

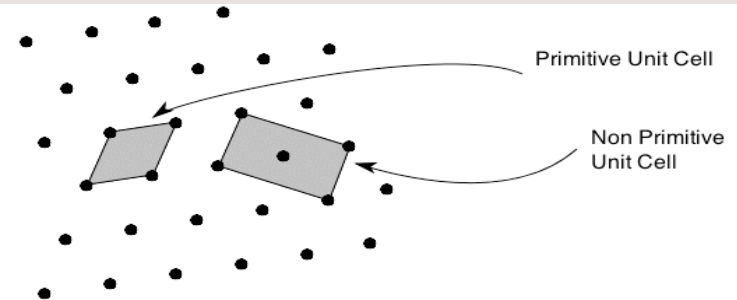
# CRYSTAL LATTICE:

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Crystalline material consists of a regular repetition of a group of atoms in **three-dimensional (3D) space**. **A crystal lattice is an infinitely repeating array of points in space .**

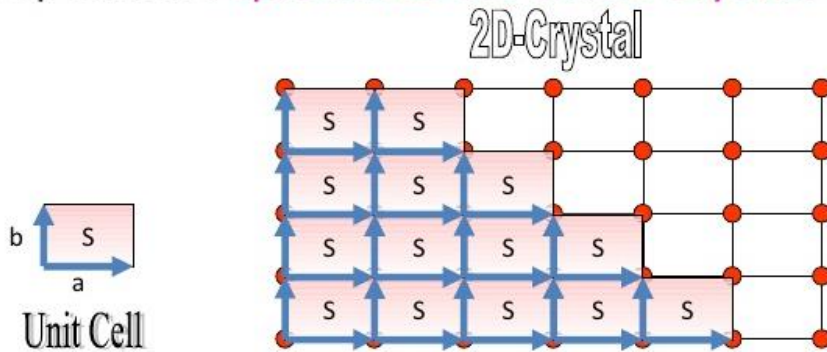
# UNIT CELL:

The smallest repeating unit of the **crystal lattice** is the unit cell, the building block of a crystal. In three dimensions the unit cell is any parallelepiped whose vertices are lattice points, in two dimensions it is any parallelogram whose vertices are lattice points.



# Unit Cell in 2D

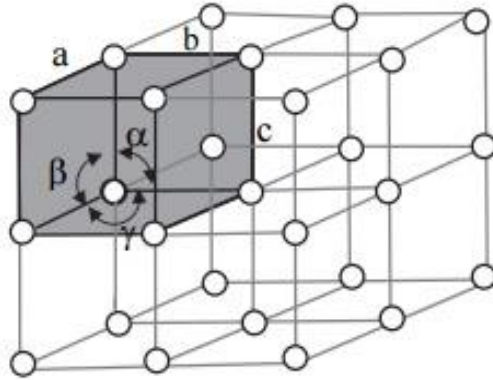
- The smallest component of the crystal (group of atoms, ions or molecules), which when stacked together with pure translational repetition reproduces the whole crystal.



## 2-DUNIT CELL



Unit cell



A Portion of a Three Dimensional Cubic Lattice and its Unit Cell

# 3D-UNIT CELL

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There are only **SEVEN** different shape of **UNIT** cell which can staked together to completely fill all space (3-Dimension) without overlapping and gives seven crystal system and belong to one of 14 **Bravais lattice**.

Therefore, the all-crystalline material have seven crystal system and 14 Bravais Lattice

	System	Parameters	Angles
1.	Cubic	$a = b = c$	$\alpha = \beta = \gamma = 90^\circ$
2.	Tetragonal	$a = b \neq c$	$\alpha = \beta = \gamma = 90^\circ$
3.	Orthorhombic	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90^\circ$
4.	Hexagonal	$a = b \neq c$	$\alpha = \beta = 90^\circ, \gamma = 120^\circ$
5.	Trigonal	$a = b = c$	$\alpha = \beta = \gamma \neq 90^\circ$
6.	Monoclinic	$a \neq b \neq c$	$\alpha = \gamma = 90^\circ, \beta \neq 90^\circ$
7.	Triclinic	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma \neq 90^\circ$

#### The Seven Crystal Systems

THE SEVEN CRYSTAL SYSTEMS

Cubic

$$a = b = c$$

$$\alpha = \beta = \gamma = 90^\circ$$

Tetragonal

$$a = b \neq c$$

$$\alpha = \beta = \gamma = 90^\circ$$

Orthorhombic

$$a \neq b \neq c$$

$$\alpha = \beta = \gamma = 90^\circ$$

Rhombohedral

$$a = b = c$$

$$\alpha = \beta = \gamma \neq 90^\circ$$

Hexagonal

$$a = b \neq c$$

$$\alpha = \beta = 90^\circ$$

$$\gamma = 120^\circ$$

Monoclinic

$$a \neq b \neq c$$

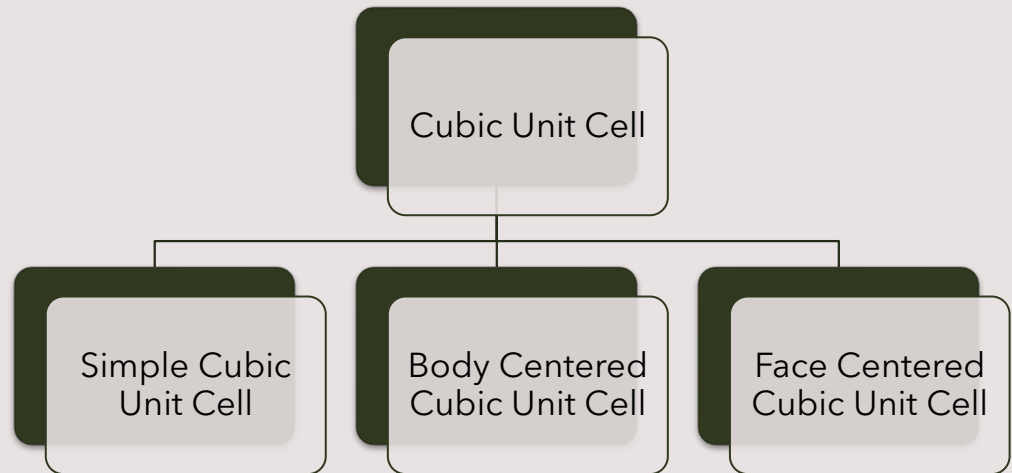
$$\alpha = \gamma = 90^\circ \neq \beta$$

Triclinic

$$a \neq b \neq c$$

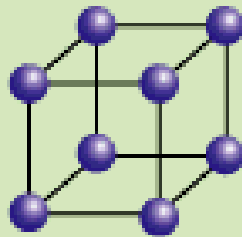
$$\alpha \neq \beta \neq \gamma \neq 90^\circ$$

# CUBIC UNIT CELL

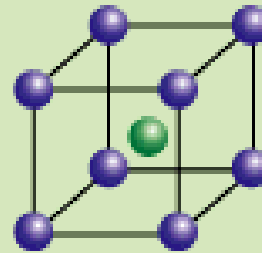
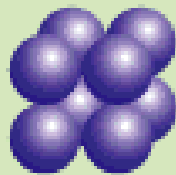


# CUBIC UNIT CELL

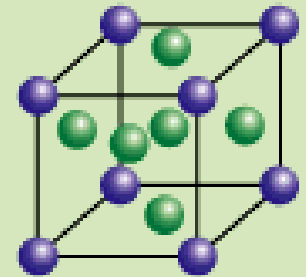
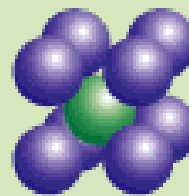
## Cubic Unit Cells



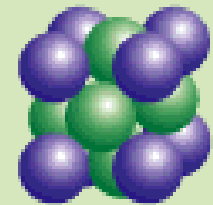
*Simple cubic*



*Body-centered cubic*

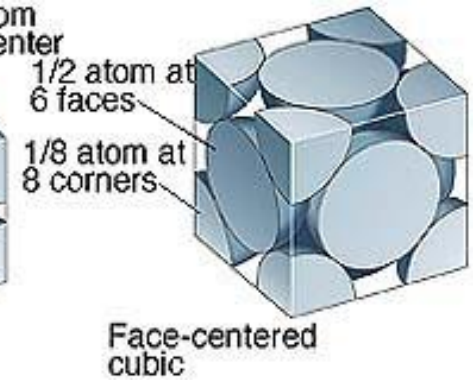
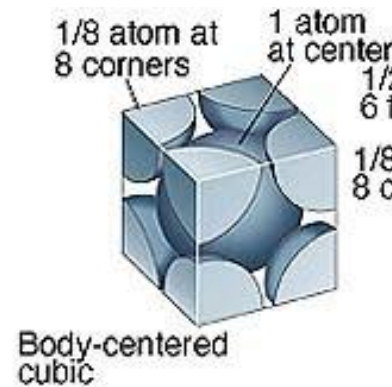
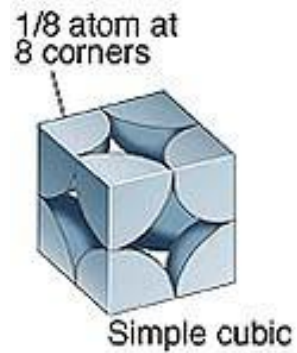


*Face-centered cubic*





# CUBIC UNIT CELL



# CUBIC UNIT CELL

#	Properties	Simple Cubic	Body Centered Cubic System	Face Centered Cubic System
1	Unit Cell Volume	$a^3$	$a^3$	$a^3$
2	No. of atom per unit cell	1	2	4
3	Co-ordination No. (CN)	6	8	12
4	Atomic Radius	$\frac{a}{2}$	$(r = \frac{\sqrt{3}}{4} a)$	$(r = \frac{\sqrt{2}}{4} a)$
5	Packing Factor	0.52	0.68	0.74
6	Example	Po	Fe	Al

# CUBIC UNIT CELL

**For detail APF follow the link below:**

<https://drive.google.com/file/d/1ziV3WxBTxpADOA19pdhTXK8xwcjNAhm5/view?usp=sharing>

Thank You !!



# कोविड १९ से बचाव



भीड-भाड वाली  
जगहों पर न जाएं



स्वस्थ  
जीवनशैली



मास्क पहने



बार-बार  
हाथ धोएं



चीजों को लगातार  
साफ करें