Energy on the Move

We have learned that all matter is made of molecules. We have also learned that when the molecules are heated they move faster than if they were cold. Now we will explore the direction in which thermal energy moves. One of the laws of science says that thermal energy or heat always moves from the warmer matter to the colder matter until they are both at the same temperature. This concept is called thermal equilibrium.

Think about the last time you took a nice warm bath. What happened after a while – the water got cooler and the bathroom air got warmer until they were both the same temperature. The heat of the bath water was transferred to the bathroom air. So the heat moves from one substance (water) to another substance (air). And it moved from the warm bath water to the cooler bathroom air. The thermal energy was transferred from the warm water to the cold air.

Materials: lamp with incandescent light bulb (40W)

What To Do:

1. Observe the UNLIT lamp your teacher shows you.
2. One student to volunteer to hold their hand next to the unlit light bulb.
3. Predict how much heat the student will feel. _____
4. Your teacher will turn on the lamp and the volunteer will again place their hand near the bulb.
5. Predict how much heat the student will feel. _____
6. After a few seconds the volunteer will share how their hand feels now.

Questions:

1. How did the volunteer's hands get warm? _____
2. Did the heat move? _____
3. Did the heat move in a particular direction? _____

Materials: 2-L bottle, balloon, container of ice and water, container of warm tap water

What To Do:

1. Blow up the balloon a little bit to stretch in out. Then let the air out.
2. Place the balloon over the mouth of the empty plastic bottle.
3. Stand the bottle in the center of the container filled with hot water. Make sure it stands straight up. Wait a few minutes and watch what happens to the balloon.
4. Remove the bottle from the hot water and place it in the container with the cold water and ice. Make sure it stands straight up. Wait a few minutes and watch what happens to the balloon.
5. Repeat several times.

Questions:

1. What happened to the balloon when the bottle was in the hot water? _____
2. From what you know about particle motion explain what happened? _____
   _____
3. What happened to the balloon when the bottle was in the ice water? _____
4. From what you know about particle motion explain what happened? _____
   _____
5. What direction did the heat move when the bottle was in the hot water? _____
6. What direction did the heat move when the bottle was in the ice water? _____

Direction of Heat Transfer

Identify the direction of heat transfer from the system to the surroundings or from the to the system in the chart below.

System	Surroundings	Direction
Classroom 78ºF	Outside Air 94ºF	
Ice cream cone 30ºF	Cafeteria 78ºF	
Can of soda 65ºF	Outside Air 94ºF	
Attic of House 120ºF	Outside Air 94ºF	
Cup of coffee 120ºF	Classroom 78ºF	
Living Room 73ºF	Attic of House 120ºF	

Questions:

1. Below you see a picture of a melting ice cube. Where is the heat coming from that is causing it to melt? _____
2. Label the heat and some arrows showing the direction the heat travels.
3. Where is the heat going? _____

4. If the room temperature is 24ºC and the ice temperature is 4ºC what would the temperature of the melted ice water be? _____
5. When will the heat transfer stop? _____

_____

Watch the video "Hot or Not" from www.missdoctorbailer.com

1. Which had the higher temperature - the surroundings or the hands of the guys? _____
2. How do you know? _____
3. In what direction did the heat flow?

_____

Watch the video "Thermal Equilibrium" from www.missdoctorbailer.com

1. What happens when object reach thermal equilibrium? _____
2. What happened to the brick when the hot iron was place on it? _____
3. If no more heat is added to the iron and the brick what will eventually happen?

_____

4. What happened to the water when the hot iron was placed in it? _____
5. If no more heat is added to the iron and the water what will eventually happen?

_____

6. In both of these examples the iron, brick and water will eventually reach thermal equilibrium. What does thermal equilibrium mean?

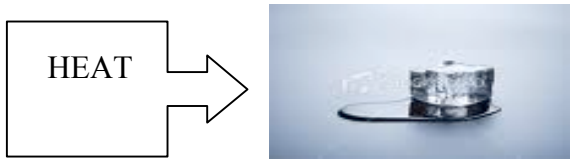
_____

Name _____ period ____

EXIT TICKET

Energy on the Move

1. Circle the diagram below that shows which direction heat travels.



2. When does heat transfer stop?

A. When the cold becomes hot
B. When the two substances are at the same temperature
C. When the hot substance becomes hotter
D. When the two substances become cold

3. The movement of heat from one substance to another is called –

A. Energy Training
B. Energy Triumph
C. Energy Transfer

Name _____ period ____

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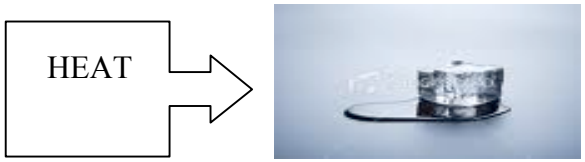

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