4th Grade Science

Week 8

Your Week at a Glance
• Heat • NGSSS: SC.4.P.11.1; SC.4.P.11.2

Student Name:_____

Teacher Name:_____

School: _____

SC.4.P.11.1 Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature. **SC.4.P.11.2** Identify common materials that conduct heat well or poorly.

Heat

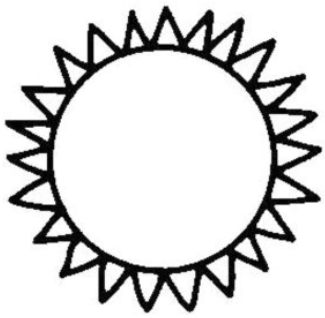
Heat is energy that moves between objects at different temperatures. Temperature is the measure of how hot or cold something is. A substance with a higher temperature is warmer than a substance with a lower temperature. Heat always moves from an object with a higher temperature to one with a lower temperature.

What happens when objects of different temperatures touch? Heat will flow from the warmer object to the cooler one. Suppose a cold spoon is placed on a warm counter. Heat will flow from the counter to the spoon. Now suppose a hot spoon is placed on a cool counter. Heat will flow from the spoon to the counter. Heat will continue to flow until the two objects are the same temperature.

Conduction is the movement of heat between two objects that are touching. Food frying in a frying pan becomes hot because it touches the pan. Conduction can also take place within an object. Your feet and hands stay warm because heat moves all around your body.

Convection is the transfer of heat within a liquid or a gas. Think about water heated in a pot on a stove. The water at the bottom of the pan becomes hot. The heated water rises. Cooler water sinks beneath it and is heated up in turn.

Radiation is the transfer of heat without matter to carry it. Heat flow by conduction or convection needs particles of matter to carry energy. Radiation can take place through an empty space where there is no matter. It is the way energy from the sun reaches Earth.



Conductors and Insulators

Conductors allow heat to move through them easily. **Insulators** do not allow heat to easily move through them. Think of pouring hot tea into two cups—a metal cup and a foam cup. The metal cup will feel warm almost immediately. The foam cup will take longer to feel warm. Heat flowed easily through the metal cup, but not as easily through the foam one.

Metals, such as silver and copper, are conductors. Rubber, glass, wood, and plastic are all good insulators. The fabric of a coat is a good insulator. In cold weather, layers of clothing trap your body heat near you. There's air between the layers of clothing. Along with the clothing, the air insulates your body. Insulators can be used to slow down the movement of heat.

Name _____ Date _____

Have you ever noticed that many cooking pans are metal with plastic handles? That's because the metal pan allows heat to flow easily from the stove to the food, but not into the handle.

For the most part, solids are better conductors of heat than liquids or gases are. That's because the particles that make up a solid are packed closely together. They vibrate but don't move apart much. Heat can move quickly from one particle to another. Many heat conductors also conduct electricity well.

Gases can be good insulators. A thin layer of trapped air is an excellent insulator. While metal wires conduct electricity and heat, most wires are covered in rubber to insulate them and keep people safe from the electricity and heat.

Student-Response Activity

❶ You hold a hot cup of tea in your hands on a cold day. Which way will the heat energy flow?

_____

_____

_____

_____

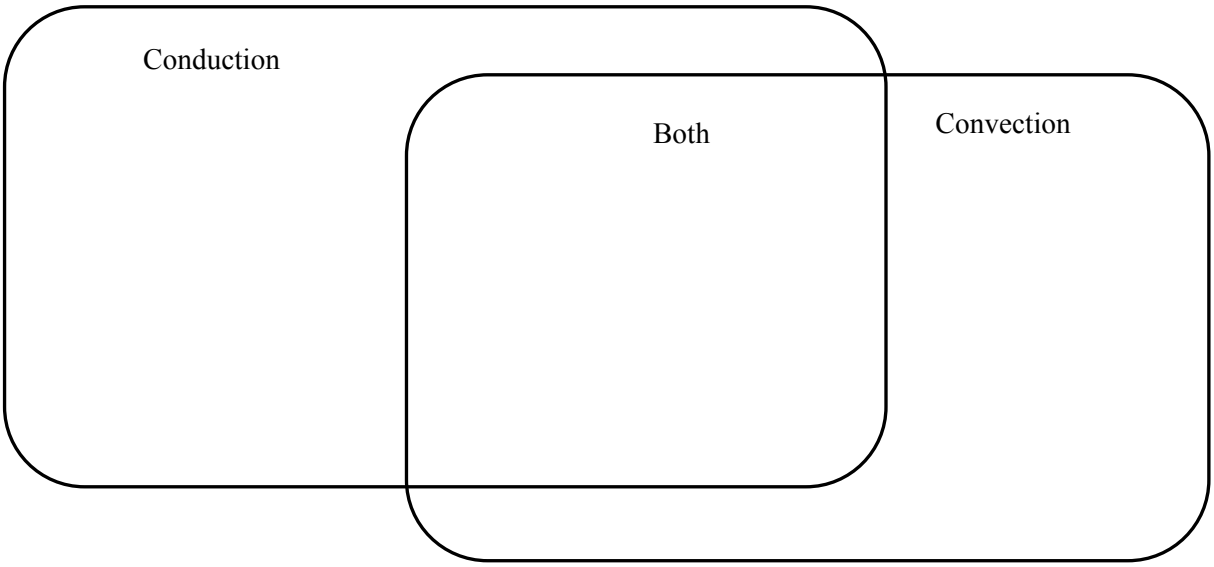
_____

Name _____ Date _____

❷ Identify examples of conductors and insulators in your home or school.

Conductors	Insulators

❸ Complete the Venn diagram below to compare and contrast conduction and convection.



❹ Explain how insulated bottles prevent heat transfer by radiation.

_____

_____

_____

Benchmark Assessment SC.4.P.11.1, SC.4.P.11.2

Fill in the letter of the best choice.

❶ Sam placed an ice cube in a cup of warm water. Which is correct?

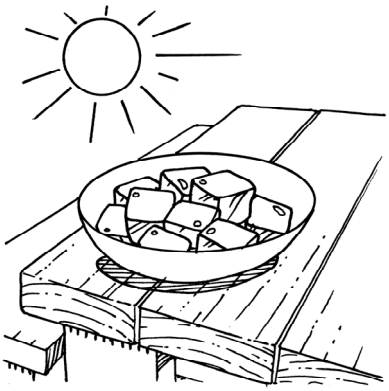
Ⓐ Cold flows from the water to the ice.

Ⓑ Cold flows from the ice to the water.

Ⓒ Heat flows from the water to the ice.

Ⓓ Heat flows from the ice to the water.

❷ How will energy from the sun melt the ice?



Ⓕ conduction

Ⓖ convection

Ⓗ evaporation

Ⓘ radiation

❸ Jude leaves a cold spoon in a hot bowl of soup. Which prediction is correct?

Ⓐ The temperature of the soup will increase.

Ⓑ The temperature of the spoon will increase.

Ⓒ The temperature of the spoon will decrease.

Ⓓ The temperature of the soup will not change.

❹ When does heat stop flowing between two objects?

Ⓕ when both reach a low temperature

Ⓖ when both reach a high temperature

Ⓗ when both reach the same temperature

Ⓘ when both reach the temperature of the surrounding air

❺ Why is electrical wire usually made from copper?

Ⓐ Copper is hard.

Ⓑ Copper is expensive.

Ⓒ Copper is a conductor.

Ⓓ Copper is an insulator.