

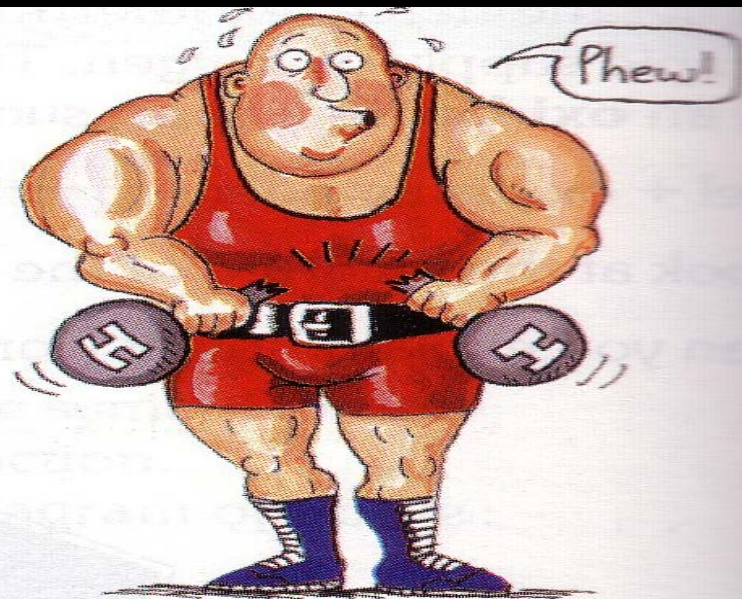
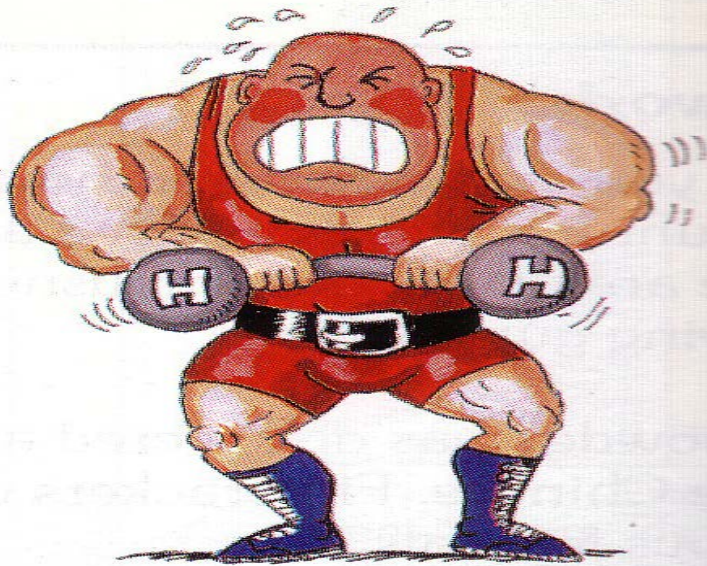
Exothermic and Endothermic Reactions

Energy and Chemical Reactions

- Chemical Energy - Energy stored in the chemical bonds of a substance.
- Chemical reactions always involve energy changes.
- Making bonds and breaking bonds involve energy changes.

Activation Energy

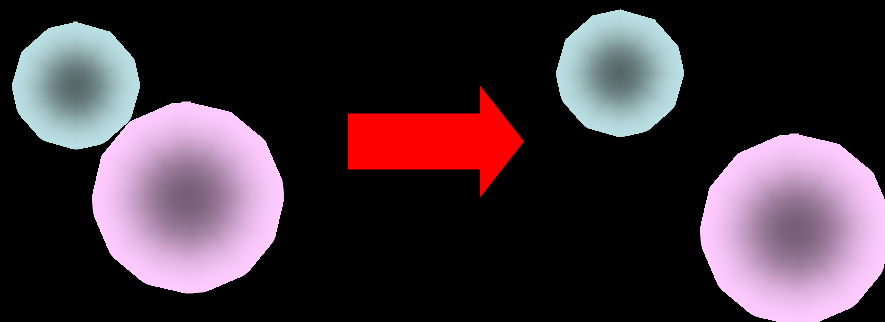
- The energy required to break the bonds in the reactants for a chemical reaction to occur.



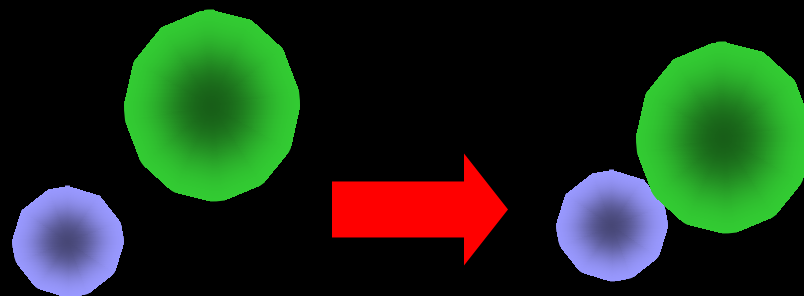
We must supply energy to break bonds

Endothermic and Exothermic reactions

Step 1: Energy must be SUPPLIED to break chemical bonds of reactants:



Step 2: Energy is RELEASED when new chemical bonds are created:



A reaction is EXOTHERMIC if more energy is **RELEASED** than **SUPPLIED**. If more energy is **SUPPLIED** than is **RELEASED** then the reaction is ENDOTHERMIC

Energy of Chemical Reactions

- Based on the type of energy (heat) change involved, chemical reactions are classified as either exothermic or endothermic.

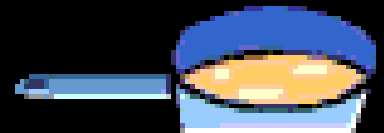
– Exothermic: energy is *released*

- Exo- = “exit”
- Burning of gasoline



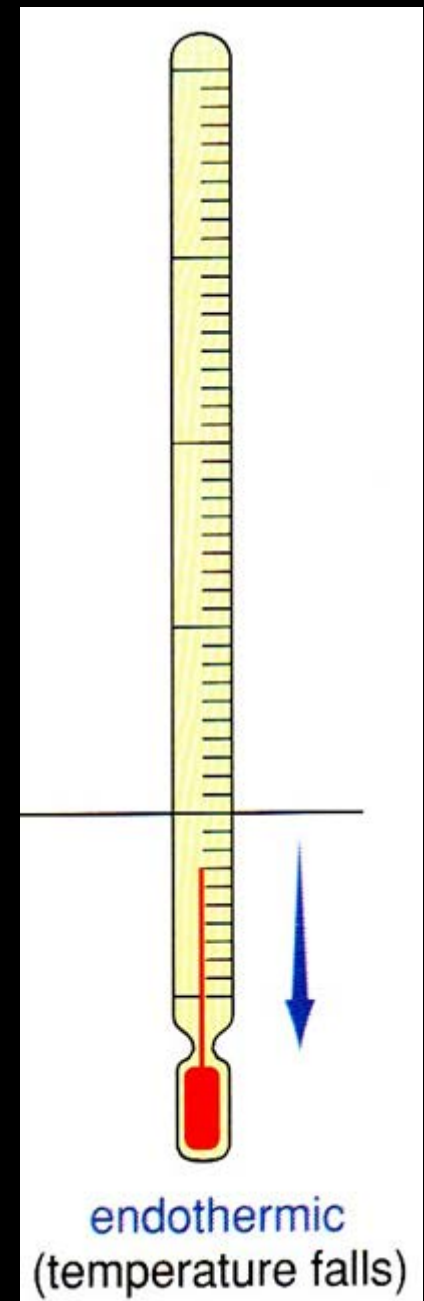
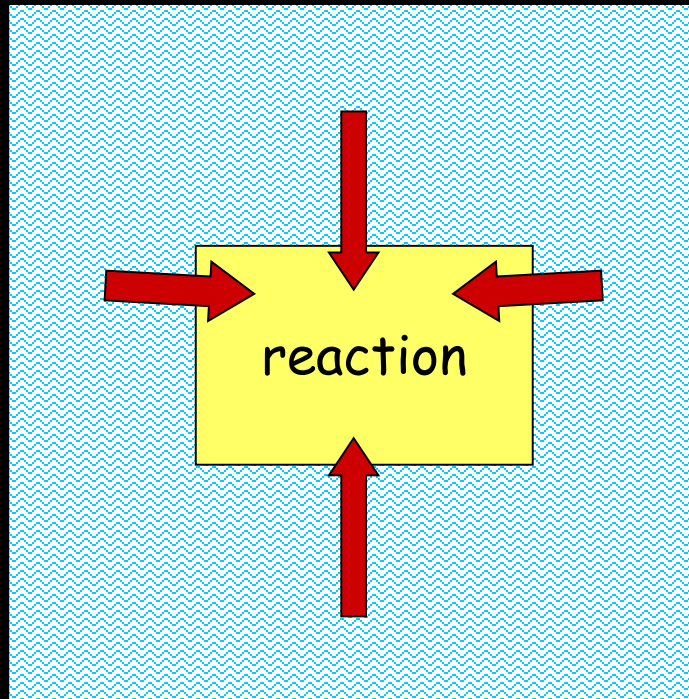
– Endothermic: energy is *absorbed*

- Endo- = “into”
- Cooking of pancakes



Endothermic

- Heat (energy) taken in
- Temperature of the substance drops
- Products feel **COLD**



Endothermic Reactions

- You may see an endothermic reaction written like this...

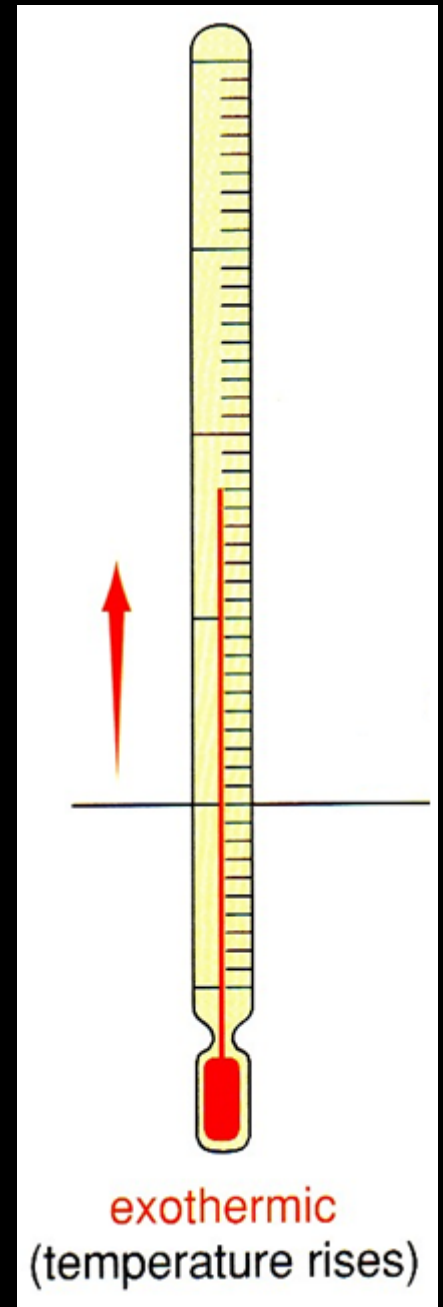
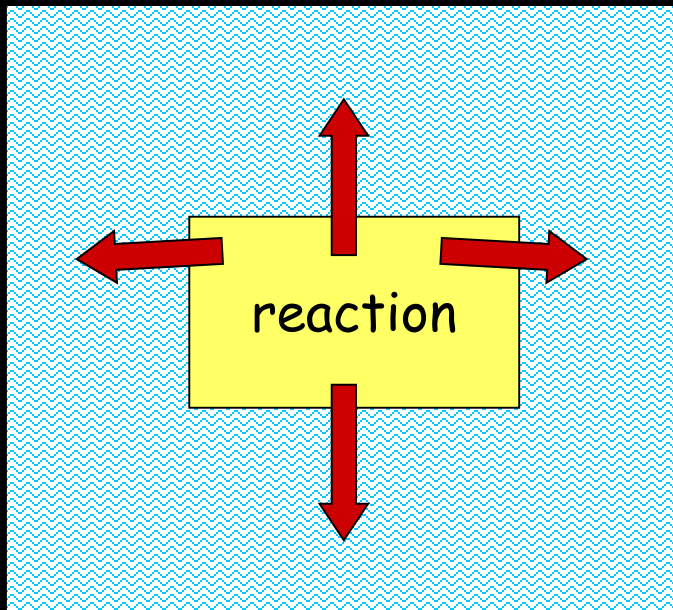


OR



Exothermic

- Heat (energy) given off
- Temperature of the substance rises
- Products feel **HOT**



Exothermic Reactions

- You may see an exothermic reaction written like this...

REACTANTS \longrightarrow PRODUCTS + **ENERGY**

OR

REACTANTS \longrightarrow PRODUCTS + **HEAT**

ENDOTHERMIC OR EXOTHERMIC?



ENDOTHERMIC!



EXOTHERMIC!

Examples

Exothermic

- Burning a candle
- Rusting iron
- Mixing Epsom salts & water

Endothermic

- Photosynthesis
- Mixing vinegar & baking soda