Note Taking Guide: Episode 1301

**Temperature:**
- A measure of the **Average Kinetic** energy of the particles in a sample of matter.
- Does not depend on the amount of **mass** in the sample.
- Symbol is \( T \); unit is \( ^\circ C \).

**Heat:**
- **Total** amount of **Kinetic** energy that flows because of a difference in **temperature**.
- Depends on **mass** of sample.
- Symbol is \( Q \); unit is \( J \) (1 cal = 4.184 \( J \)).
- **Food Calorie** = 1000 cal = 1 kcal = 4.184 \( J \).

- Kinetic energy is **energy in motion**.
- Potential energy is **stored**.
  - Potential energy is hiding and cannot be **measured**.
  - Only changes in P.E. can be measured.

**Specific Heat Capacity:**
- Amount of energy required to raise the **temperature** of 1 gram of substance.
- Symbol is \( c \); unit is \( J/\text{g}^\circ C \).

\[ Q = m \times c \times \Delta T \]

When heat \( Q \) is absorbed by a system, part of it \( c \) goes into storage as potential energy and part of it is used to make the molecules move around faster, raising the **temperature** \( \Delta T \).

Why does sand get hotter in the day and colder at night than the water?

**Heating Curve for Water**

**I:** Heat is being used to raise the **temperature** of the **ice**.

\[ Q = m \times c \times 

**II:** Heat is being used to turn solid to **liquid** (phase change).

\[ Q = m \times \Delta H_{fus} \]

- Heat of fusion - **Heat required to change 1g of**

**III:** Heat is being used to raise the **temperature** of the **liquid**.

\[ Q = m \times c \times \Delta T \]

**IV:** Heat is being used to turn liquid to **vapor** (phase change).

\[ Q = m \times \Delta H_{vap} \]

- Heat of vaporization - **Heat required to change 1g of**
endothermic change: (Melting is an example.)
- Physical or Chemical change in which a system
  absorbs Heat from its Surroundings
- KE $\rightarrow$ PE (Heat seems to Dissappear)
- PE of system increases and it becomes less Stable
  Evaporation is another example.)

exothermic change:
- Physical or chemical change in which a system
  gives off heat to its Surroundings
- PE $\rightarrow$ KE (Heat seems to appear out of Nowhere)
- PE of system decreases and it becomes MORE stable.

Ex. - Why does your skin feel cool when you get out of the pool?
Think about these steps to answer the question:

Identify the system - Water evaporating
- goes from liquid (low P.E.) to gas (high P.E.).
- This is an ENTHALPIC change. In this type of change, the system (the water)
  absorbs heat from the surroundings.

Identify the surroundings - Your Skin
- Your skin feels cool because it LOSES heat. The heat was used to evaporate the water.

Why do farmers spray fruit on trees with water when the temperature is going to drop below freezing? Identify the system and surroundings and make the statements about them (as done above.)

Energy Diagram of a Chemical Change:
Label the chart:

As molecules get closer, their electron clouds repel each other, and their P.E. (increases, decreases).
The activated complex is highest point in P.E. The energy required to reach the complex is called the ACTIVATION energy.

Products are (higher, lower) in P.E. than reactants and are (more, less) stable. This reaction is EXO thermic.

Problem Set #1: Draw the P.E. diagram shown and label the following:
- Reactants, products, activation energy, activated complex, $\Delta H$, (+ or -)

Products are (higher, lower) in P.E. than reactants and are (more, less) stable. This reaction is ENDOTHERMIC.

When $E_a$ is high, the reaction is (slow, fast).

Sketch a diagram of these reactions:
- slow, endothermic
- faster, endothermic
- faster, exothermic

Chemistry Quiz CR1. CR2. 1. 2. 3.