Important Concepts . . .

Preview Review

Science *Grade 7* *TEACHER KEY*

W1 - Lesson 4: Heat Transfer

V5-07

Important Concepts of Grade 7 Science

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W1 - Lesson 2 ..... Nutrient Cycles, Energy Flows, and Changes in Ecosystems
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Materials Required.
Textbook:
Science in Action 7

Science Grade 7
Version 5
Preview/Review W1 - Lesson 4 TEACHER KEY

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Preview/Review Concepts
for
Grade Seven Science

TEACHER KEY

W1 - Lesson 4:
Heat Transfer

OBJECTIVES

By the end of this lesson, you should be able to

- define conduction, convection, and radiation
- explain where conduction, convection, and radiation can occur
- explain characteristics of materials that absorb or reflect energy
- define and identify conductors and insulators

GLOSSARY

absorb - to take energy in

conduction - the transfer of energy between particles that are touching each other

conductor - a material that allows heat to move through it

convection - the transfer of energy by moving particles

insulator - a material that stops or slows the movement of heat

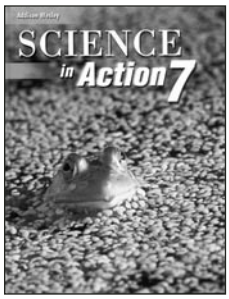
radiation - the transfer of energy in wave form

reflect - to bounce energy off matter

W1- Lesson 4: Heat Transfer

You know from the last lesson that heat is energy that moves from where there is more kinetic energy to where there is less. Interestingly, heat can be transferred in only three ways. Those three ways are **conduction**, **convection**, and **radiation**.

In all cases, heat transfer occurs only when there is a difference in temperature. Another way of saying this is that once the hotter and colder substances become the same temperature, heat transfer stops.



Conduction

For heat to transfer by conduction, particles containing the energy must be touching each other. They vibrate in place and bump into each other. As they do this, they pass heat from particles with more energy to the ones they are touching that have less energy. Read page 209 in *Science in Action 7*.

1. Explain how heat moves from one end of a metal rod to the other.

   At the end where heat first enters, particles are speeded up. They bump into particles they are touching and pass energy to them. The process moves along the rod.

2. In what states of matter does conduction occur?

   Mainly in solids, to some extent in liquids.

3. Why does conduction not occur in all states of matter?

Particles must be close enough to bump into each other and pass energy from one particle to another.

Sometimes we want to control the flow of heat. Some materials allow heat to move through them. They are called **conductors**. **Insulators** stop or slow the movement of heat. Read page 211 in your text.

4. List some materials are used to prevent conduction? What are they called as a group?

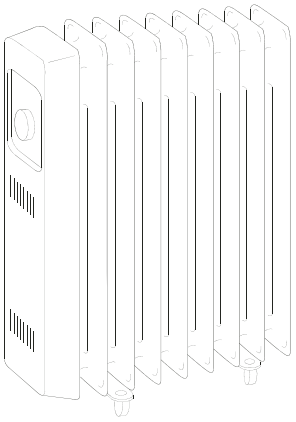
Insulators (e.g., cork, plastic, wood)

5. Describe some situations where you would want a product made of a conductor.

Answers will vary. (e.g., the base of cooking pots, car radiators, etc.)

6. Where are some places insulators are used?

Answers will vary. (e.g., handles of cooking pots, around ovens.)



Convection

Read pages 213 and 216 in *Science in Action 7*. To transfer heat by convection, particles must move from one location to another. When they move, they carry their heat to a new location and release it there. The particles produce a convection current when they move. At times, convection currents are desired, for example when heating a house using forced air. At other times convection currents may not be wanted if it is desired that heat remain in a particular location.

7. Describe the pattern of movement of particles in a convection current.

The movement of particles occurs in a circular motion.

8. Why do fluid particles move in convection currents when they are heated?

Heat is added to particles. They speed up and spread out. This makes them less dense so they rise through more dense particlse above them. As they move up, they start to lose heat and become more dense. They will drop down.

9. Air is a good insulator. Why are the spaces between window panes only a centimetre or two wide? Why are they not much wider?

If they were much wider, a convection current would develop which would transfer heat from the inside. The building would cool quicker.

10. What would happen in a home heated by forced air if there were no return ducts from the house to the furnace?

There would be no convection current set up to move heat around the house.

Radiation

Radiation is different from conduction and convection. Infrared waves of energy rather than particles are the source of the heat. Energy transferred in this way is called radiant energy. Read pages 217 and 220 in the textbook.

Different materials interact in different ways with radiant energy. Some materials absorb it; others reflect it. Materials that absorb radiant energy can then re-emit it. Colours also interact differently with radiant energy.

11. On a sunny, hot day, what colours of clothing would you wear to keep the coolest? Why?

Light colours (e.g., white to reflect the heat)

12. If you were building a heater to be placed in the middle of a large room, what type of material would you use? Why?

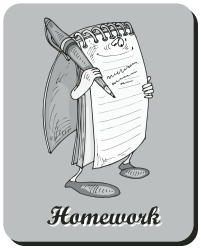
You'd want to make it of a good absorber/emitter. It should also be dull and dark coloured.

13. Where can energy travel as radiation but not by conduction and convection?

Through space - no particles for conduction and convection to occur

Heat transfer is occurring everywhere around you. Can you identify the different types of transfer? You will get an opportunity to do just that in your Homework assignment.

If you finish this lesson early, you may want to begin lesson 5 because a quiz will be part of the next class.



Homework

At home, look for at least three instances of heat transfer. Describe them, and identify each as conduction, convection, or radiation.

Answers will vary.

conduction - heat pots on stove

convection - hot air heating

radiation - heat from light bulbs