Name Block \_\_\_\_ Binder Page # \_\_\_\_

**Goal:** **Students will be able to identify the method of heat transfer in a system.**

 **Students will** **know the direction of heat transfer.**

 **Students will be able to recognize the three methods of heat transfer in our**

 **atmosphere.**

Task: You will move around the room from station to station and make observations about the method of heat transfer taking place.

**Station 1: Lamp on thermometers and beads**

Take two sticks with beads on them from the beaker. Make sure they are both white.

Place one thermometer under the incandescent bulb and one under the black light.

Be sure the thermometers are the same distance from the bulb (about 6 inches).

Place the sticks with the white bead next to each thermometer.

Turn the lights on for 2 minutes.

\*\*Record the temperatures of the thermometers and put them back in the beaker.

\*\*Record the color of the beads and put them back in the beaker.

\*\*What was the method of heat transfer?

\*\*Why do you think there was a difference in the color of the beads?

**Station 2: Beaker of Magic Fluid**

\*\*Use the flashlight (cell phone) to observe the fluid in the beaker.

Use the tongs to place the beaker on the hot plate.

\*\*Observe the motion of the fluid in the beaker.

Turn the temperature up to 5 for 30 seconds.

\*\*Was there any change in the movement after 30 seconds?

\*\*What is the method of heat transfer from the hot plate to the beaker?

\*\*What is the method of heat transfer within the fluid?

Turn the heat back down to 1.

Use the tongs to take the beaker off the hot plate.

\*\*Wait 30 seconds and place 1 ice cube in the beaker. What happens?

Leave the beaker where it is.

**Station 3: Heat Transfer apparatus**

The two cups are called calorimeters (insulated cups).

Boiling water at 95 degrees Celsius was placed in the Calorimeter A.

Water at 22 degrees Celsius was placed in calorimeter 2.

The two calorimeters are connected by a metal bar.

\*\*Record the temperatures of the thermometers in each calorimeter when you get to the station.

\*\*What is the method of heat transfer between the two calorimeters?

\*\*Is the hot calorimeter heating the cold one or is the cold one cooling the hot one? (touch the metal bar to help answer this question)

\*\*Hold your hand an inch or two from the metal bar (above or below) and record the way heat is transferred to your hand.

**Station 4: Radiometer**

Observe the radiometer with the light off. Notice the alternating black and white fins. Turn the light on and notice what happens.

\*\*What type of heat transfer are you observing?

The fins spin away from the black toward the white because the black fins get hotter. \*\*Explain why using the word **albedo**:

The fins are in contact with the air, the hotter black fins cause the air molecules to move away faster and giving the fins more of a push in the opposite direction.

\*\*What method of heat transfer is happening between the fins and the air?

**Station 5: Melt the ice**

\*\*Pick up the two black spheres and make an observation about how they feel (temperature wise):

\*\*Predict which one will cause an ice cube to melt faster:

Put an ice cube on each of the black spheres.

\*\*Does the ice melt faster on the metal or plastic square?

\*\*What is the method of heat transfer that is taking place?

\*\*Explain why the metal square melts the ice faster.

**Station 6: Spinning Angel**

**Please, please, please be careful with this angel. It belongs to the son of another teacher.**

Light the candle under the angel. After a while you will see the blades begin to spin. \*\*Are the blades spinning for the same reason they spin in the radiometer? (If you have not done the radiometer yet, hold off on answering this)

\*\*Look at the blades and explain (use a diagram) why they spin the way they do.

\*\*What method of heat transfer is at work?

**Station 7:  Candle Chimney**

Mr. Reitsma will have a box at the front of the room with a lit candle inside. He will light a napkin on fire and blow it out to create smoke and hold it over one of the chimneys. \*\*What happens to the smoke when it is held over the chimney?

\*\*What method of heat transfer is happening within the box?

\*\*Diagram the direction of air movement in the chimney and explain why it moves the way it does:

**Station 8: Container of Hot Water and Ice Water**

Heat Flow: Container 1 contains Ice water. Container 2 contains heated water. Touch / hold both containers. Answer the following questions about the containers.

\*\*1. How do your hands feel after touching container 1?

\*\*2. How do your hands feel after touching container 2?

\*\*3. What was the method of heat transfer between the containers and your hands?

\*\*4. Use what you know about heat transfer to explain your observations for 1 and 2.

**Station 9: Lava Lamp**

Observe the Lava Lamp (**BUT DO NOT TOUCH)**. There is a light under the glass that goes on when the Lava lamp is turned on.

\*\*1. What does the wax do in the lava lamp?

\*\*2. What method of heat transfer does this show?

\*\*3. What method of heat transfer is responsible for heating the wax?

\*\*4. Conduction does take place in the heating of the wax. Where can conduction be observed?

Demo at end: Convection of Hot and Cold Water

Which way was energy transferred in each station.

Demo: Radiation – Gas Bubbles!!