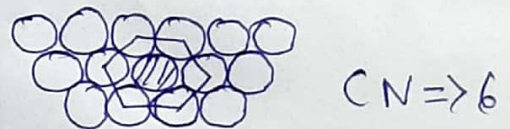
1D Lattice ⇒  C.N. ⇒ 2

2D Lattice ⇒ 5 type. [Square, Rectangular, Parallelogram, Rhombic, Hexagonal]

Square 2D packing.



Hexagonal 2D packing.



3D Lattice ⇒

From square 2D packing.

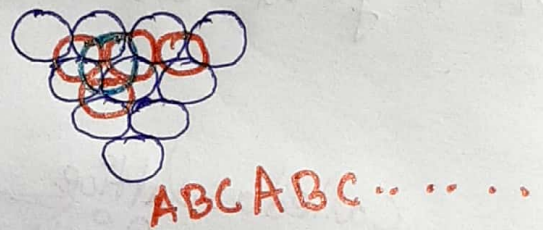
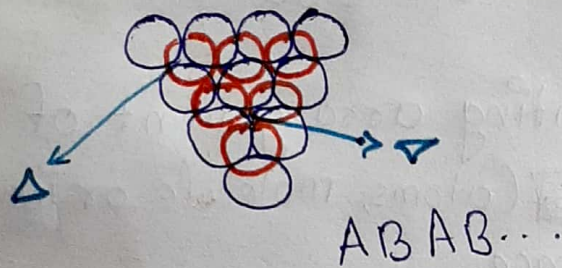


AAA.....



ABAB.....

From 3D packing :-



So in order to understand this whole 3D arrangement. We use Unit cell

So unit cell \Rightarrow smallest repeating unit which can be studied understood or studied for a Lattice structure.

* Unit cell \Rightarrow smallest \times repeating unit.

Parameters \rightarrow edge length $\Rightarrow a, b, c$
 \rightarrow Angles b/n edges $\cdot \alpha, \beta, \gamma$

Based on parameters the unit cell forms 7 crystal systems.

	edge length	axial angles
Triclinic	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma \neq 90^\circ$
Imp. Monoclinic		$\alpha = \gamma = 90^\circ \neq \beta$
* Orthorhombic		$\alpha = \beta = \gamma = 90^\circ$
Hexagonal	$a = b \neq c$	$\alpha = \beta = 90^\circ \neq \gamma = 120^\circ$
Tetragonal		$\alpha = \beta = \gamma = 90^\circ$
Rhombohedral	$a = b = c$	$\alpha = \beta = \gamma \neq 90^\circ$
Cubic		$\alpha = \beta = \gamma = 90^\circ$

These crystal lattice systems based on these arrangements of lattice point forms 14 different Bravais Lattices.

1st member of all 3 groups form 1 each.

Monoclinic & Tetragonal \Rightarrow 2 each

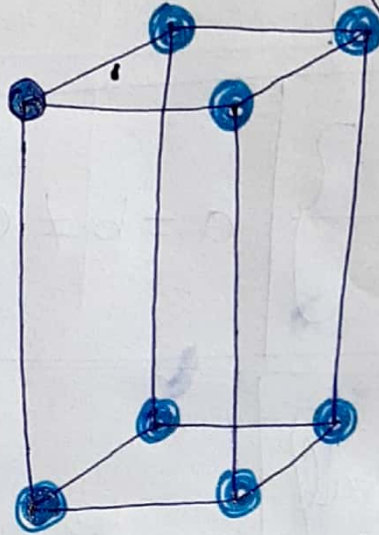
Imp. Question * Orthorhombic \Rightarrow 4

Cubic \Rightarrow 3 \leftarrow main focus \rightarrow

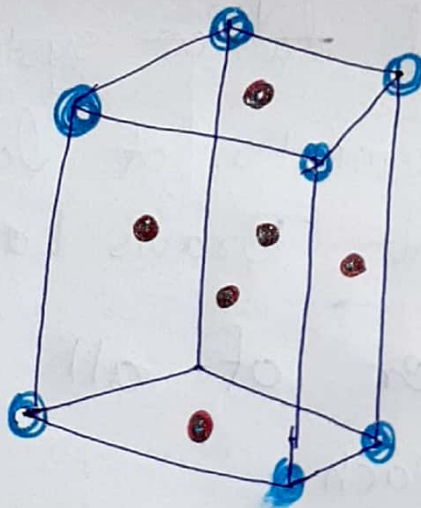
Total Bravais Lattice = 14

* 4 different arrangements of crystal systems.

Primitive \Rightarrow only at corners.



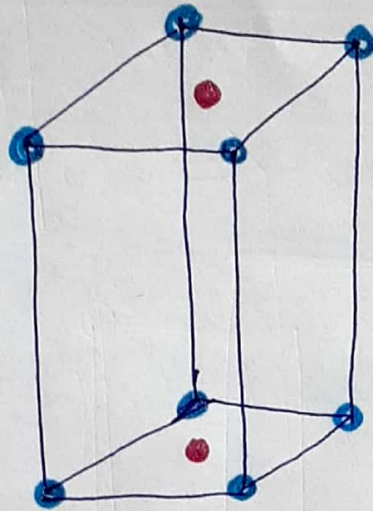
Face centred \Rightarrow corners & Face centre.



End centred



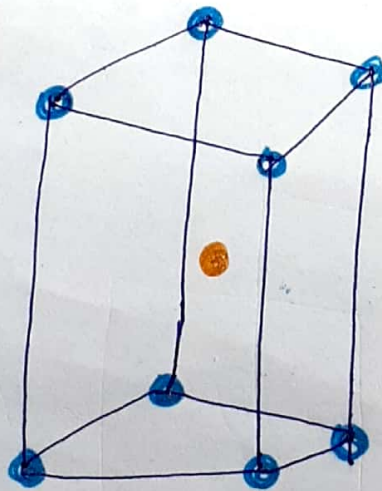
Corners &
any of two
opposite FC



Body centred



Corner &
Body Centre.



* Cubic Bravais Lattices

Simple cubic \Rightarrow only corners
(Primitive)

It is formed from 3D Lattice
of square 2D packing AAA.....



Contribution per unit cell

8 corner contribution per
corner $\frac{1}{8}$

$$\Rightarrow 8 \times \frac{1}{8} = 1 \text{ particle per unit cell.}$$