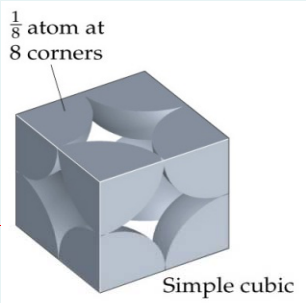
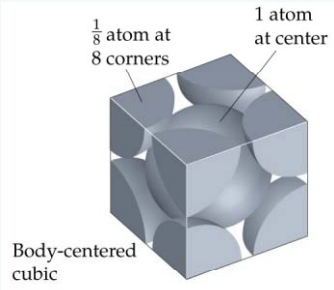
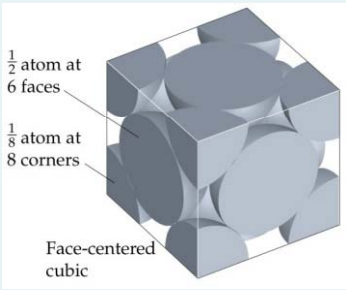


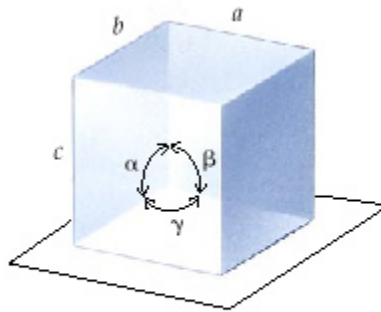
Summary of Unit Cells

Unit Cell	Structure	Atoms Touch along	# atoms	% space occupied
Primitive (simple cubic)	 <p>Simple cubic</p>	Edge $a = 2r$	$1/8 \times 8 = 1$	52%
Body-centered cubic (bcc)	 <p>Body-centered cubic</p>	Body diagonal $a\sqrt{3} = 4r$	$1/8 \times 8 = 1$ $1 \times 1 = 1$ Total = 2	68%
Face-centered cubic (fcc)	 <p>Face-centered cubic</p>	Face diagonal $a\sqrt{2} = 4r$	$1/2 \times 6 = 3$ $1/8 \times 8 = 1$ Total = 4	74% densest pack

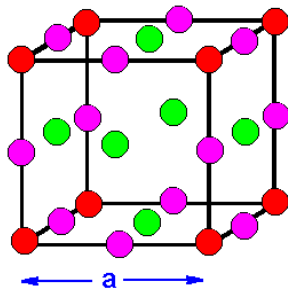
Crystal Lattice: a repeating pattern of atoms, molecules, or ions that extends in three dimensions.

Unit Cell: the smallest unit of a crystal lattice that, when repeated in three dimensions, will reproduce the entire crystal structure.

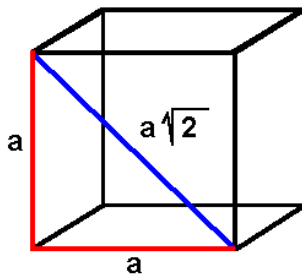
There are only seven types of unit cells known in nature. They are characterized by the relative lengths of the edges and the angles at which the sides meet.



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



Corners = 8
 Faces (sides) = 6
 Edges = 12
 All of the edges of a cube are the same length (a).

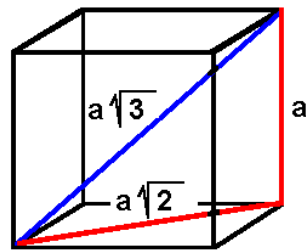


Face Diagonal

$$c = \sqrt{a^2 + a^2}$$

$$c = \sqrt{2a^2}$$

$$c = a\sqrt{2}$$



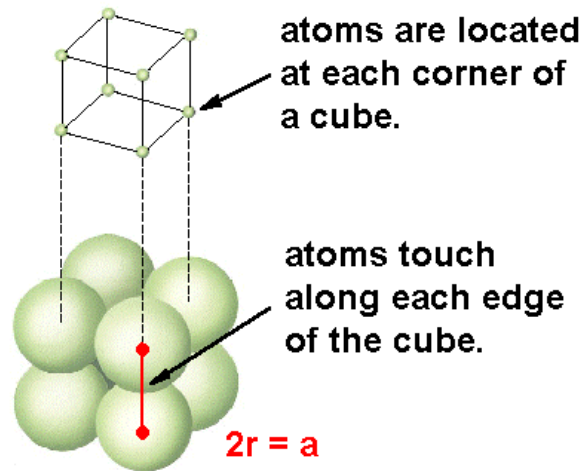
Body Diagonal

$$c = \sqrt{2a^2 + a^2}$$

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

$$c = a\sqrt{3}$$

Simple Cubic Unit Cell (sc)



Body-Centered Cubic Unit Cell (bcc)

