

Name _____
Date _____

Science-Matter on the Move
Student # _____

Thermal Energy vs. Heat

Any change in matter requires energy. For example, we need thermal energy to cook popcorn. When popcorn is cooked, its thermal energy increases. We see this change in thermal energy when the popcorn transforms from kernels into fluffy white puffs. We feel this change in thermal energy as heat.



Although we experience thermal energy as heat, the two are different. Heat is the transfer of thermal energy. Heat always flows from objects with more thermal energy to those with less energy. When an object feels warm to the touch, it is



because the object has more thermal energy than your fingertips do. When heat flows from the object to your fingers, you feel this gain of thermal energy as warmth. When an object feels cold, it is because the object has less thermal energy than your fingertips do. As heat flows from your fingertips to the object, you feel this loss of thermal energy as cold.



The hand gains thermal energy from the heat pack.



The hand loses thermal energy from the ice.

Three Ways Heat is Transferred

Heat is the flow of thermal energy from warmer objects to cooler objects. Heat moves between objects of different temperatures in a variety of ways.

If you warm your hands on a cup of cocoa, heat flows from the cup to your hands by means of **conduction**. Conduction is the transfer of thermal energy through physical contact.



Conduction



Radiation

When you hold your hands by a fire, waves of energy from the flames transfer heat to your hands by means of **radiation**.

Radiation is the movement of energy waves through matter or empty space.

Finally, a blow dryer uses **convection** to dry your hair. Convection is the transfer of thermal energy through the movement of a liquid or gas.



Convection

Other examples:



These eggs are fried by means of conduction.



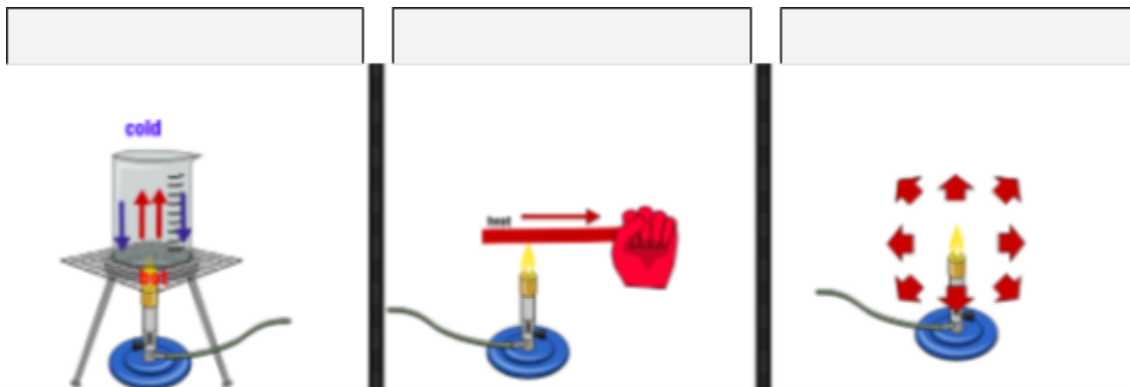
Microwave ovens cook food by means of radiation.



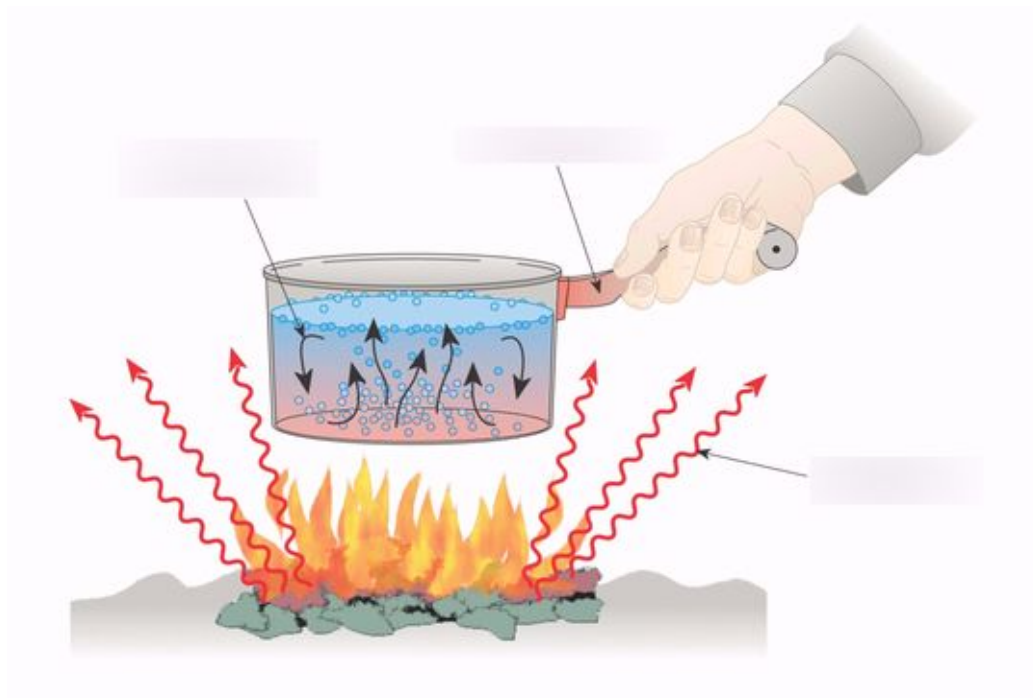
Water boils by means of convection.

Conduction, Radiation, and Convection

The picture below shows three examples of heat being transferred through conduction, radiation, and convection. Based on what you learned, label each heat transfer:

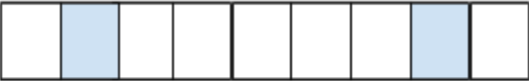


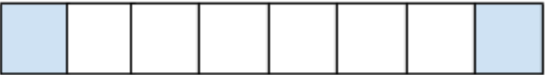
The picture below shows three examples of heat being transferred through conduction, radiation, and convection. Label where each of these is taking place.

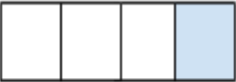
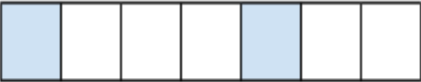
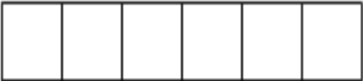



Select from the vocabulary words to complete the sentences. Then unscramble the shaded letters to decode the bonus message.

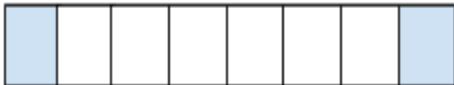
thermal energy	heat	conduction	generate
temperature	radiation	convection	internal


1.  is what cooks your food in the microwave oven.

2. When the molecules within a substance move, they  energy.

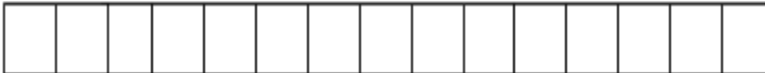
3.  is the transfer of 
 from warmer objects to cooler ones.

4. When you take your , you are measuring the average amount of your thermal energy.

5. Thermal energy is also called  energy.

6. When you fry an egg in a frying pan, you are cooking it by means of .

Bonus:



waves from the sun warm Earth through radiation.