

PERIODIC TABLE PHASES

INTRODUCTION

The periodic table of the elements summarizes information about the properties of elements including the physical states and chemical reactivity. This brief activity encourages the student to look at the periodic table to discover some of those properties.

OBJECTIVE

Students will look for patterns in the properties of elements, as reflected in patterns of the periodic table.

MATERIALS

- One large copy of the periodic table per group
 - Table should show state of matter, chemical symbol, and chemical name.
- Optional: periodic tables for each participant with little information to be used for recording observations.

PROCEDURE

- 1) After student is exposed to examples of phases and phase transitions (gas, liquid, solid), student studies the periodic table to find examples of each type.
- 2) Physically on the periodic table, where are gases found?
- 3) Where are liquids found?
- 4) Where are solids found?
- 5) What are the properties of the elements that would make an element a gas?
- 6) What are the properties of elements that would make an element a liquid?
- 7) What are the properties of elements that would make an element a solid?

Teacher notes

The properties of the phases are developed in a model that uses balls and a pan to show the phases.

- 1) Gases are generally found on the right top of the periodic table. Gas atoms and molecules need to exist separately from each other, so they need to not bind to other atoms or molecules or be otherwise attracted to each other. Noble gases on the far right column have filled electronic levels, so don't bind one to another. The atoms are relatively small, so they aren't attracted to each other by Van der Waal forces.
- 2) Liquids are rare on the periodic table: Bromine and Mercury. Bromine forms a diatomic molecule, and then is very stable. Molecules formed by smaller atoms in this column (halogens, second column from the right) aren't attracted to each other because they are small. Bromine is large enough that at room temperature, the diatomic molecules are attracted to each other, but not strongly enough to form a solid.

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- a) Mercury is a large atom, but must be stable enough by itself to be attracted to other mercury atoms only strongly enough to form a liquid. Mercury has a high vapor pressure and low boiling point.
- 2) Solids are by far the most common form of elements, mostly metals. The solids generally form crystalline structures in which the atoms are actually bound to each other in specific matrix positions. That bonding is more or less strong and causes the physical properties to be more or less solid. For example, carbon bonds strongly to other carbon atoms to form the hardest solid, diamond. On the other hand, sodium bonds to itself so loosely and is so reactive that it isn't found as a metal in nature. The metal is very soft and can be cut easily with a butter knife.

Periodic table link: <http://www.chemicool.com/>

Printable periodic table: http://www.sciencegeek.net/tables/CA_CST.pdf