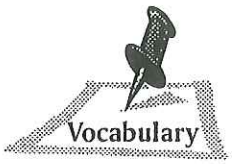
KEY.



- temperature
- heat

Lesson 1

Getting Started: Temperature versus Heat

Learning Outcomes

After completing this lesson you will be able to

- ❑ differentiate between heat and temperature
- ❑ demonstrate how heat is transferred

In this lesson you will make some observations about **temperature** and **heat**. Scientists also try to understand these concepts.

Temperature is a measure of how hot or cold something is. We often speak of temperature in regard to weather (e.g., "It's –30°C outside today!") or in regard to matter such as a liquid (e.g., "The temperature of the hot tub was over 40°C.").

Heat is the energy that is transferred from materials with a high temperature to materials with a low temperature. You may have heard people refer to heat when talking about a fire (e.g., "The heat from the burning fire was intense."). In the case of the fire, heat energy is transferred to the cool air around it.

Learning Activity: Exploring Temperature and Heat

Try the following learning activity to learn about temperature and heat.

1. Place three plastic bowls in a line. Fill one with hot water (but not too hot!), one with water at room temperature, and one with cold water (put a couple of ice cubes in it).
2. At the same time, place your left hand in the bowl of hot water and your right hand in the bowl of cold water. Leave your hands in the bowls for at least one minute.

Record how each hand feels, in comparison to the other hand (use words like "warmer" and/or "cooler").

3. Now place both hands in the bowl of water at room temperature. Record how each hand feels in comparison to the other hand.

Questions: Temperature and Heat

Remember, heat energy is transferred from materials with a high temperature to materials with a low temperature. When this happens, the object receiving the heat energy warms up.

Think about your learning activity while you answer the following questions. Circle the correct answer.

1. Which had the higher temperature?
   a) your left hand
   b) the hot water
2. How was the heat being transferred?
   a) from the hot water to your hand
   b) from your hand to the hot water

3. Which had the higher temperature?
   a) your right hand
   b) the cold water
4. How was the heat being transferred?
   a) from the cold water to your hand
   b) from your hand to the cold water
5. Fill in the blanks to explain what happened in the learning activity. Use the following words (some words will be used more than once) to fill in the blanks.

cooler	to
warmer	away from
temperature	heat energy

When your left hand was in the hot water and your right hand was in the cold water, your left hand felt (a) _____ than the right hand. Heat energy was transferred (b) _____ your left hand and (c) _____ your right hand. The temperatures of the two bowls of water were different. When you put both hands in the middle bowl with room temperature water the left hand felt (d) _____ than the right hand. Even though the (e) _____ of the water was the same for both hands, they experienced different heat transfers. Heat energy was transferred (f) _____ your left hand and (g) _____ your right hand. This shows how even when the (h) _____ stays the same the (i) _____ transfer can differ, resulting in different feelings of warm and cold.

Notes

Experiment A

Dip your finger in water and then run your finger around the mouth of an empty 1-litre plastic bottle. Place a dime over the opening of the bottle. (The water helps to create a seal when the dime is placed on top.) Now pour hot water over the sides of the bottle. Observe what happens.

1. Draw diagrams to show what happened to the dime before and after you poured hot water over the sides of the bottle.

Diagrams	
Before	**After**

4

2. Explain what happened, using the term "particles."

4

Experiment B

Attach a previously inflated balloon over the top of an empty one-litre plastic bottle. (**Safety note:** Check to see that the balloon will stretch over the neck of the container. Blow up the balloon to stretch it, and let it deflate before using. Repeat this process several times.) Pour hot water over the sides of the bottle. Observe what happens. Then place the bottle in a container of ice and water and observe what happens.

1. Draw diagrams to show what happened before you began, after you poured hot water over the sides of the bottle, and after you placed the bottle in ice water.

Diagrams	
Before	
After Hot Water	**After Ice Water**

2. Explain what happened with the hot water and with the ice water, using the term "particles."

/6

Experiment C

Take two medium-sized, resealable plastic sandwich bags and blow them up (you can do this by zipping the bag closed, then unzipping a small hole at one end of the zipper). Blow each bag up like a balloon and seal it while holding pressure on the last breath. You want these bags to be full, with the plastic tense.

Now let the bags sit on the counter for a couple of minutes to cool down to room temperature. The bags will probably become a little less tense in the process of cooling, so add one more puff of air to make them tense again.

Now stick one of the bags into your freezer for about three minutes, while leaving the other one on the counter. Observe what happens.

1. Draw diagrams to show what happened to the bag at room temperature and the bag in the freezer.

Diagrams	
Bag at room temperature	**Bag from freezer**

4

2. Explain what happened, using the term "particles."

4