

Please write into notebook ©

○ CH 4

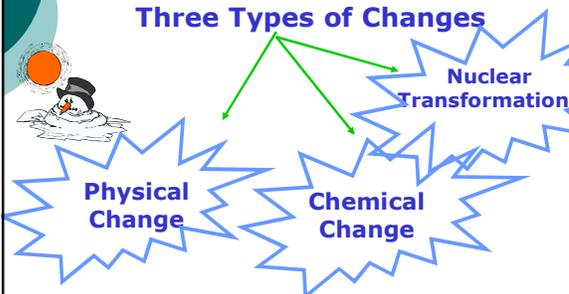
## Changes in Matter

Please write into notebook © 

### 4.0 Types of Changes:

**Three Types of Changes**

- Physical Change
- Chemical Change
- Nuclear Transformations

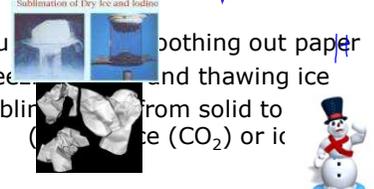


Please write into notebook ©

### 4.1 Physical Change:

- ★ Does **not change** the chemical composition of a substance
- Process is easily **reversible** ★

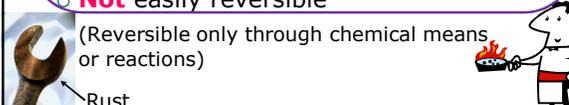
- Ex. Crumpling and flattening paper
- Ex. Freezing and thawing ice
- Ex. Sublimation of Dry Ice and Iodine from solid to gas (CO<sub>2</sub>) or iodine



Please write into notebook © 

### 4.2 Chemical Changes:

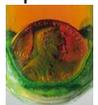
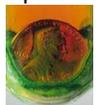
- ★ **Changes** the chemical composition of the substance
- ★ **New substances** are **formed** with new properties
- **Not** easily reversible  
(Reversible only through chemical means or reactions)



Please write into notebook ©

### Signs of Chemical Changes:

Tells you a **chemical change** occurred

- Formation of a gas 
- Formation of a precipitate 
- Change in colour 
- Production of heat &/or light 
- Increase or decrease in mass 



Please write into notebook ©

### 4.3 Nuclear Transformations:

The particles in the nucleus are rearranged.

- New elements are created!
- Fission = nucleus is split to make 2 or more lighter nuclei
- Fusion = 2 small nuclei combine to form one heavier nuclei

*Please write into notebook ☺*

### 4.4 Reactions

Chemical reactions can be represented symbolically with chemical equations  
eg.

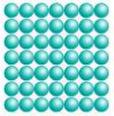
$$2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$$

Meaning:  
2 molecules of water (H<sub>2</sub>O) combine to make 2 molecules of hydrogen gas (H<sub>2</sub>) and 1 molecule of oxygen gas (O<sub>2</sub>).

*Please write into notebook ☺*

### Physical states

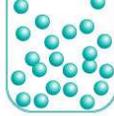
increasing energy →



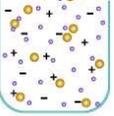
**Solid**  
The molecules that make up a solid are arranged in regular, repeating patterns. They are held firmly in place but can vibrate within a limited area.



**Liquid**  
The molecules that make up a liquid flow easily around one another. They are kept from flying apart by attractive forces between them. Liquids assume the shape of their containers.



**Gas**  
The molecules that make up a gas fly in all directions at great speeds. They are so far apart that the attractive forces between them are insignificant.



**Plasma**  
At the very high temperatures of stars, atoms lose their electrons. The mixture of electrons and nuclei that results is the plasma state of matter.

© 2011 Encyclopædia Britannica, Inc.

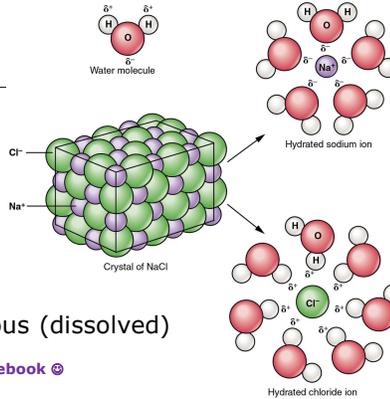
*Please write into notebook ☺*

s = solid

l = liquid

g = gas

aq = aqueous (dissolved)



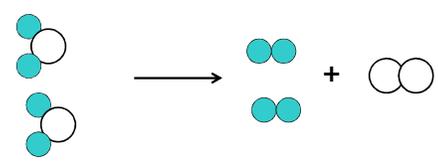
*Please write into notebook ☺*

*Please write into notebook ☺*

$2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$

The **particle model** uses spheres to represent the individual atoms.

H = ●    O = ○



*Please write into notes*

### 4.5 Oxidation

- Materials oxidize when they react with oxygen in the air
- Rusting (corrosion) is a form of oxidation
- Iron in air will form iron oxide (rust)

$4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$

○ ○

○ ○

+

● ●

● ●

● ●

→

● ● ○ ○

● ● ○ ○

● ● ○ ○

● : O

○ : Fe

*Please write into notes*

### 4.6 Speed of oxidation

**Slow Down**

- Galvanize the metal (coat in Zinc)
- Oil coating (rust proofing)
- Water proofing
- Preservative

**Speed up**

- Air
- Light
- Water
- Salt

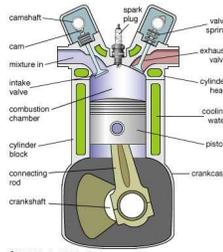


*Please write into notes*

### 4.7 Combustion

- A form of oxidation that releases a large amount of energy
  - Burning wood,
  - Cellular respiration
  - Burning fossil fuels

Internal Combustion engine →



© 2005 Pearson Education, Inc.

*Please write into notes*

### 3 conditions necessary for combustion

1. **Ignition temperature:** minimum temperature needed for combustion to start.
2. **Oxidizing agent:** causes the fuel to react ( $O_2$  in the air is most common)
3. **Fuel:** substance that is holding onto chemical energy in its bonds (wood, propane, oil, gas etc.)

*Please draw triangle into notes*

### Triangle of Fire



Combustion will continue until you run out of one (or you have very little left)!

*Please write into notes*

### 3 types of combustion

- 1- **Rapid:** fire, explosion, car engine
- 2- **Slow:** decomposition, fermentation, corrosion
- 3- **Spontaneous:** ignites without any outside energy source (eg: some forest fires, oil coated rags, etc.) [linseed oil link](#)

