Heat Transfers

Methods of heat transfer

- Conduction- when the two objects actually touch. (this is the best method)
- Convection- through a circulation of fluids.
- Radiation- energy leaving in the form of an electromagnetic wave (like light) .
- Radiation will have the lowest rate of transfer, but it is also impossible to stop.

Conductors and Insulators

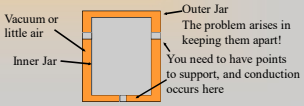
- Conductors- materials that allow heat to quickly pass throughout the material (like metals)
- Insulators- materials that do not allow heat to quickly pass throughout a material (like wood or plastic)
- This mainly deals with the movement of particles
- metals have a "sea of electrons" which allows for quick heat transfer.

Insulated Container

- Any insulated container (Thermos, Yeti, Hydroflask), is a container that is capable of keeping hot items hot or cold items cold.
- They sell very cheap ones that go into little kid's lunch boxes. They sell very expensive ones that keep beverages hot or cold for much longer.
- A insulated container works by preventing transfers of heat!

Thermos

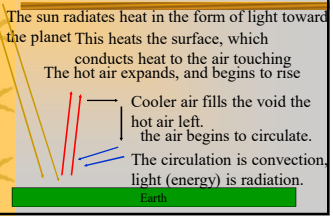
- This is how a thermos works.
- You have a jar inside a jar with a vacuum (nothing, no air or anything) in between them



Why do metals feel cool to the touch at room temperature?

- Room temperature is cooler than human body temperature.
- Heat is ONLY noticed when there is a transfer!!
- Metals quickly conduct heat from your body throughout the metal (since it is taking heat it feels cold).
- Wood or plastic don't conduct heat quickly so not as much is taken from your skin.
- Good insulators normally have a lot of space for air, because gases don't conduct as well as solids.

Convection and radiation



How do clothes keep you warm?

- They prevent a transfer of heat by convection.
- Internal body temperature is 98.6º F, skin temperature is closer to 80º F.
- This is because heat is transferred away from the skin.
- Thicker clothes slow down this transfer.
- Cooler clothes are correctly called breezy as they allow the convection to take place rapidly.

Why is water colder/hotter than air?

- 75º degree air is comfortable, 75º water is very cold.
- 100º air is uncomfortable, but livable. 100º water (hot tubs) come with a warning, don't stay in the water for extended time, or you can die.
- Why?

Why

- Heat is noticed when there is a transfer.
- Water is better at transferring heat through convection than air.
- At 75° F air is transferring just enough heat away to make you comfortable.
- Water transfers heat away at a faster rate, so it feels cold.
- At 100°, water transfers enough heat to you to kill you, if you stayed in it for an extended period of time. Air does not.

Radiation Energy

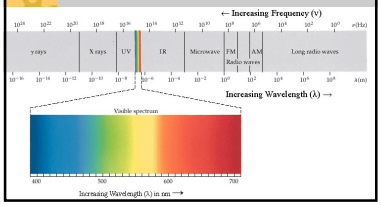
- This is from Bohr's research.
- High energy atoms, one's that are hotter, have more motion.
- The electrons jump to higher energy level orbitals because of the extra energy.
- This atom is said to be "excited".
- This is unstable, and the electrons will "fall" back into place shortly.

"falling electrons"

- When the electrons fall back into the correct energy level orbital, it releases a packet of energy called a photon.
- The photon is the base unit of radiation.
- Every atom has exact distances between energy levels, so there are only certain types of photons each atom can produce.
- Neon produces photons which we see as a red visible light, argon as blue visible light.

Radiant Energy

- Radiation can be visible light, but can also be a large spectrum of things like…



Conduction and reactions

- Reactions require an activation energy.
- For paper to burn it must reach 451° F or 233° C
- If it can conduct heat at lower temperatures it will not burn, even in an open flame.
- Water can boil in a paper cup because it never gets above 100° C.