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Absolute vs. Relative Temperature

- Temperature measures the average KE per particle within a substance.
- Absolute temperature scales also have 0 set to ______. In the metric system, 273 _____ means ______.
- Relative temperature compares the average atomic ______ of a _____ to a known average. For example, 0 _____ means ______ at 1 atm, 100 _____ means ______ at 1 atm. In Fahrenheit, that's _____ and ____, respectively.

<u>*** Note:</u> $\Delta T = \pm 1$ °C = ____ K while T = 0 °C = ____ K

Internal Energy vs. Temperature

- Internal Energy is *all* the microscopic ______ and _____ an object has collected (ignoring any that was converted to macroscopic ______ or _____ related to external objects.)
- In contrast temperature is the _____ microscopic ____.
- Note: This mean two substances could have the same temperature and ______ internal energies. For example:
- Note: High temperature doesn't have to mean High thermal energy. 1 microgram of salt might be very hot, but it would have little thermal energy because ______.
 The Great Lakes in are very cold even in the middle of summer. They have absorbed ______.
 energy from the sun, but they are so ______ that they don't ______ a lot.
- In Chemistry, you learned every material heats up slightly differently (has a different specific heat). Heat added to an object = ______. (If no phase change has occurred.)
 So, Q may be proportional to _____, but ____ has a big effect on how much _____ is observed.
- So, Q may be proportional to _____, but ____ has a big effect on how much _____ is observed. *Examples:*

Thermoequilibrium and Heat Transfer Processes

There are 3 ways thermoequilibrium is achieved:



Diagrams:

Phases of Matter

U4P1c

- As heat is added or ______ from a substance it will change ______. The phase changes with added heat because the ______ of atoms becomes too big for the atomic ______ to hold the current configuration. NOTE: phases are based on ______ type, not on ______. After all, solid ______ is less ______ than liquid ______.
- Solid -- _____ shape, _____ volume, _____ bonds
- Liquid -- _____ shape, _____ volume, _____ bonds
 Gas -- _____ shape, _____ volume, _____ bonds
- Plasma -- same as _____, but electrons and proton are _____, so _____ form.

		* <u></u>	^
Solid	Liquid	Gas	Plasma

Phases Transitions



Measuring Heat Loss/Gain Directly and Using Conservation of Energy

There are two formulas learned from Chemistry that measure heat transfer in/out of a system. 0

If no phase change occurs: Q = _____ where C is _____.
 If a phase change is occurring: Q = _____ where H is _____.

Note: the second formula has no _____, which means that even though heat might be being added 0 to the system, the ______ in not changing. This might sound odd, until you realize you've observed this every time you get a glass of water at a restaurant. When you first drink from the glass, you are basically ______ surprised by the temperature. This is because the glass contains both ______ and _____ guaranteeing the temperature is roughly _____. If it were colder, the contents would be _____, if warmer _____. It take heat to ______ in the ice. So, temperature doesn't change until that process is done.

Example:

• When two objects "touch", they come into ______. Since energy is never nor _____, the heat emitted by a hot object _____ the heat _____ by a cold object. NOTE: This does not mean the temperature loss and gain will be equal. Normally a massive object's temperature will change ______ a light object's temperature. • Calorimetry uses the knowledge that _____ = ____ or ____ = ____ to learn the mass or specific heat of an unknown object by measuring its temperature change when placed in a

Example:

known fluid.