Name: _____

Thermal Energy Quiz Review

1. Amy wraps her dolls in blankets but can't understand why they don't warm up. Why don't they warm up?

   The dolls are not generating heat like a person under a blanket would. Blankets help us to FEEL warm because they slow down the loss of heat from our bodies to the environment.

2. You pick up a can of soda off the countertop. The countertop underneath the can feels colder than the rest of the counter. Why?

   Heat energy moved FROM the countertop TO the can of soda leaving the counter colder to the touch.

3. After cooking an egg in boiling water, you cool the egg by putting it into a bowl of cold water. Which of the following explains the egg's cooling process?

   The egg cooled off quickly because the heat moved FROM it TO the cold water.

4. When you hold a metal coat hanger in a camp fire to roast a marshmallow, the coat hanger might get too hot to hold. Explain why.

   The coat hanger is a good conductor of thermal energy. (It has a low specific heat capacity so that means that it doesn't take as much energy to increase its temperature a certain number of degrees.)

5. An aluminum plate and a plastic plate have been in the freezer all night long. When you remove them the next morning, will the aluminum plate be warmer or cooler than the plastic plate, or will they be the same temperature? Why?

   The plates are the same temperature. The aluminum plate FEELS colder because it is a better

conductor than plastic (plastic is a good insulator). This means that the metal plate is better at moving heat away from your hand than the plastic plate so it feels colder.

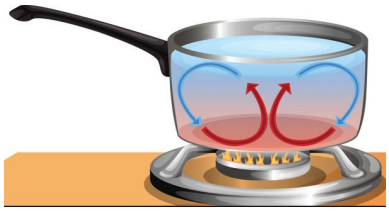
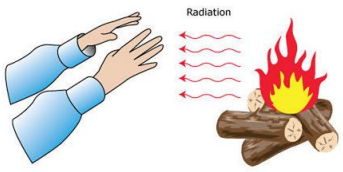
6. On a hot day, the basement of a house is usually cooler than the upstairs floors. Explain why.

   Convection - warm air is less dense and so it rises.

7. Describe the relationship between the kinetic energy of the particles in a glass of water and the temperature of the water.

   As the kinetic energy of the particles increases, the temperature of the water increases.

8. Give a definition for conduction, convection and radiation and draw a picture for each term.

Conduction	Convection	Radiation
Definition: *transfer of thermal energy through direct contact*	Definition: *transfer of energy in fluids (gases or liquids)*	Definition: *transfer of heat through electromagnetic radiation*
Picture: 	Picture: 	Picture: 

9. Pretend you want freeze your water bottles so you have cold water for practice after school. You put the water bottles in the freezer. Draw the direction of heat transfer as the water turns into ice.

   Heat is transferred FROM the water TO the air in the freezer.

10. You take your frozen water bottle out of the fridge, take it to school and put it in your locker. Draw the direction of heat transfer as the ice turns into water.

    Heat is transferred FROM the air in your locker TO the water bottle.

11. Describe the relationship between the amount of matter and the energy transfer required to raise the temperature. (think bucket vs. bathtub)

    It takes more energy to raise the temperature of a sample with more mass. It takes more energy to heat a bathtub full of water than a bucket full of water.

12. Define specific heat capacity:

    Specific heat capacity is the amount of energy required to raise one gram of a certain substance
    one degree Celsius.

13. Use the table to answer the two questions on the side.

Material	Specific Heat (J kg^{-1} K^{-1})
Aluminium	878
Copper	381
Iron	438
Lead	126
Ethanol	2410
Water	4200
Hydrogen	14150

Which requires the most energy transfer to raise temperature 5°C?

Hydrogen

Which requires the least energy transfer to raise temperature 5°C?

Lead

14. Pretend you put both copper pot and an aluminum pot over the same campfire at the same time. Which would be warmer after 10 minutes? Why?

The copper pot would be warmer after 10 minutes because it has a lower heat capacity. (It requires less heat energy to raise its temperature.)

15. For the Save the Penguins! Project you need to be prepared to:
    a. Draw your device.
    b. Describe the direction of heat transfer in your device.
    c. Describe design features that minimized thermal energy transfer and explain why.