

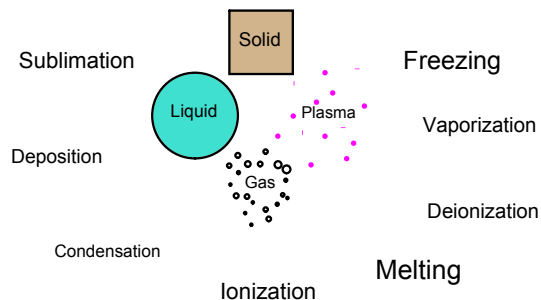
## 2.2 – Changes in Matter



Feb 27-12:39 PM

## States of Matter - Review

Help! The states of matter have been scrambled into an unidentifiable mess! Can you unmess them?  
Move words and shapes around, and connect them with arrows.



Dec 13-8:19 AM

## Physical Change

Appearance changes, NOT properties.

Examples?

Cutting paper, melting ice, breaking wood, dissolving sugar in water.



Chocolate melting is physical.



Feb 27-12:39 PM

## Phase Change

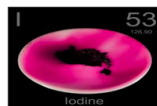
Transition from one state of matter to another.

Terms: boiling, freezing, melting, vaporizing, condensing – going from vapor to liquid (or solid)

sublimating – going from solid to vapor without becoming a liquid.

Frost on your windshield is condensation without first going to liquid.

Demo: Iodine in hot water.



Coming soon to a windshield near you!



Feb 27-12:39 PM

## Chemical Change Terms

**Chemical change (reaction):** Process of one or more substances changing to one or more other substances.

**Reactants (or reagents):** Starting substances of a reaction.

**Products:** Ending substances of a reaction.

Written: Reactants  $\longrightarrow$  Products

Vocabulary of reactions:

Decompose, rust, oxidize, corrode, explode, burn, tarnish, rot, ferment all refer to chemical reactions.



Feb 27-12:39 PM

## Chemical Reaction Energy

Chemical reactions are driven by energy changes: the energy needed to break chemical bonds between them, and then reestablish them in another configuration of atoms.

An **exothermic** reaction produces more energy than it requires.  
Example: a firecracker exploding.

An **endothermic** reaction requires more energy than it produces.  
Example: baking a loaf of bread.

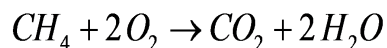
Feb 27-12:39 PM

### Chemical Bond Modeling Activity

Chemical bonds are broken and reformed during reactions.

Using the models, break all the bonds and form new molecules for the combustion of methane into carbon dioxide and water!

The long bonds are flexible, and are used in double bonds (in  $\text{CO}_2$ ).



Feb 27-12:39 PM

### Law of Conservation of Mass

Matter is neither created nor destroyed during a chemical reaction – only transformed.

Mathematically,

$$\text{Mass of Reactants} = \text{Mass of Products}$$

Credit is given to Lavoisier for quantifying this.

(Engage time machine now)



Feb 27-12:39 PM

### Antoine Lavoisier

(1743 – 1794) French chemist, a founder of modern chemistry.



Used analytical balances to study reactions.



Mercuric oxide decomposes into mercury and oxygen. Doing this in an enclosed container, he determined the mass of reactants equaled the mass of products.



Guess how he died?



Feb 27-12:39 PM

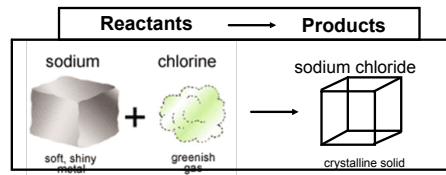
### Ex. 1.

A student makes 28.5 grams of sodium chloride ( $\text{NaCl}$ ) by reacting 11.2 grams of sodium metal with chlorine gas. How many grams of chlorine reacted with the sodium?

$$\text{Mass Reactants} = \text{Mass Products}$$

$$11.2 \text{ g Na} + \text{???? g Cl} = 28.5 \text{ g NaCl}$$

$$\text{So: } 28.5 \text{ g NaCl} - 11.2 \text{ g Na} = 17.3 \text{ g Cl}$$



Feb 27-12:39 PM

### Homework

Read 3.3 of your book  
2.2 Problems in your Booklet  
Due: Next Class.

Feb 27-12:39 PM