Name _____

Period _____ Date _____

Heat Transfer Demonstration Lab

We know from the Particle Model, that all objects and substances are made from tiny particles. These particles are always in motion, even when the object itself is not. Since these particles are moving, they have kinetic energy. The **total kinetic energy of these particles is called thermal energy**. When thermal energy moves from a warmer to cooler region it is known as 'heat'. The **temperature** of a substance is a **measure of the average kinetic energy** of its individual particles.

There are three basic methods by which heat is transferred from one area to another: conduction, convection and radiation.

Conduction is the direct transfer of thermal (heat) energy from one substance to another. As one high energy ("hot") particle collides with another particle with less energy, ("cold") some of the energy from the first is transferred to the second. In that way the second is "warmed up" and the first is "cooled off" this would continue until all molecules in the substance reached the same temperature. (thermal equilibrium). Different materials have different "abilities" to conduct heat. Generally, the more dense the substance, the better heat conductor it is, because the molecules are more closely packed and collisions between molecules occur more often. Water, air and soil are poor conductors of heat. Metals and rock are good conductors of heat.

Convection is the transfer of thermal (heat) energy in a fluid (either liquid or gas) Convection works on the principle that as a fluid is heated (particles gain motion); the fluid expands and becomes less dense. A material that is less dense than the surrounding material will rise. In this way a heated fluid will transfer heat from one area to another. For example, air over a landmass that has absorbed heat and been warmed. The air will in turn absorb heat from the land and be warmed itself. As it is warmed it will rise, taking the heat with it. It will be replaced with cooler, denser air.

Radiation is the transfer of energy in the form of a wave. Radiation does not require the presence of matter to transfer energy. All of the energy we receive from the sun comes to us by this method.

Student Procedures:

1. Rotate from station to station as instructed. At each station, observe the temperatures of the various materials and record them on the data table below.

2. Based upon your observation and the background material you have read draw a conclusion as to which heat transfer process was represented by the different stations. Record this in the appropriate location on the data table.

3. Answer the conclusion questions.

Conclusion Questions:

At stations A through F different heat transfer processes were demonstrated. Below you will find a "box" to write a paragraph concluding your observations from each of the stations. Describe HOW heat was transferred at each station. Consider the following as you describe the events that occurred **AT EACH STATION.**

- Where was the area of high heat content (where is it hot?)?
- Where was the area of low heat content (where is it not hot!)?
- How was heat transferred?
- What is your evidence?
- What was happening to the particles of the different materials at each station?

Conclusions:

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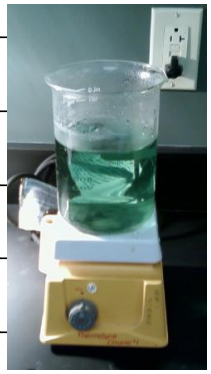
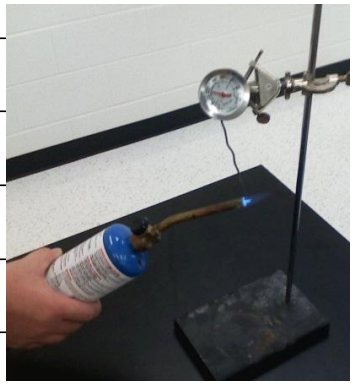
Station A: Heated/Non-heated Beaker

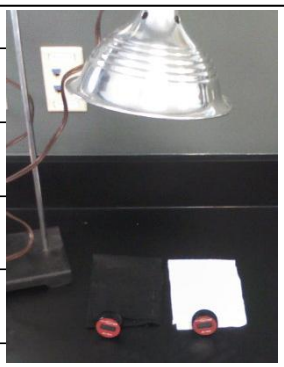
Station B: Beaker with Dye



C. Wire and Torch



D. Felt



E. Beakers with Sand

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Heat Transfer Demonstration Lab—Data Table

Station	Temperature (degrees C)		Heat Transfer Process
A Heated Beaker(1)/Non-heated Beaker(2) Aluminum Bar	Heated Beaker -begin	Non heated Beaker - begin	
	end	end	
A Heated Beaker(1)/Non-heated Beaker(2) Steel Bar	Heated Beaker -begin	Non heated Beaker - begin	
	end	end	
B. Beaker with dye	Record what happens to dye as the beaker is heated		
C. Wire	Begin		
	End		
E. Black& White	Black felt		
	White felt		
F. Beakers with sand	Under light		
	Not under light		