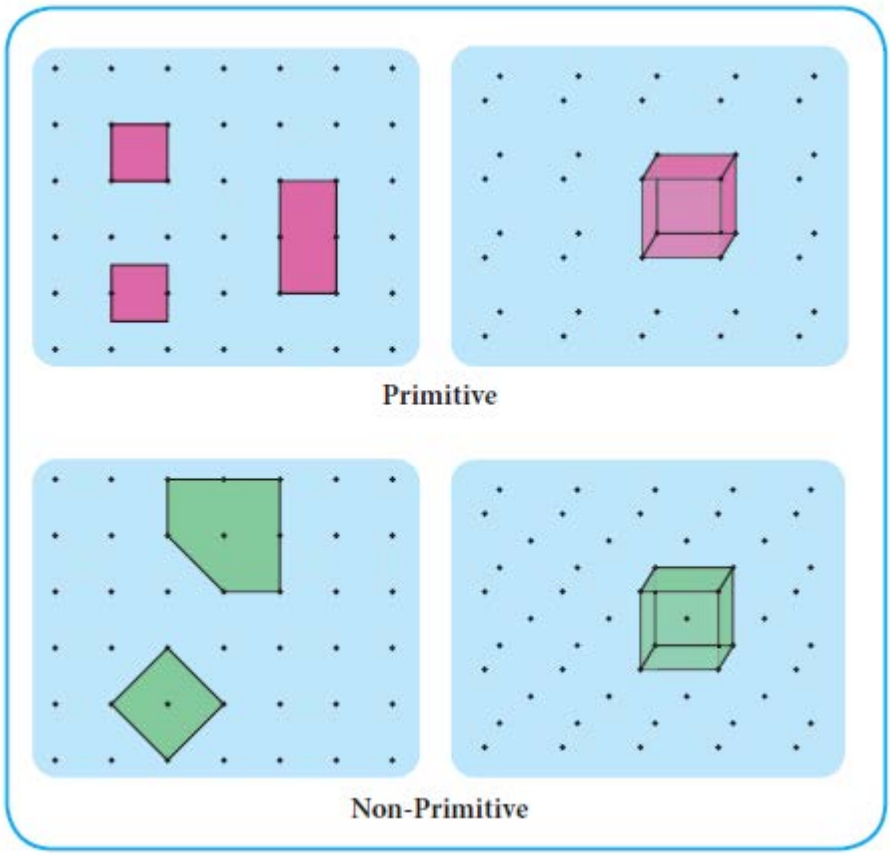
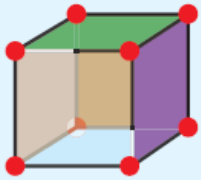
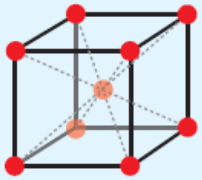
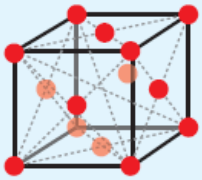
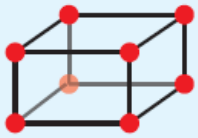
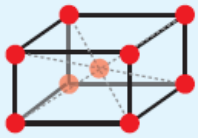
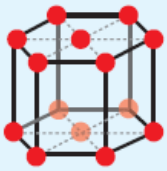
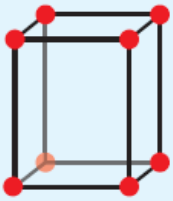
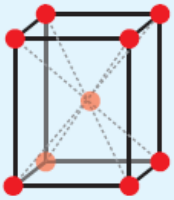
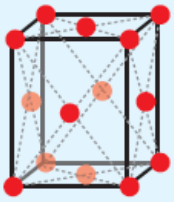
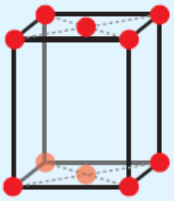
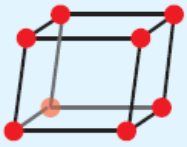
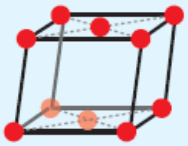
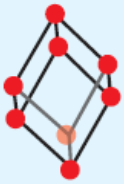
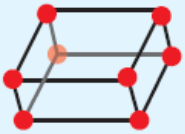
Primitive and non-primitive unit cell

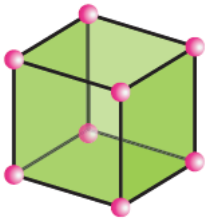
There are two types of unit cells: primitive and non-primitive. A unit cell that contains only one lattice point is called a primitive unit cell, which is made up from the lattice points at each of the corners.

In case of non-primitive unit cells, there are additional lattice points, either on a face of the unit cell or within the unit cell.



There are seven primitive crystal systems; cubic, tetragonal, orthorhombic, hexagonal, monoclinic, triclinic and rhombohedral. They differ in the arrangement of their crystallographic axes and angles. Corresponding to the above seven, Bravis defined 14 possible crystal systems as shown in the figure.

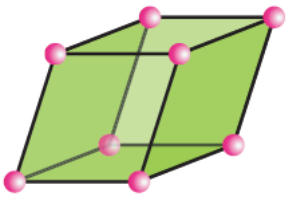
cubic	 primitive	 body centered	 face centered	
tetragonal	 primitive	 body centered		
hexagonal				
orthorhombic	 primitive	 body centered	 face centered	 basis face centered
monoclinic	 primitive		 basis face centered	
trigonal				
triclinic				



Cubic

$a = b = c$

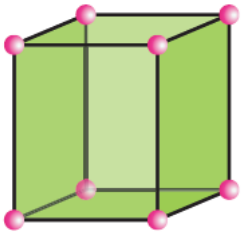
$\alpha = \beta = \gamma = 90°$



Rhombohedral

$a = b = c$

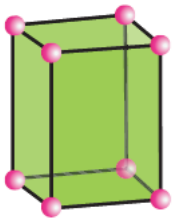
$\alpha = \beta = \gamma \neq 90°$



Hexagonal

$a = b \neq c$

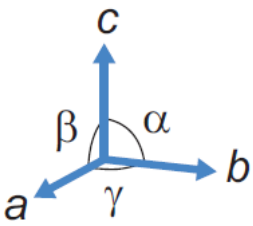
$\alpha = \beta = 90°, \gamma = 120°$

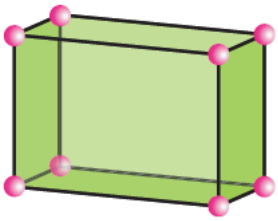


Tetragonal

$a = b \neq c$

$\alpha = \beta = \gamma = 90°$

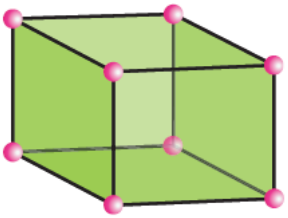




Orthorhombic

$a \neq b \neq c$

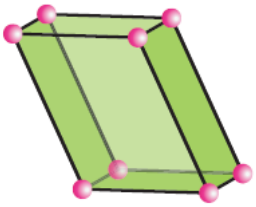
$\alpha = \beta = \gamma = 90°$



Monoclinic

$a \neq b \neq c$

$\alpha = \gamma = 90°, \beta \neq 90°$



Triclinic

$a \neq b \neq c$

$\alpha \neq \beta \neq \gamma \neq 90°$