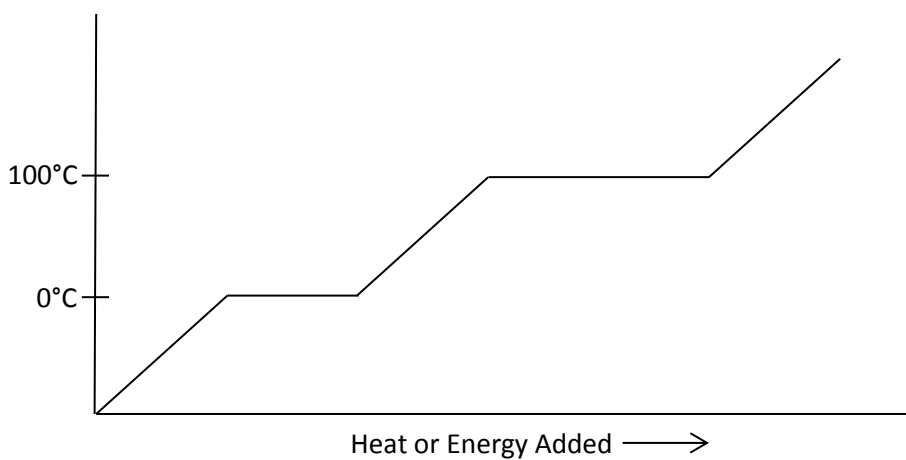**Success 24/7 Chemistry: Heat Curve**

Heating/Cooling Curve shows energy changes. All matter follows curve when energy is added or lost.

Heating/Cooling Curve of H_2O

Phase changes to know:

Melting

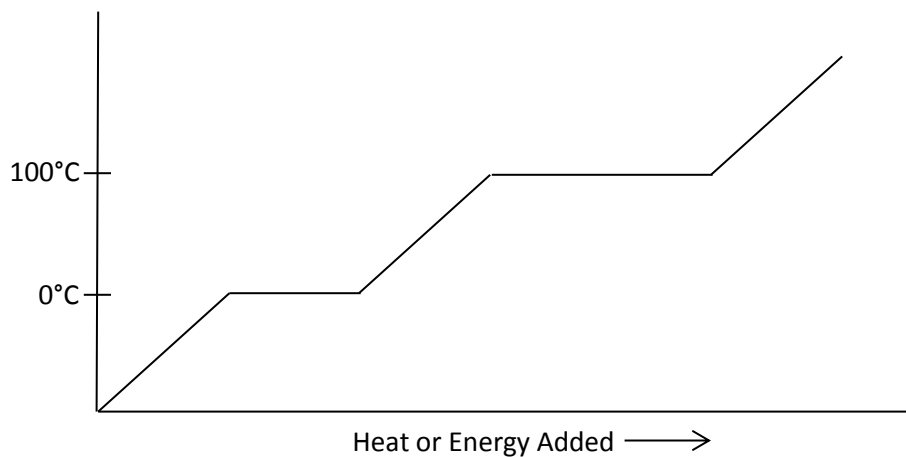Freezing

Vaporization

Condensation

Sublimation

Deposition

The temperature of a substance does not change during a phase change because all of the energy is going into changing the state of matter instead of the temperature. Once the phase change is complete, the temperature can increase or decrease.

What is the highest temperature pure liquid water can reach?

What is the lowest temperature pure liquid water can reach?

Heating/Cooling Curve of H$_2$O

In order to find how much energy is required to heat/cool ice, water, or steam use the equation q = mcΔT.

Specific Heat of Ice, Water, and Steam

C_{ice} = 2.1 J/g°C

C_{water} = 4.18 J/g°C or 1.00 cal/g°C

C_{steam} = 2.0 J/g°C

Heat of fusion/Heat of solidification (H$_f$)

The amount of heat required to melt/freeze 1 gram of a substance.

Equation to find total energy required: q = mH$_f$

H$_f$ = 334 J/g

Heat of vaporization/Heat of condensation (H$_v$)

The amount of heat required to vaporize/condense 1 gram of a substance.

Equation used to find total energy required: q = mH$_v$

H$_v$ = 2260 J/g

How to calculate the total amount of energy required to complete a phase change and/or temperature change of water.

1. Use a heat curve ANY time the problem mentions water changing temperature or phase (and metal is not mentioned along with it…that will be a different type of problem). Do not forget to label the melting (0°C) and boiling (100°C) lines.
2. Plot the beginning temperature and ending temperature on the heat curve.
3. Each time you go through a different part of the heat curve, you MUST use a new equation. If you are using C and ΔT, pay close attention to what line you are on.
4. If you used more than one equation, add all answers together.

Practice Problems:

1. Calculate the amount of energy, in joules, required to vaporize 3.2 g of water at 100°C to steam at 100°C.

2. How much energy, in joules, would be required to heat 83.1 g of ice at -4.5°C to water at 0°C?

3. Calculate the amount of energy, in calories, required to heat 17 g of water at 37°C to steam at 187°C.