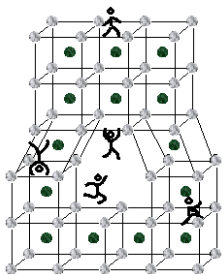


Building A Crystal



- Unit Cells
- Bravais Lattices
- Typical Crystal Lattices
- Miller Indices

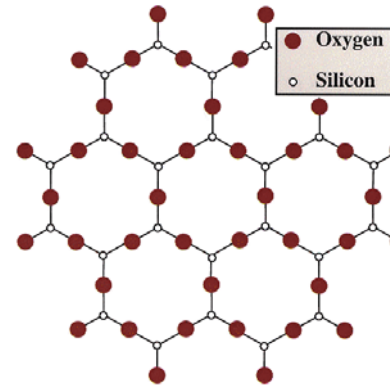
• **HW #2- due 10/10**

Monday
Sept. 1, 2003

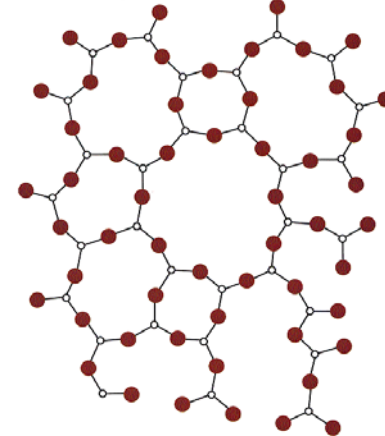
MATS275: INTRODUCTION
TO MATERIALS SCIENCE

Short Range – Long Range Order

Quartz: (Crystalline)
Both Short and Long Range Order



Glass: (Amorphous)
Short Range Order Only



A Unit Cell



M. C. Escher

4 Types of Symmetry

Reflectional



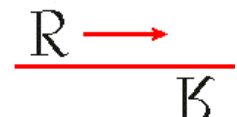
Rotational



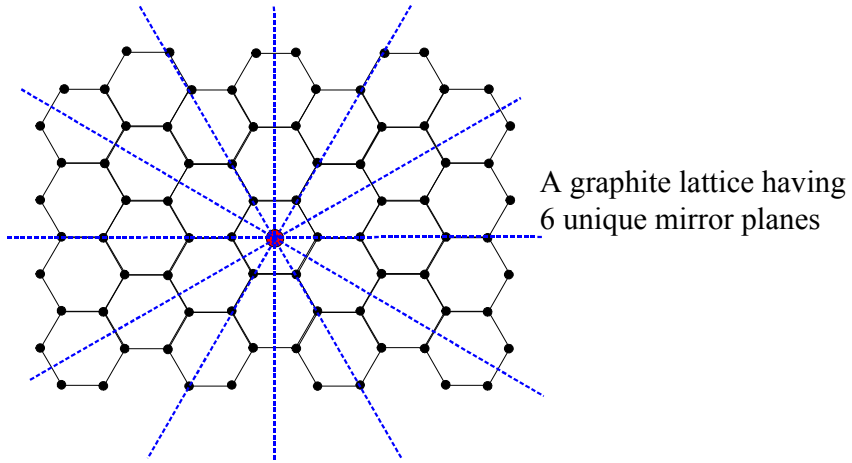
Translational



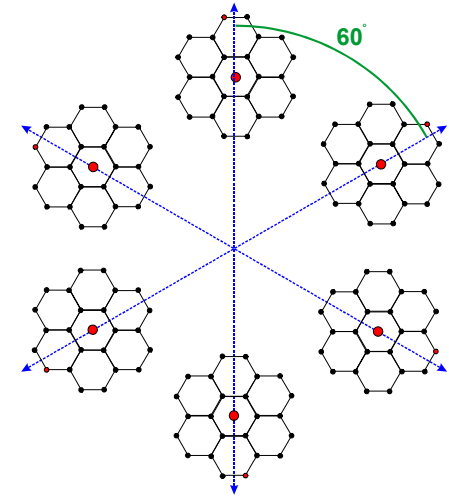
Glide/Reflectional



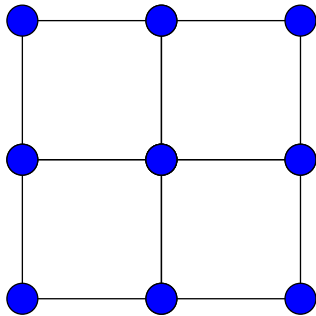
Mirror (Reflection) Symmetry in Graphite



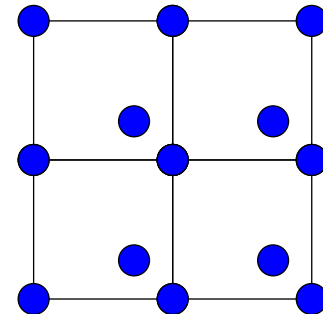
6-fold Rotational Symmetry



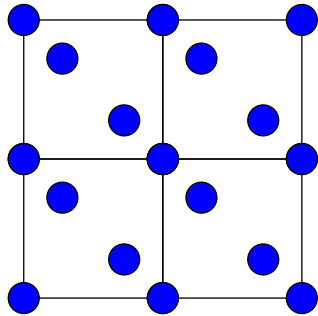
Symmetry Operations



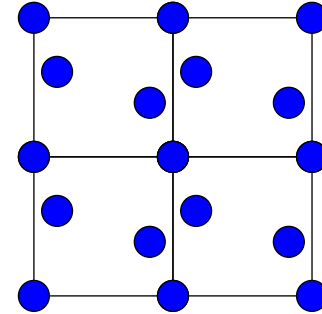
Symmetry Operations



Symmetry Operations

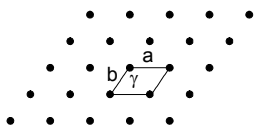


Symmetry Operations

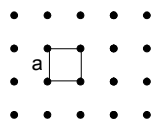


2-D Lattice Types

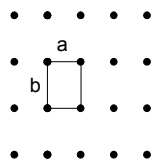
Parallelogram



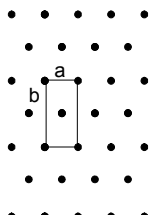
Square



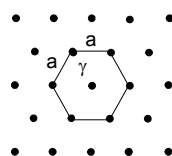
Rectangle



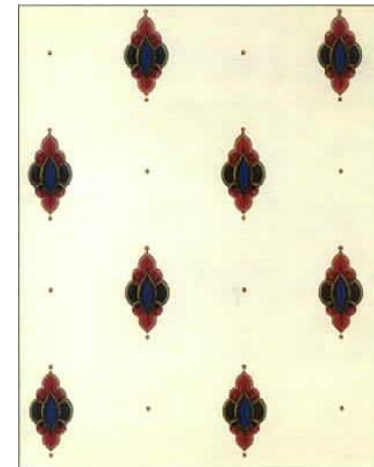
Centered Rectangle



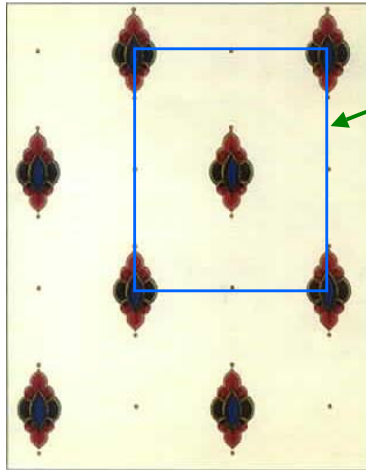
Hexagonal



Wallpaper-2D Lattice Type?



Wallpaper-Centered Rectangle



Unit
Cell

The Bravais Lattices

• Cubic	3	} <i>Most elements</i>
• Tetragonal	2	
• Hexagonal	1	
• Orthorhombic	4	
• Rhombohedral	1	
• Monoclinic	2	
• Triclinic	1	
		14 total

Lattice + Basis = Crystal Structure

