# THERMOCHEMISTRY

Objective: Explain how energy is communicated in a reaction. Classify a process as either exothermic or endothermic.

#### Thermochemistry:

The study of energy changes that occur during chemical reactions and changes of state.

#### **Chemical Potential Energy:**

Potential energy is the energy stored in the bonds of a substance.

#### Heat:

Energy that is transferred from one object to another because there is a temperature difference between them. Warm > Cool

#### Law of conservation of energy-

energy is conserved during a chemical reaction.

#### System:

The aspect of the universe your focus is on.

#### Surroundings:

Everything else-typically referring to the immediate area around the system.

#### **ENDOTHERMIC process:**

Is a change in which energy (usually heat) is absorbed from the surroundings, by the system. This increases the potential energy of the system The system will feel cold.

#### reactants + energy → products. EXOTHERMIC process:

Is a change in which energy (heat) is released from the system to the surrounding. This decreases the potential energy of the system and the system will feel hot.

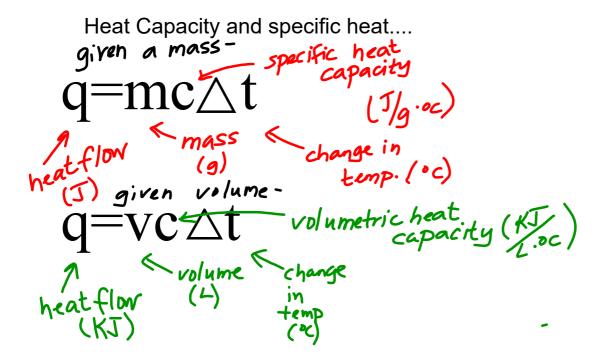
Heat flow- heat can be used or given off.

- measured in Joules or KJ

### Heat Capacity (q)

The amount of heat needed to increase the temperature of an object exactly 1 degree celsius Depends on mass and composition.

specific heat capacity (c) the amount of heat required to raise 1g of a substance 1°C. see back of periodic table



## EX 1

What is the amount of heat needed to raise the temperature of  $1550^m$ g of ice from -52.50 °C to -49.30 °C?  $\Delta T$   $g = m(\Delta t) = 1550g \cdot 2.015/g \cdot 2.20\%$  = 9969.6 T 99705

### EX 2

By removing 242.0 J of energy, the temperature of a substance is lowered from 28.1° C to 14.6° C. Calculate the specific heat are 13.5° capacity if there is 10.6° g of the substance.

$$\frac{g = mc\Delta t}{m\Delta t}$$

$$C = \frac{g}{m\Delta t}$$

$$C = \frac{242.0 \text{ T}}{10.69 \cdot 13.5 \text{ °C}}$$

$$= 1.69 \text{ J}$$

$$9.9 \text{ °C}$$

$$+W \rightarrow 3$$

2. 1.41 × 107 J 14.1KJ

#### Practice

The temperature of 335 g of water changed from 24.5°C to 26.4°C. How much heat did this sample absorb?

Q=mCAt: 335g. 4.19I. 1.9°C = 2667J = 2.67.

How much heat in kilojoules has to be removed from 225g of water to lower its temperature 2. from 25.0°C to 10.0°C?

 $g = mcM = 225g \cdot 4 \cdot 9T \cdot 15^{\circ 2} = 1414J \rightarrow 14.1 \text{ KJ}$ To bring 1.0kg of water from 25°C to 99°C takes how much heat input?  $g = mcM = 1000g \cdot 4 \cdot 19J_{3.0g} \cdot 74^{\circ} \text{ L} - 310060J \cdot 3.1 \times 10^{5} \text{ J}$ 

- An insulated cup contains 75.0g of water at 24.00°C. A 26.00g sample of metal at 82.25°C is 4. added. The final temperature of the water and metal is 28.34°C. What is the specific heat of the metal?
- What is the specific heat of silicon if it takes 192J to raise the temperature of 45.0g of Si by g=mcat

$$C = \frac{m(\Delta t)}{-m\Delta t} = \frac{75.0g \cdot 4.19J_{g \cdot oc} \cdot 4.349C}{-26.0g \cdot -53.919C}$$