Success 24/7 Chemistry: Thermochemistry

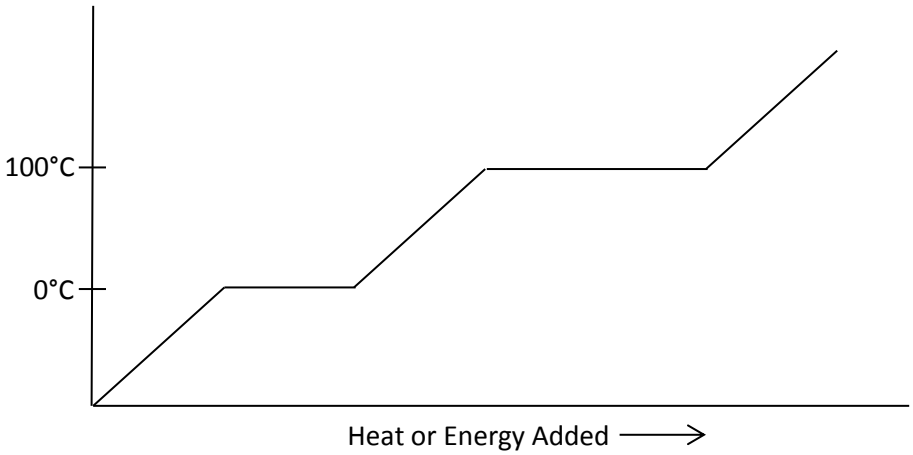
Thermochemistry: This unit is all about heat transfers during chemical reactions.

Energy: the capacity for doing work

Kinetic Energy: Energy of motion (the motion can be waves, electrons, atoms, molecules, and substances)

Potential Energy: Stored energy

Heating/Cooling Curve of H_2O



Sloped portions indicate a temperature change which also indicates a change in kinetic energy.

Horizontal portions indicate a phase change where $\Delta T = 0$. However, particle position does change causing a change in potential energy.

Practice: what type of energy is represented?

A car parked at the top of the hill _____

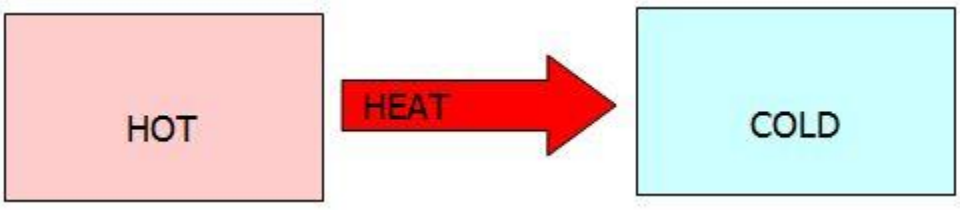
A charged battery _____

Clapping _____

A car that is rolling down a hill _____

Heat (q)- energy that is transferred from one object to another because of a temperature difference between them.

Heat always flows from a warmer object to a cooler object.



System vs Surroundings

In Chemistry, we focus on the system.

System: part of the universe on which you focus your attention. (ex: the chemical reaction)

Surroundings: everything else in the universe (ex: the beaker, table, air around the reaction, etc)

Law of Conservation of Energy

In any chemical or physical process, energy is neither created nor destroyed.

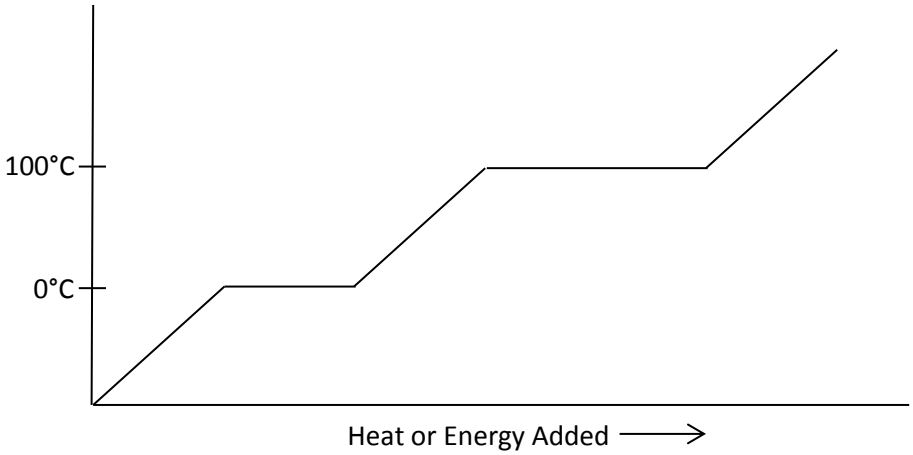
Heat may be lost by a system, but it is never destroyed. It is transferred to the surroundings…

Endothermic process- system absorbs heat from the surroundings.

Exothermic process- system releases heat from the surroundings.

The heat curve is useful to determine if a phase change is endothermic or exothermic.

Heating/Cooling Curve of H_2O



Endo or Exo?

Handwarmer getting hot _____

Baking bread _____

Steam condensing _____

Paper burning _____

Ice melting _____

Energy Units:

calorie (cal) or Joule (J) **1 cal = 4.18 J**

calorie – quantity of heat needed to raise the temperature of one gram of water 1^oC. A food Calorie is used in nutrition and is capitalized.

1000 cal = 1 kcal = 1 Calorie

Heat capacity: the amount of heat needed to raise the temperature of an object 1^oC. It depends on mass and composition.

Think about the amount of substance you have and WHAT you have.

What will take longer to heat up?

A pool of water vs. a cup of water

Water vs. metal

Specific Heat Capacity (C): The amount of heat it takes to raise the temperature of 1 g of a substance 1^oC.

(very similar to heat capacity but takes the amount into consideration).

C = $\frac{cal}{g^0C}$ or $\frac{J}{g^0C}$

Matter with a low specific heat loses or gains heat quickly (ex: air, glass, most metals)

Matter with a high specific heat loses or gains heat slowly (ex: water (l), ammonia, hydrogen)

Specific Heats of Common Materials

MATERIAL	SPECIFIC HEAT (Joules/gram • °C)
Liquid water	4.18
Solid water (ice)	2.11
Water vapor	2.00
Dry air	1.01
Basalt	0.84
Granite	0.79
Iron	0.45