Thermal Energy Study Guide

Name: _____ Hour_____

Goal 1

Define the following in your own words:

1. Conductor - **a material that allows heat to flow through it easily**

   Two examples - **metal pot, fork**

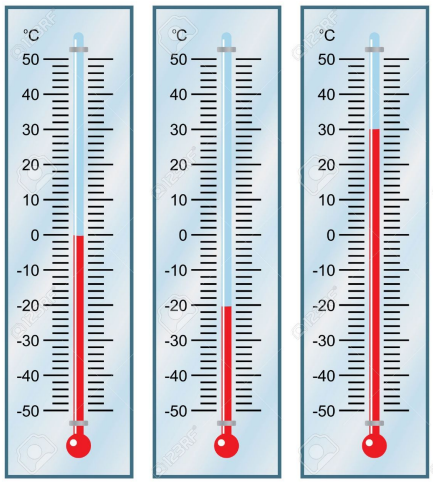
2. Insulator - **a material that DOES NOT allow heat to flow through it easily**

   Two examples - **styrofoam, wood**

Goal 2

1. A balloon was blown up and placed in the freezer. When it was taken out of the freezer, it expanded. Which of the following explains the changes in kinetic and thermal energy when the balloon was taken out of the freezer?
   a. **Kinetic energy increases, thermal energy increases**
   b. Kinetic energy decreases, thermal energy increases
   c. Kinetic energy increases, thermal energy decreases
   d. Kinetic energy decreases, thermal energy decreases

2. In which picture are the molecules moving the slowest? How do you know?



The middle thermometer shows the lowest temperature so it has the least kinetic energy.

3. At what temperature does water freeze?

__**32**_____°F, ____**0**____°C, ___**273**____K

4. At what temperature does water boil?

____**212**____°F, ___**100**_____°C, __**373**____K

5. What temperature is absolute zero?

_____**-460°F**__**°F,** ___**-273°C**____**°C,** __**0 K**___**K**

6. What is room temperature?

__**68-70°F**___**°F,** __ **20-21°C**_**°C,** _**294 K**___**K**

7. Describe what is happening to the kinetic energy of the particles in water as it goes from 40 degrees Celsius to -2 degrees Celsius.

The kinetic energy of the particles decreases. The substance goes from a liquid to a solid (particles sliding past each other TO particles slowing down and vibrating and place).

8. Describe what is happening to the kinetic energy of the particles in water as it goes from 80 degrees Celsius to 103 degrees Celsius.

The kinetic energy of the particles increases. The substance goes from a liquid to a gas (particles sliding past each other, taking up the space of its container TO particles moving quickly, bouncing in many different directions).

9. In an experiment, one thermometer was placed under a light blue t-shirt and one thermometer was placed under a dark navy t-shirt. A heat lamp was then set up to shine on both shirts. The temperature was measured and recorded for 2 hours. Describe or illustrate what happens to the temperature of each thermometer. Explain WHY this happens.

The thermometers start at the same temperature. Both thermometers increase in temperature. The dark navy t-shirt increases more because dark colors absorb more heat than light colors. Light colors reflect some of the heat.

Goal 3

1. You have iced tea in a glass you are outside on a hot day. Describe the direction of heat transfer.

The heat energy transfers from the warm air to the glass of ice tea until they reach equilibrium (the same temperature).

2. You have a cup of hot cocoa in the classroom. Describe the direction of heat transfer. When does the transfer of thermal energy stop?

The heat energy transfers from the hot cocoa to the air around it until they reach equilibrium (the same temperature).

3. Define EQUILIBRIUM as it refers to thermal energy:

The point when temperatures of different substances are equal (the same); balanced

Goal 4

Identify which of the three ways heat is transferred in each example below (Conduction, Convection, Radiation). Explain WHY!

1. Holding cold snow in my hand. ____**Conduction because my hand is directly touching the snow.** _____

2. Getting too hot sitting next to the fire. __**Radiation because I am not directly touching the fire and it is emitting electromagnetic waves as heat.**_____

3. A hot tub is heated through this process. _____**Convection because it is the circulation of water that actually heats the whole hot tub** _____

Fill in the blank with Conduction, Convection and Radiation below.

4. Near the ceiling of a room the air is warmer. The warm air rises because of ____**convection**_____.

5. A student holds the back of his hand near an iron to see if it is hot. Heat is transferred to his hand by ___**radiation**_____.

6. A huge rock at the state park gets so hot during the day that you can't sit on it from __**radiation (the rock is heated from the sun)**_____.

7. You lay on that same rock at night so that you can keep warm by ___**conduction**_____.

8. Give an example of **convection** you see in your everyday life. Explain how heat is transferred in your example. Include density in your explanation. *Answer in complete sentences*.

My bedroom is heated up through convection, by the movement of the air in the room. The heating vent on the floor gives off hot air. That hot air rises because it is less dense than the air around it (the particles are less compact). The air at the top of the room will cool off because it is away from the heat source. This cool air at the top will sink because it is more dense (particles are more compact). Once it sinks to the bottom of the room the air will eventually be heated up again because it is near the heating vent and the cycle continues until the room is heated up.

Goal 5

1. What happens to the melting point/freezing point of water when you add salt?

Salt depresses (lowers) the freezing point of water so that it will freeze at a lower temperature than water by itself.

2. Describe the reason for pouring salt on the roads in the winter.

We pour salt on the roads in the winter because salt lowers the freezing point of water. Since water normally freezes at 32 F (0 C), salt can make the roads safer by keeping water on the roads from turning into ice in temperatures below freezing.

3. Why do we use salt to make ice cream?

We use salt to make ice cream because it allows the ice to get even “colder” which freezes the cream even faster because it has such a low temperature.