

## CLASSIFICATION OF SOLIDS: By structure

- Solids may also be classified by structure. A more in-depth look at solids is something you would find in a materials science class, but we'll discuss two broad categories of solid materials.

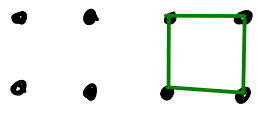
### ① AMORPHOUS SOLIDS

- have a disordered structure at the microscopic level.
- a very small amount of solids are completely amorphous, but quite a few plastics are at least partially amorphous.

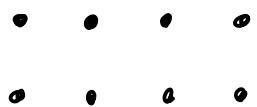
### ② CRYSTALLINE SOLIDS

- have a well-defined three dimensional structure at the microscopic level.
- structure is made up of a regular, repeating arrangement of points in space - a CRYSTAL LATTICE

## MORE ON CRYSTALS

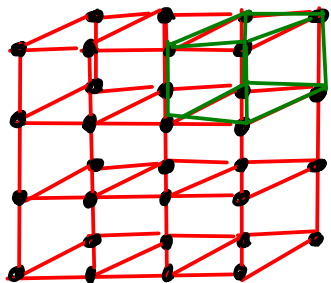


Here's a simple CRYSTAL LATTICE in 2D. The points represent atoms occupying LATTICE POINTS



The simplest repeating pattern that describes the entire crystal is called the UNIT CELL. It's outlined in GREEN here.

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Here's a crystal lattice in three dimensions. This one is called a SIMPLE CUBIC lattice. This simple structure can be found in some solid metals like polonium. A polonium atom occupies each lattice point.

The unit cell, again, is highlighted in GREEN.

See pages 449-450 for more types of crystal systems and more unit cells.

## CRYSTAL DEFECTS

- Natural crystals almost always have some DEFECTS in their structure.
  - Holes in the crystal lattice, where an atom should be but isn't
  - Misaligned planes in the crystal
  - Substitutions of one atom for another in the crystal lattice
- Often defects are undesirable, but not always:

Alumina:  $Al_2O_3$

- clear / white in color
- usually used as the "grit" in cleaners like Comet and Soft Scrub!

ruby:  $Al_2O_3$  with some Al replaced with Cr

- red in color
- valuable gemstone!