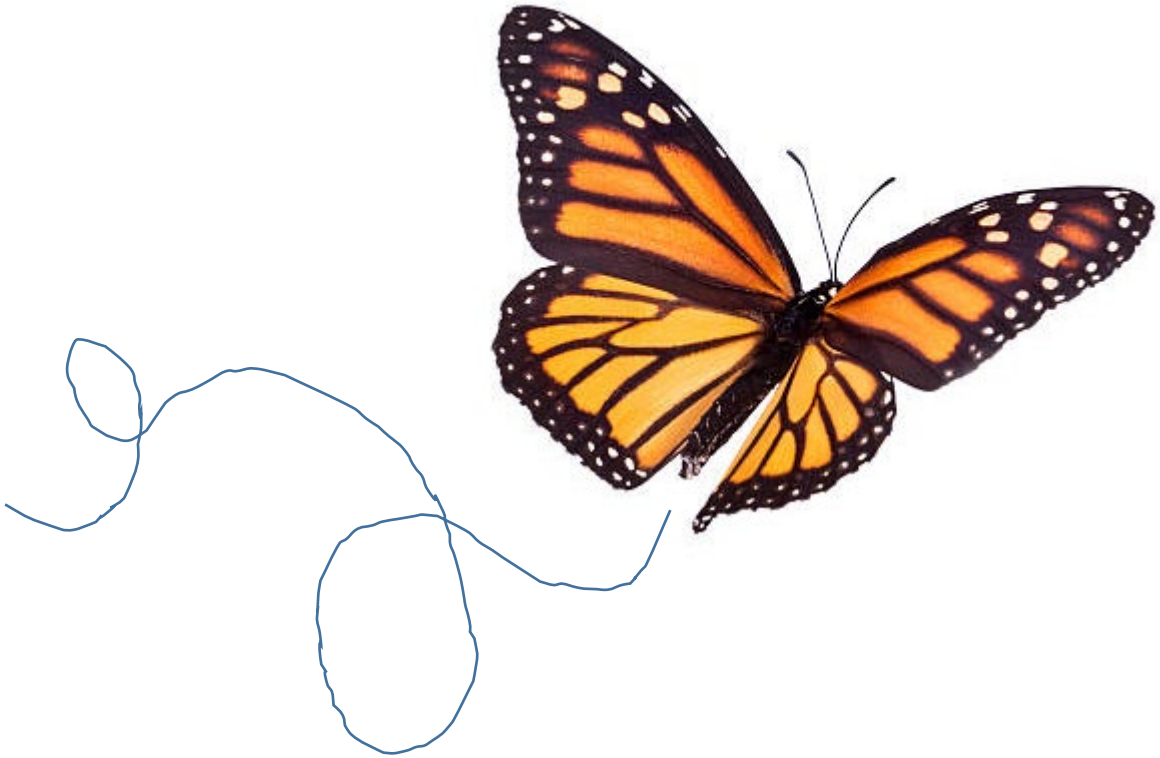
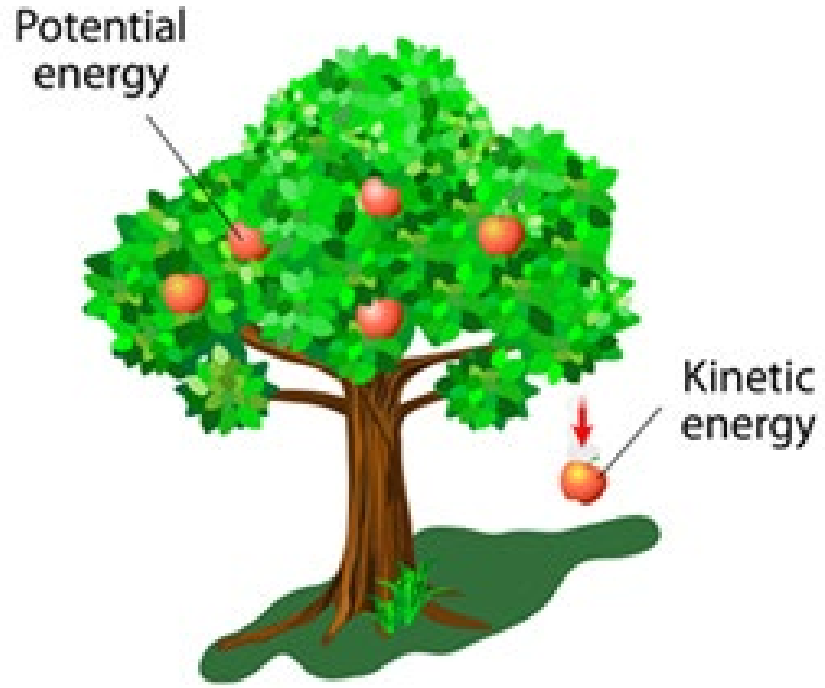

# Working with Chemical Reactions: Where does the Energy go?

# Energy comes in different forms.



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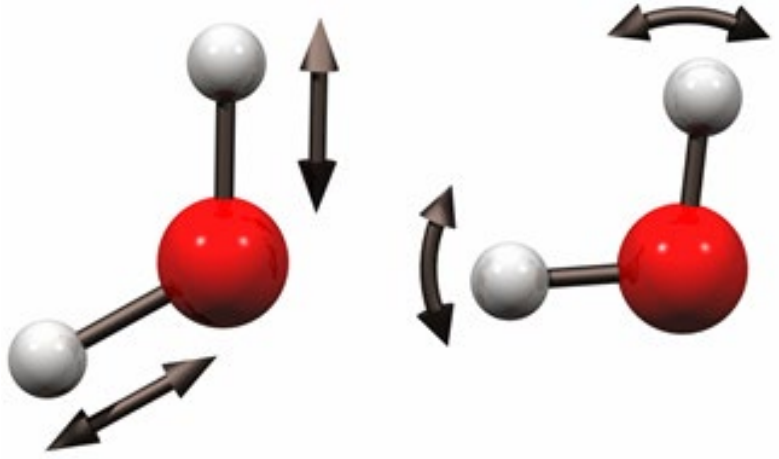
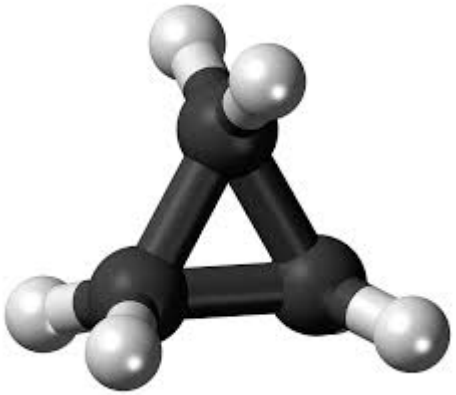
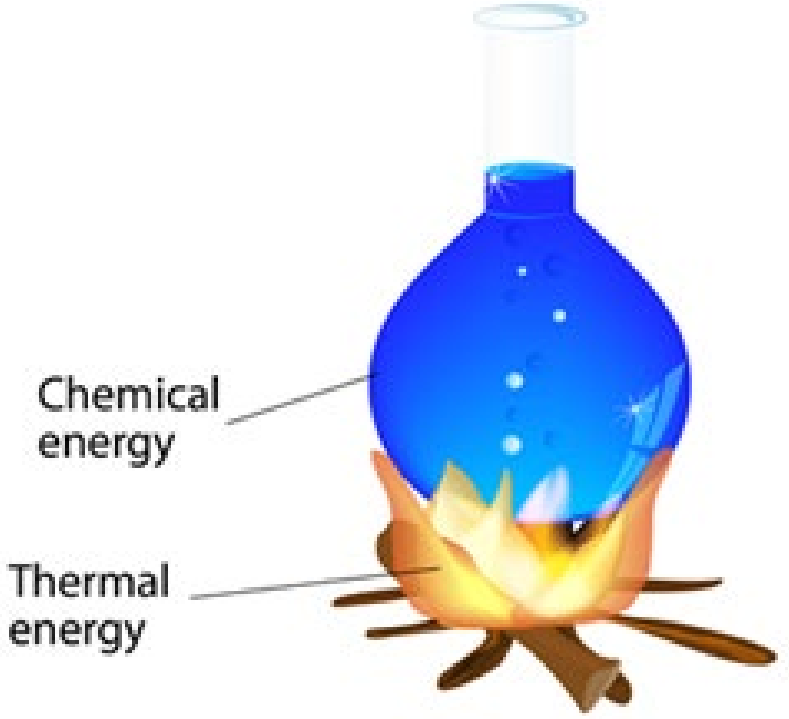
# Molecules also have different types of energy.

**Kinetic energy**



**Potential energy**



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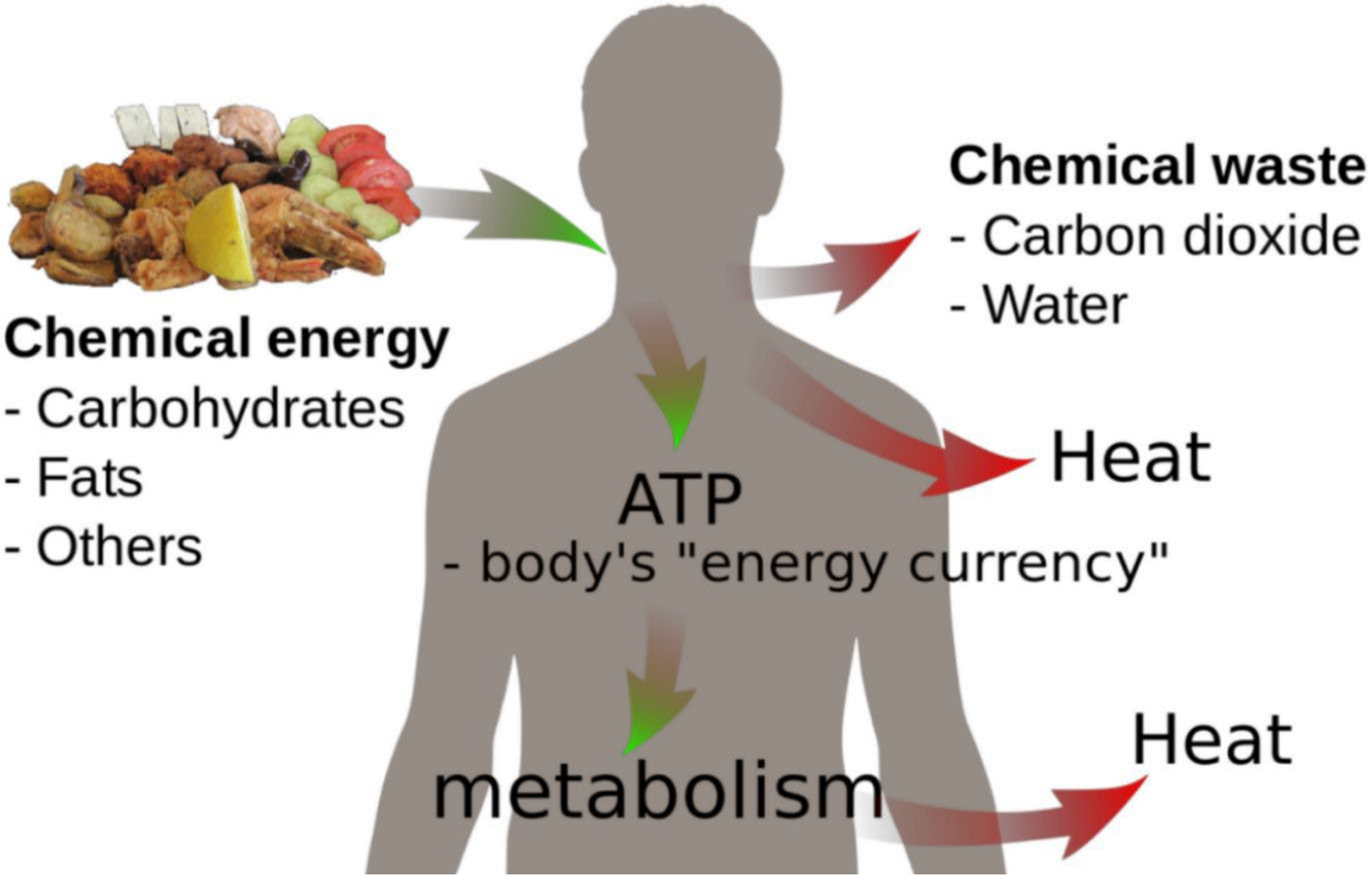
# Energy and human life




https://study.com/academy/lesson/how-the-sun-provides-energy-within-the-ecosystem.html

# Energy is interconvertible.

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

$C_6H_{12}O_6 \rightarrow 2C_2H_6O + CO_2$

$2C_2H_6O + 6O_2 \rightarrow 4CO_2 + 6H_2O$

**Law of Conservation of Energy**

The total quantity of energy in the universe is constant

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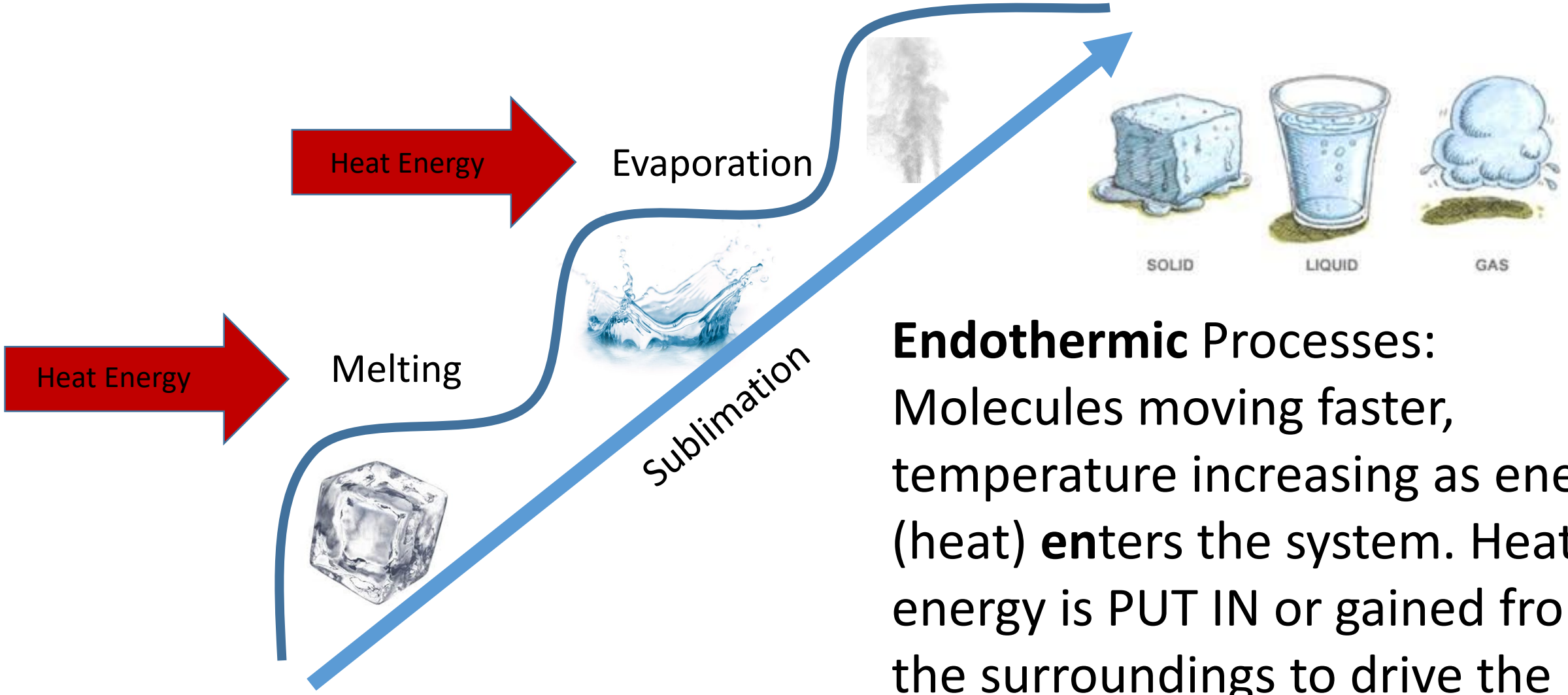
http://www.alternative-energy-tutorials.com/energy-articles/ethanol-used-as-a-fuel.html




**Endothermic** Processes: Molecules moving faster, temperature increasing as energy (heat) **en**ters the system. Heat energy is PUT IN or gained from the surroundings to drive the process.

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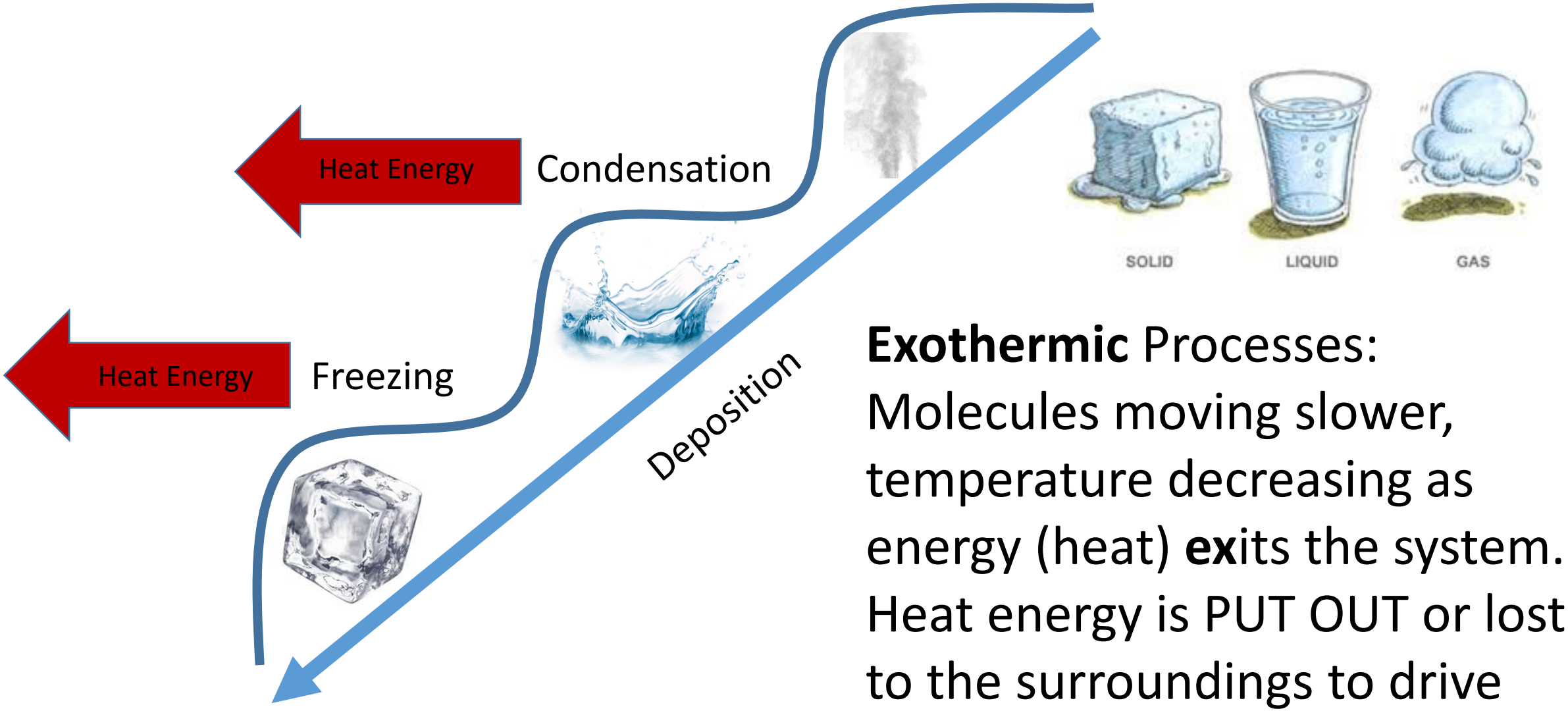






**Exothermic** Processes: Molecules moving slower, temperature decreasing as energy (heat) **ex**its the system. Heat energy is PUT OUT or lost to the surroundings to drive the process.

http://clipart-library.com/clipart/1568757.htm

Both of these processes involve the system losing or giving off heat to it's surroundings. They are **Ex**othermic.

Chemical change:

Heat Energy

Combustion (Burning)

Physical change:

Heat Energy

Freezing

Heat Energy

From surroundings

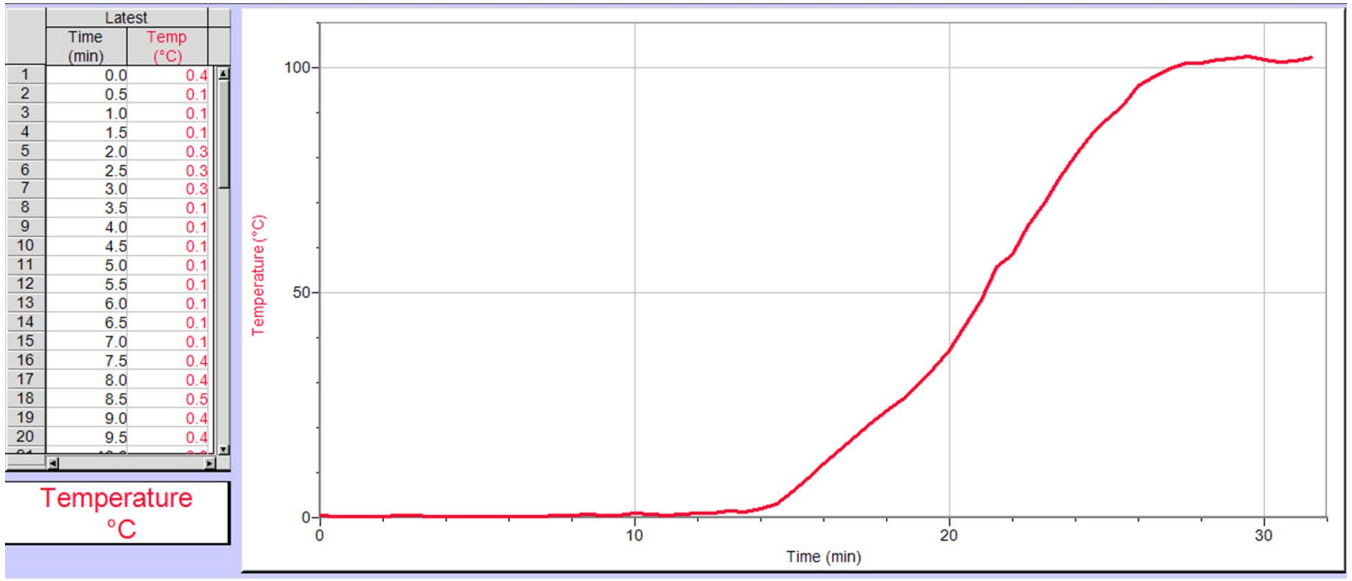
Melting

Heat Energy

From combustion (burning)

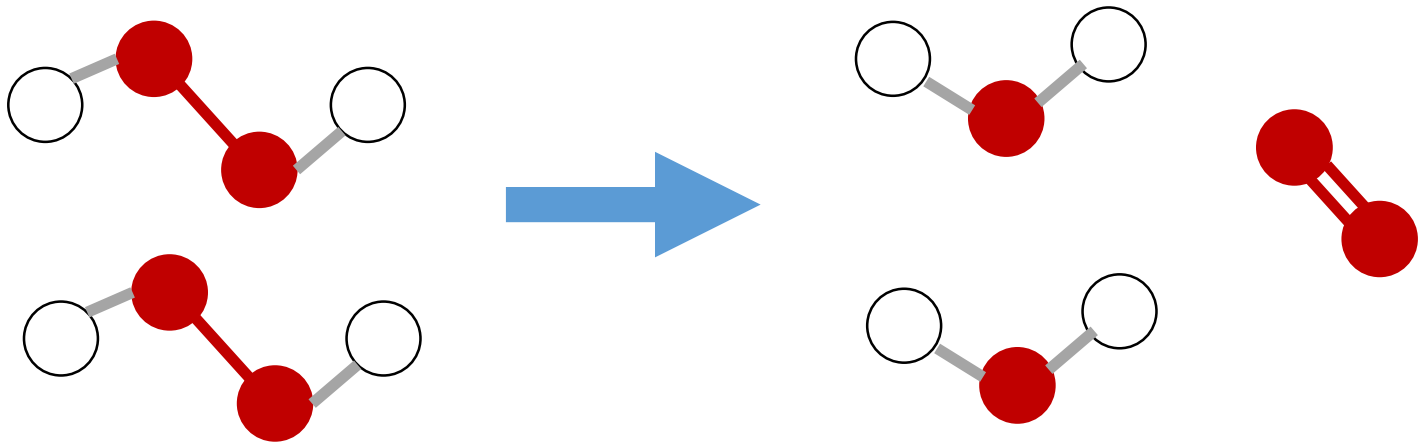
These processes can be combined to drive changes in other systems. Ask yourself: “Where does the energy go?”

# Scientists can use a variety of equipment to track and monitor changes in a system during a chemical reaction.

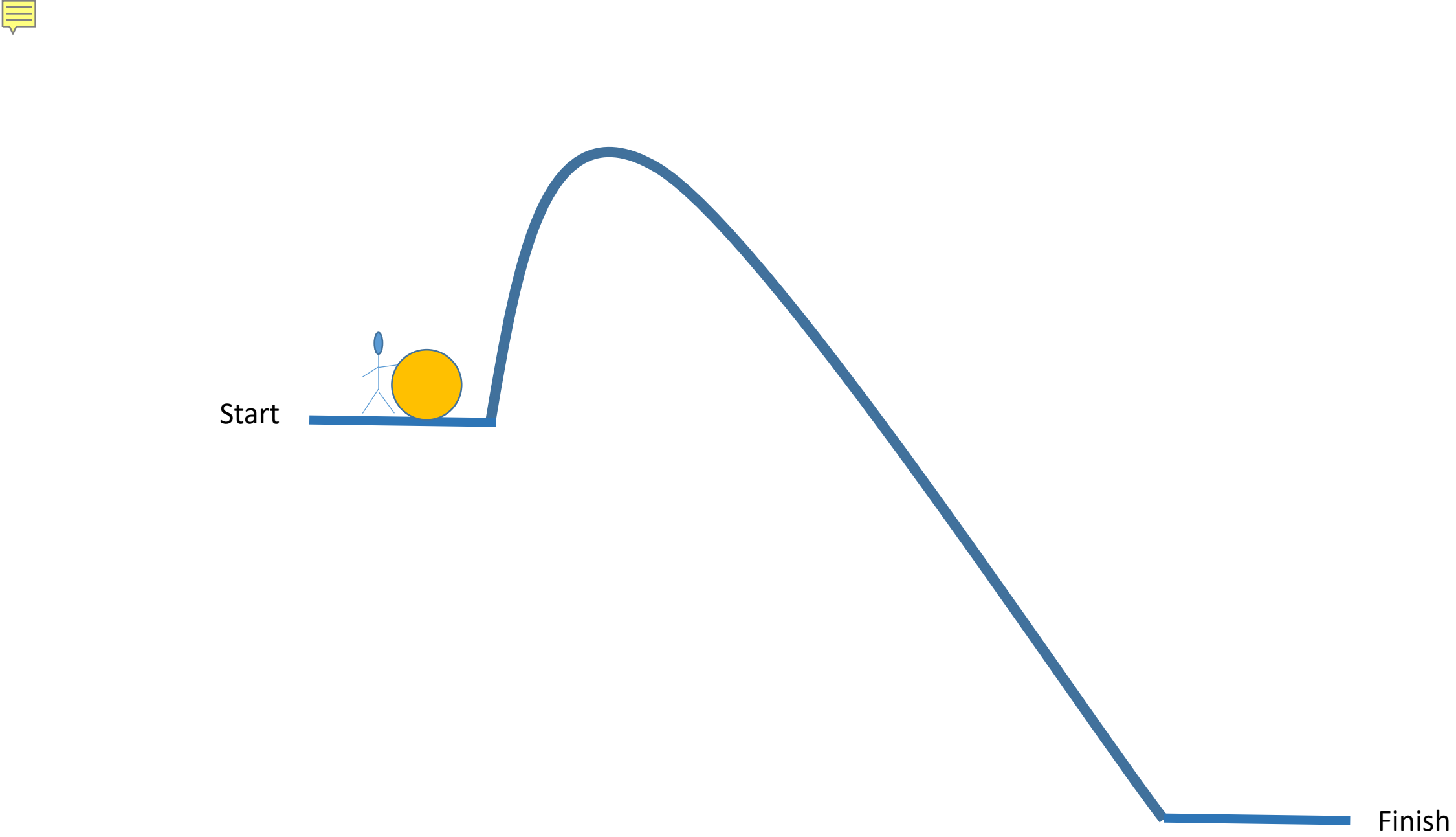



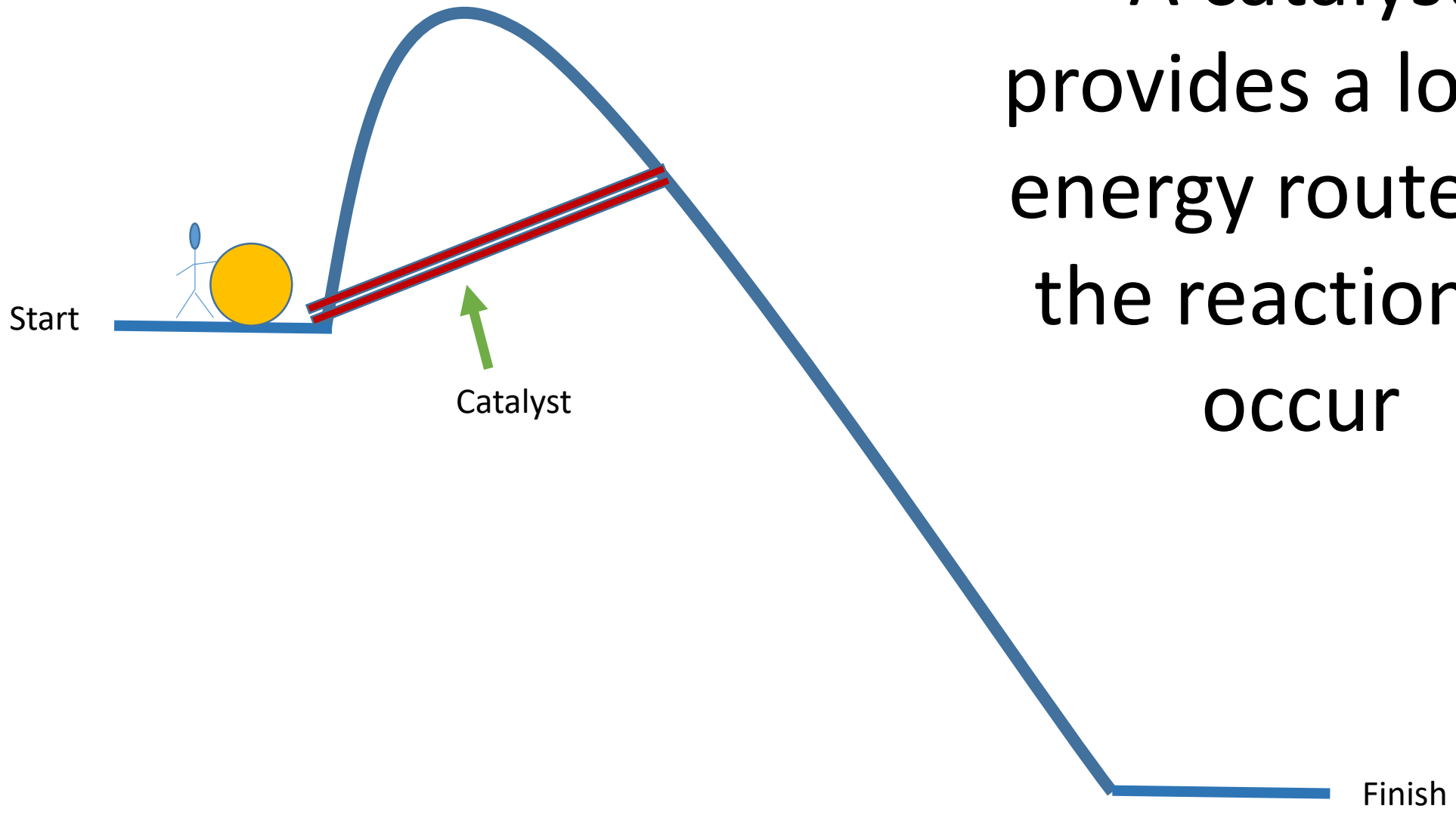

https://vernierscaliper.com/vernier-sensors-for-light-motion-temperature-sound-more-836.html

# Decomposition reaction: AB → A + B



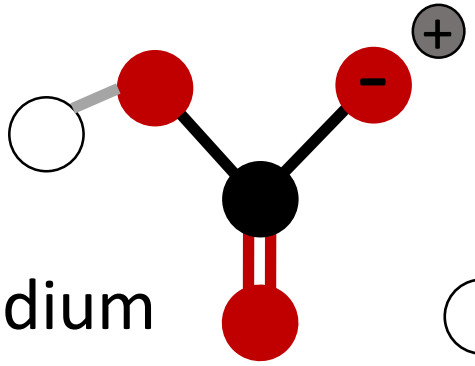
$$2H_2O_2 \rightarrow 2H_2O + O_2$$


Start
Finish

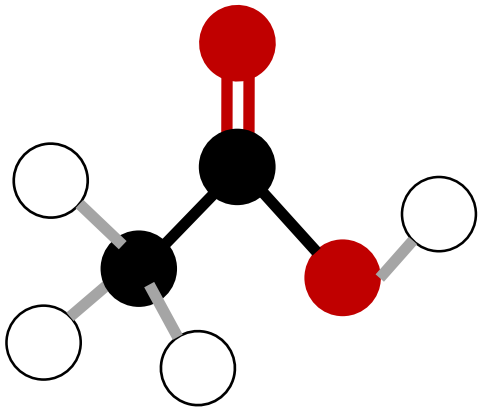



A catalyst provides a lower energy route for the reaction to occur

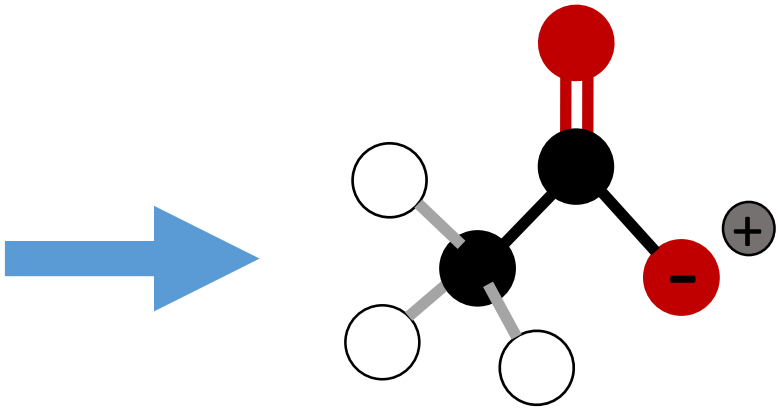
# Decomposition reaction: AB → A + B
# Neutralization reaction: The products, water and a salt, are neutral



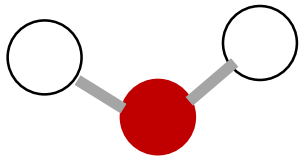
Sodium Bicarbonate



Acetic Acid (Vinagar)



Salt (Sodium Acetate)



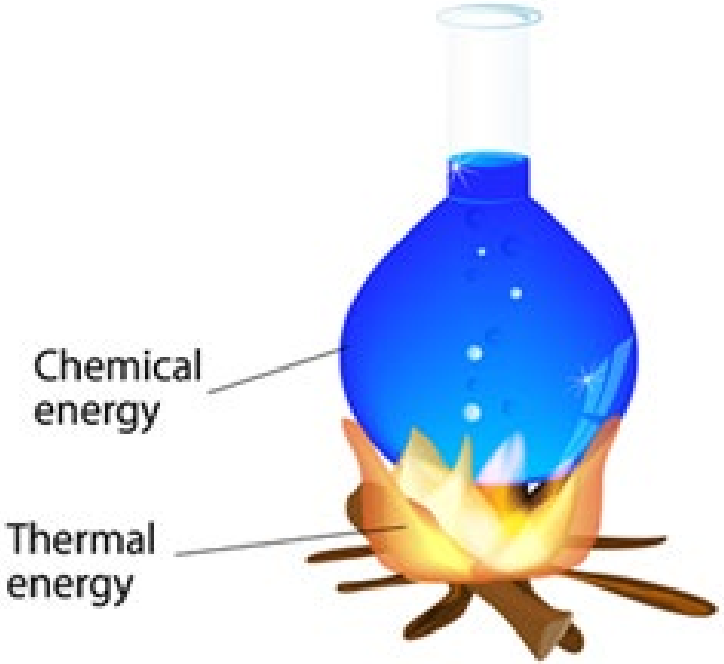
Water

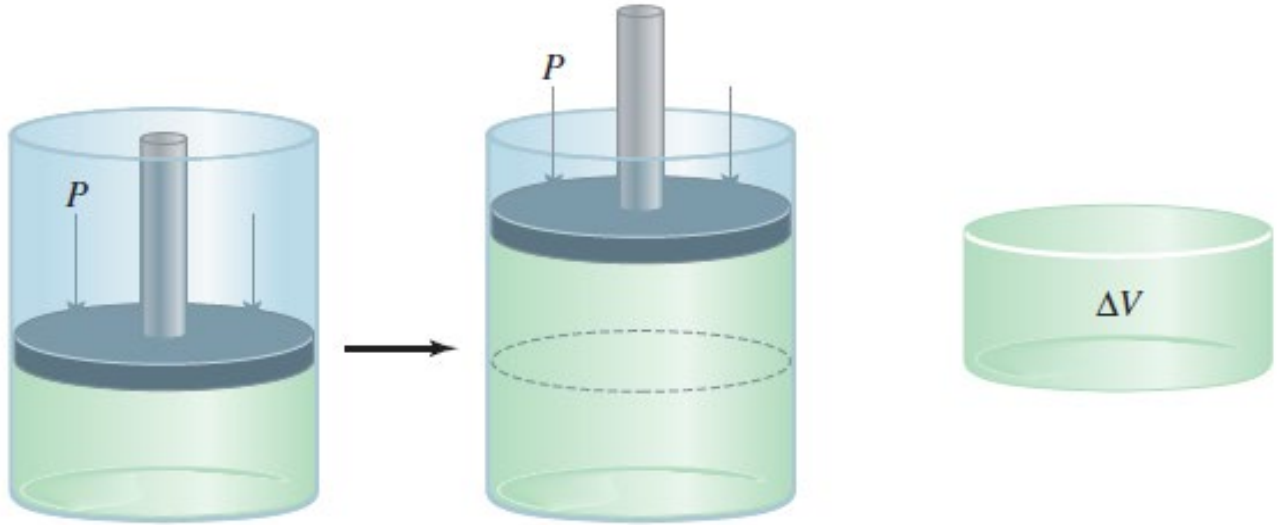
Carbon dioxide gas

$$NaHCO_3 + HC_2H_3O_2 \rightarrow NaC_2H_3O_2 + H_2O + CO_2$$

# Energy is the capacity to do work.

## Work = Force x Distance




$$w = -P\Delta V$$

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https://ch301.cm.utexas.edu/section2.php?target=thermo/first-law/work.html