CLASS SET – DO NOT WRITE ON THIS!

How Thermal Energy (Heat) Travels

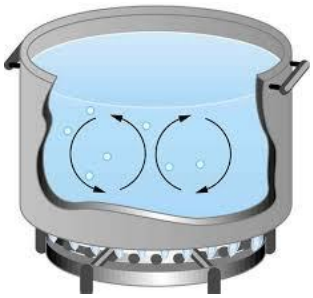
Have you ever burned the roof of your mouth on hot pizza? Have you burned your feet from walking barefoot across hot asphalt or beach sand on a hot summer day? Have you ever had a sunburn? These examples all have something in common: thermal energy (heat)! Thermal energy moves from warmer matter to cooler matter in three different ways: conduction, convection, and radiation. As you read the descriptions, try to think about everyday situations that involve the different types of thermal energy transfer.

Conduction

Imagine you just came in from a cold winter walk. Your older brother helps you make a cup of soup. You get a spoon and put it in the bowl of hot soup. Your phone buzzes with a text message from your friend. You leave the soup for a minute to reply to your friend. You pick up your spoon and notice that it got really hot! How did this happen? The metal spoon became hot because the spoon is in direct contact with the soup. As the heat from the soup comes in contact with the bottom of the spoon it moves up to the cooler end, all along the entire spoon up to the top. The heat moves through the spoon because the spoon is colder than the soup and because the spoon is in direct contact with the hotter soup. This type of heat transfer is known as conduction. Conduction is the transfer of heat through a material by direct contact. In order for heat to move by conduction, two things with different temperatures must be touching. Transfer of heat by conduction usually happens in solids such as this metal spoon.

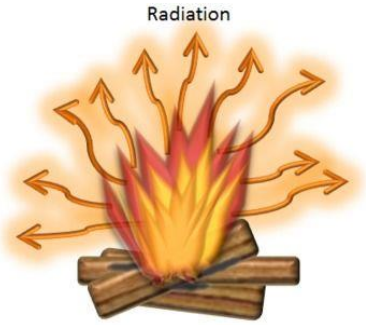
Convection

You put a pot of water on the stove to make macaroni and cheese. As you watch the water boil you pour in the macaroni and notice that it keeps sinking and rising in a circular pattern. The water at the bottom of the pot that is directly above the heat source gets hot and rises to the top of the water. It then spreads out, cools, sinks, and is heated again in a continuous cycle. This continuous cycle of hot water rising, cooling, and sinking is known as a convection current. Convection currents transfer heat in a fluid (gas or liquid) as a result of the movement of the fluid itself. Believe it or not, without heat transfers by convection, there would be no wind, ocean currents, or mountains!



Radiation

If you have ever held your hand close to a hot stove, it would feel warm without your hands actually touching the hot stove. The sun and fire can do this too. They can warm you even when you are not physically touching them! The hot stove, the sun, and fire are heat sources. The type of thermal energy transfer you are experiencing is radiation. Radiation brings thermal energy to Earth by traveling through empty space! Radiation is the transfer of thermal energy via electromagnetic waves through space. There are no solids connecting the Sun to planet Earth and there are no fluids (substances that flow like air or water) setting up convection currents to transfer heat. Amazing!



Comprehension Questions (Answer the following questions in your INB in complete sentences.)

1. What are the three ways that heat can travel from one place to another? *(Heat can travel from…..by…….)*

2. How does heat move from one object to another by conduction? *(Heat moves by conduction when……)*

3. How does heat move by convection? *(Heat moves by convection when….)* Draw and label a diagram.

4. Explain what is unique about radiation. *(Radiation is unique….)* Why is radiation able to transfer heat in places conduction and convection can't? *(Radiation is able to transfer heat…….)*

*Edited from http://www.powersleuth.org/docs/EHM%20Lesson%205%20FT.pdf