

Thermochemistry

Energy Transformations

- _____ – the study of energy changes that occur during chemical reactions and changes in state
- _____ – energy stored in the chemical bonds of a substance

Heat

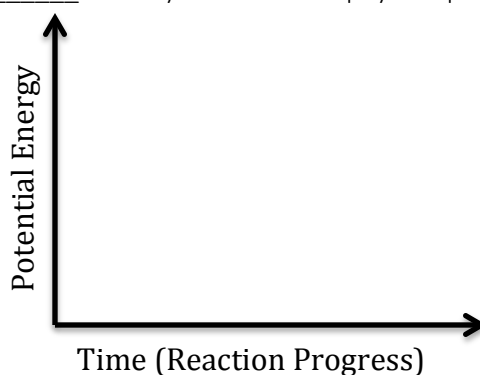
- Represented by _____
- One effect of adding heat to an object in an:
 - Heat always flows from a:

Processes

- _____ – the part of the universe on which you focus your attention
- _____ – everything else in the universe
- _____ – in any chemical and physical process, energy is neither created or destroyed

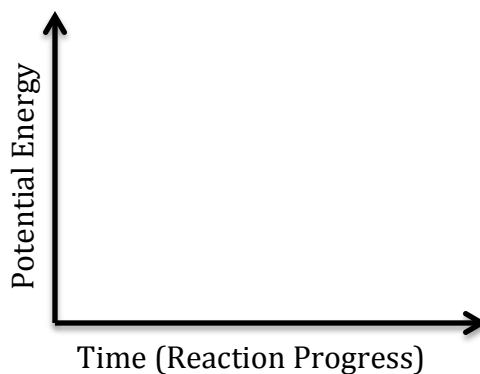
Endothermic Process

- _____



Exothermic Process

- _____



Units for Measuring Heat Flow

- _____ – the quantity of heat needed to raise the temperature of 1 g of pure water 1°C
- _____ – the quantity of heat needed to raise the temperature of 1 g of pure water 0.2390°C

$$1\text{J} = \text{_____cal} \quad \text{_____J} = 1\text{cal}$$

Heat Capacity and Specific Heat

- Heat capacity depends on the _____ and _____ of the object
- Specific heat is the amount of heat it takes to raise the temperature of 1g by 1°C

$$C = \text{_____} \quad \text{or} = \text{_____}$$

Measuring and Expressing Enthalpy Changes

Calorimetry

- _____ (H) of the system is the heat content of a system at constant pressure
- A _____ is an insulated device used to measure the absorption or release of heat in chemical or physical processes
- _____ – foam cups which do not let much heat in or out, open to the atmosphere.
- Measures enthalpy (H), $q = \Delta H$
- $q_{\text{sys}} = \text{_____} = -q_{\text{surr}} = \text{_____}$
- _____ ΔH values are _____ reactions, while
_____ ΔH values are _____
- Constant-Volume Calorimeters, or bomb calorimeter

Model 3 – Heating Mercury and Water

Trial	Substance	Mass (grams)	ΔT ($^{\circ}\text{C}$)	Added Energy (Joules)
1	Hg	100.0	71.0	1,000.0
2	Hg	100.0	142	2,000.0
3	H ₂ O	100.0	2.39	1,000.0
4	H ₂ O	100.0	4.78	2,000.0

Compare any two trials in Model 3 that use the same amount of energy but involve different substances. Is the temperature change the same or different in the two trials?

Based on the data in this activity, the specific heat of water was determined to be $4.18 \text{ J/g}^{\circ}\text{C}$. Use data from Model 3 to solve for the value of the specific heat for mercury.

Select the correct word to complete the sentence:

When adding the same amount of energy to two similar massed samples, the substance with the larger specific heat will have a (larger or smaller) temperature change?

If 23,000 joules of energy are used to heat water by 4.00°C , what is the mass of the water?

If 23,000 joules of energy are used to heat mercury by 4.00°C , what is the mass of the mercury?

What is the specific heat of aluminum if 4,750 joules of heat energy added to 249 g of aluminum produces a recorded temperature change of 21.1°C ?