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Subject - Physics

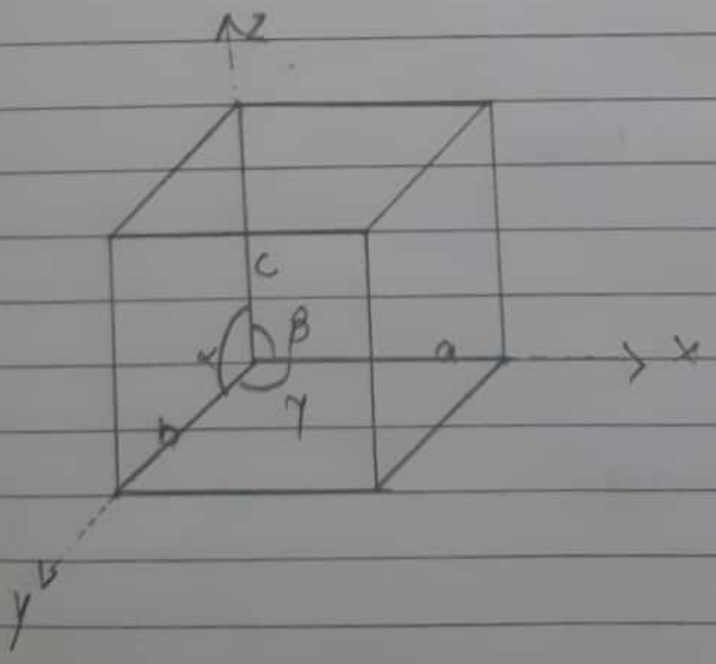
PHYSICS VLAB EXPERIMENT-4
CRYSTAL STRUCTURE

AIM:- To study Various Crystal Structures.

Lattice:- A Crystal structure is formed only when the group of atoms is arranged identically at the lattice point. The group of atoms or molecule is called a basis. Lattice point is actually an imaginary concept.

Lattice + Basis = Crystal Structure

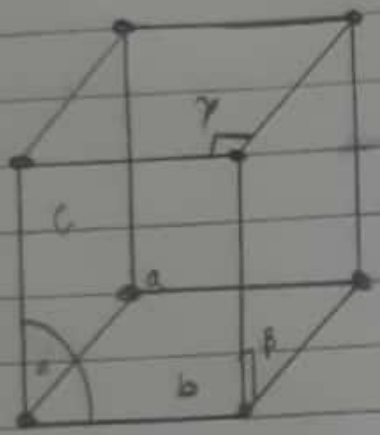
Unit Cell:- unit cell can be considered as building block of crystal. it can be described as the smallest volume which when repeated in all direction gives the crystal. The three edges a, b, c along axis & angle between them α, β & γ is termed as Lattice Parameters.



S no.	Lattice Systems	Simple	Base-Centered	Body Centered	Face-Centered	Example
1	triclinic (none)	$\alpha \neq \beta \neq \gamma \neq 90^\circ$				$CuSO_4.5H_2O$, $K_2Cr_2O_7$
2	monoclinic (1 diad)	$\alpha \neq 90^\circ$, $\beta = \gamma = 90^\circ$	$\alpha \neq 90^\circ$, $\beta = \gamma = 90^\circ$			$CaSO_4 \cdot 2H_2O$, $FeSO_4$, Na_2SO_4
3	orthorhombic (3 diads)	$a \neq b \neq c$	$a \neq b \neq c$	$a \neq b \neq c$	$a \neq b \neq c$	KNO_3, $BaSO_4$
4	rhombohedral (1 triad)	$\alpha = \beta = \gamma \neq 90^\circ$				As, Sb, Bi
5	tetragonal (1 tetrad)	$a \neq c$		$a \neq c$		TiO_2, SnO_2, $NiSO_4$
6	hexagonal (1 hexad)					SiO_2, Zn, Mg, Cd
7	Cubic (4 triads)					Au, Cu, NaCl

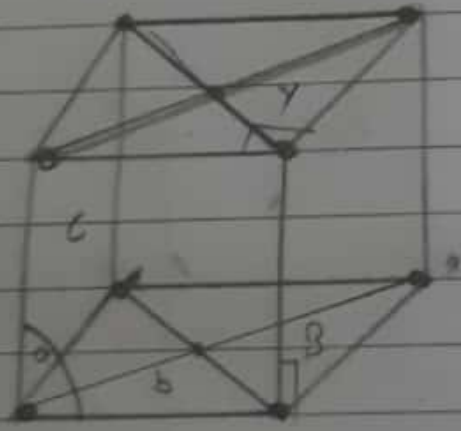
Crystal Structure -

Triclinic
Simple



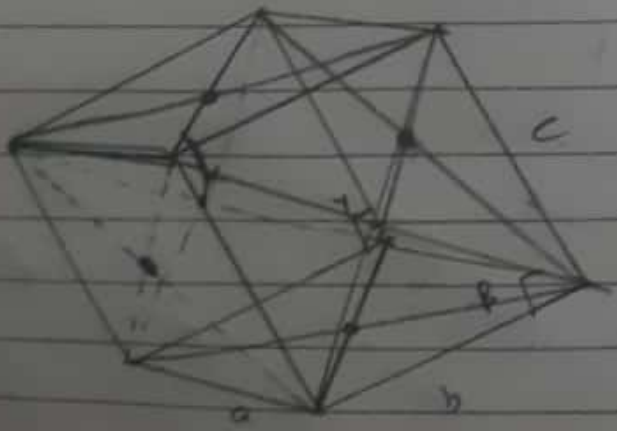
$\alpha \neq 90^\circ \quad \beta = \gamma = 90^\circ$
$a \neq b \neq c$

Monoclinic
Base Centered



$\alpha \neq 90^\circ \quad \beta = \gamma = 90^\circ$
$a \neq b \neq c$

Orthorhombic
face Centered

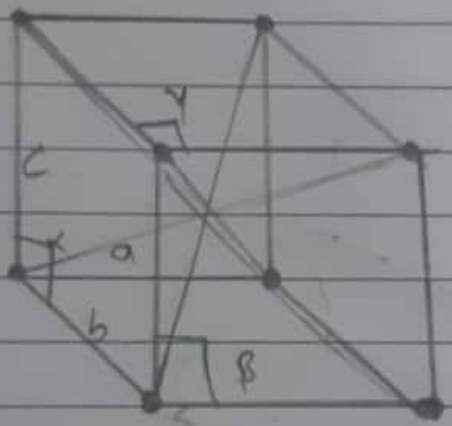


$\alpha = \beta = \gamma = 90^\circ$
$a \neq b \neq c$

Orthorhombic
Simple

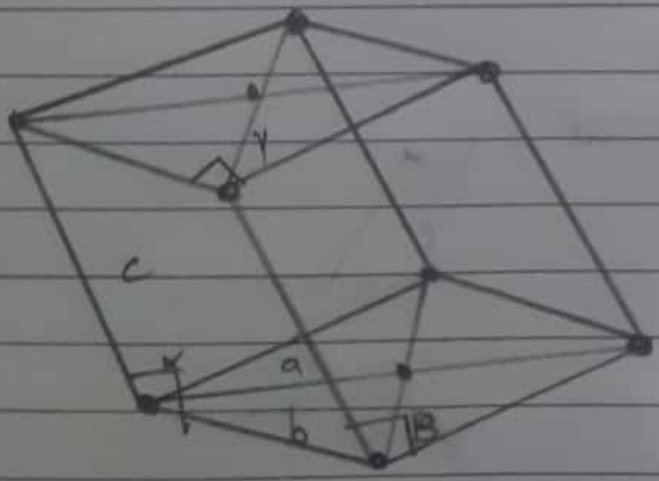
$\alpha = \beta = \gamma = 90^\circ$
$a \neq b \neq c$

Orthorhombic
Body Centered



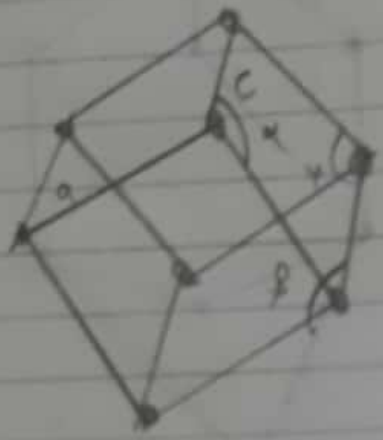
$\alpha = \beta = \gamma = 90^\circ$
$a \neq b \neq c$

Orthorhombic
face Centered



$\alpha = \beta = \gamma = 90^\circ$
$a \neq b \neq c$

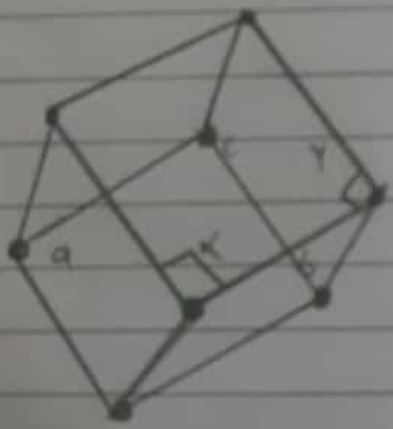
Rhombohedral Simple



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

$a = b = c$

Tetragonal Simple

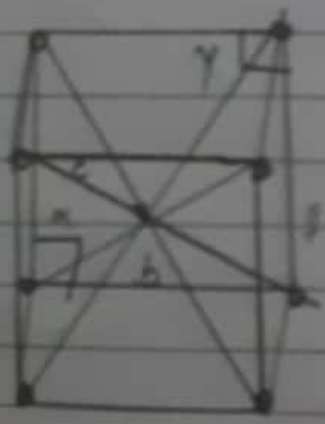


$\alpha = \beta = \gamma = 90^\circ$

~~$a \neq b \neq c$~~

$a = b \neq c$

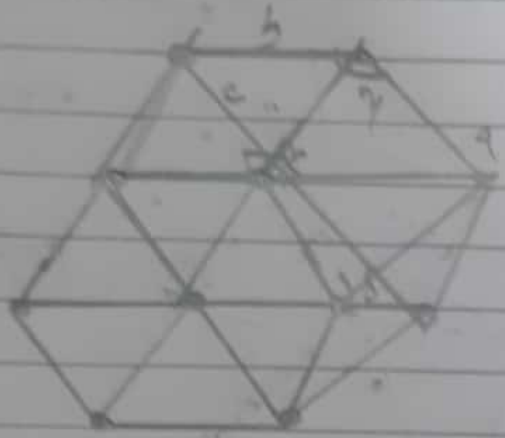
Tetragonal Body Centered



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

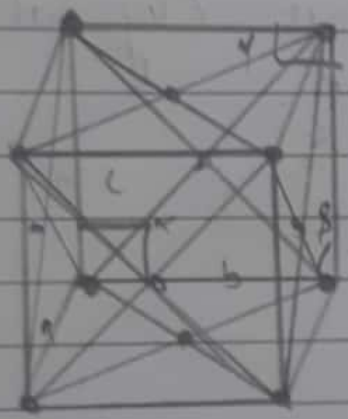
$a = b \neq c$

Hexagonal
Simple



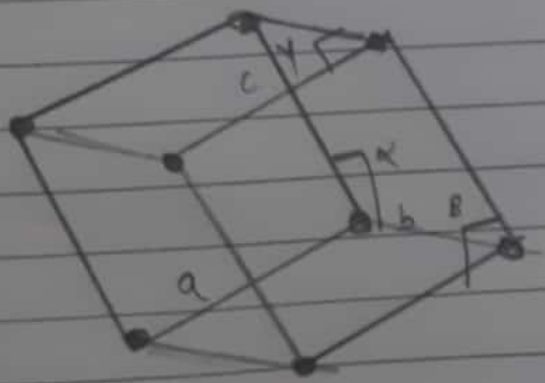
$\alpha = \beta = 90^\circ, \gamma = 120^\circ$
$a = b \neq c$

Cubic
face centered



$\alpha = \beta = \gamma = 90^\circ$
$a = b = c$

Cubic
Simple



$\alpha = \beta = \gamma = 90^\circ$
$a = b = c$

Cubic
Body Centered

$\alpha = \beta = \gamma = 90°$
$a = b = c$

Result:- The various Crystal lattices are observed & studied.