

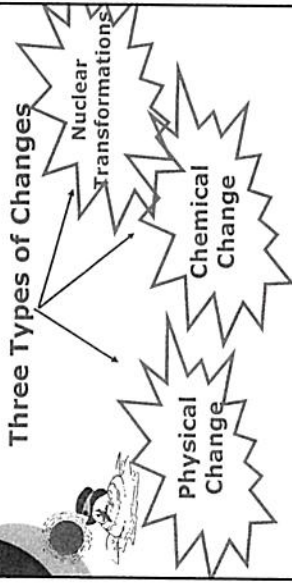
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o CH 4

Changes in Matter

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4.0 Types of Changes:



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4.1 Physical Change:

★ Does **not** change the chemical composition or the nature of a substance

o Process is easily reversible ★

- o Ex. Crumpling out paper
- o Ex. Freezing and thawing ice
- o Ex. Sublimation from solid to gas (Dry Ice (CO₂) or iodine)



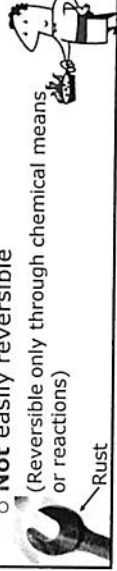
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4.2 Chemical Changes:

★ **Changes** the chemical composition or make-up of the substance

★ **New substances are formed** with new properties

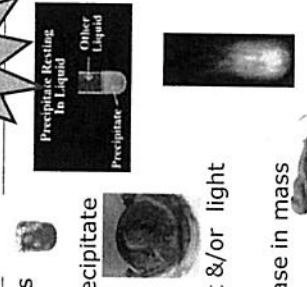
- o **Not** easily reversible
(Reversible only through chemical means or reactions)



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Signs of Chemical Changes:

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



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4.3 Nuclear Transformations:

o The particles in the nucleus are rearranged.

o New elements are created!

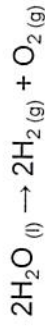
o Fission = nucleus is split to make 2 or more lighter nuclei

o Fusion = 2 small nuclei combine to form on heavier nuclei

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4.4 Reactions

Chemical reactions can be represented symbolically with chemical equations eg.

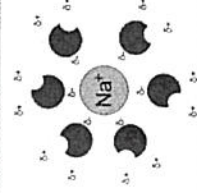


Meaning:

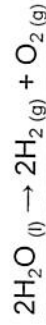
2 molecules of water (H₂O) are split to make 2 molecules of hydrogen gas (H₂) and 1 molecule of oxygen gas (O₂).

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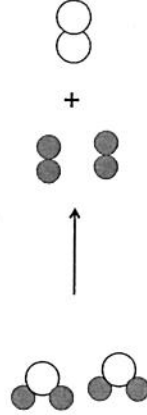
s = solid l = liquid g = gas
aq = aqueous (dissolved in water)



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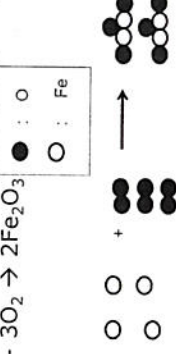
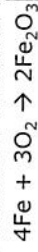
The **particle model** uses spheres to represent the individual atoms.



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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)

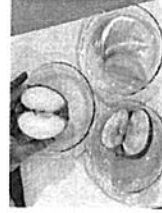


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4.6 Speed of oxidation

Slow Down

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



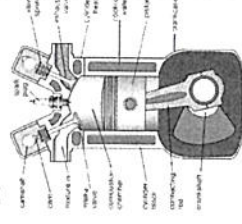
Speed up

- Air
- Light
- Water
- Salt

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4.7 Combustion

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



Internal Combustion engine →

3 conditions necessary for combustion

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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 to chemical energy in its bonds (wood, propane, oil, gas etc.)

Triangle of Fire

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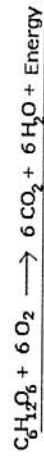
Combustion will continue until you run out of one (or you have very little left!)

3 types of combustion

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

Cellular Respiration



Glucose + oxygen → carbon dioxide + water + energy

Basic Photosynthesis

