

# Energy, Work, and Heat Transfer

## E-Learning Day #2 Heat Transfer: Convection and Conduction

### STANDARDS:

- 7.4.1 Understand that **energy is the capacity to do work.**
- 7.1.2 Describe and give examples of **how energy can be transferred from place to place** and transformed from one form to another through **radiation, convection and conduction.**

### GENERAL DIRECTIONS:

- READ:** Read and analyze the text that goes with each specific e-Learning day. Scan over the text once and then go back and read more carefully. Mark important information however you need to.
- WATCH:** There are one or more videos that go with each text's topic. These will help you make even more sense of the text.
- QUIZ:** After reading and watching the videos complete the quiz. You can find the quiz button on my Weebly page.

☺ You may refer back to the text and videos as often as needed to complete the quiz. Each question is worth TWO points.


# Day #2 Heat Transfer: Convection and Conduction

## Focus Questions:

- How is heat transferred?
- What is convection? How does heat move through convection?
- What is conduction? How does heat move through conduction?

## How Is Heat Transferred?

Heat is transferring around you all the time. If it wasn't, nothing would ever change temperature. Heat doesn't transfer randomly. It travels only in one direction and by three different methods.

 Heat is transferred from warmer areas to cooler areas by conduction, convection, and radiation.



## What is convection?

Energy in the form of heat can also be transferred through the movement of gases or liquids. **Convection** (kuhn•VEK•shuhn) is the transfer of energy as heat by the movement of a liquid or gas. In most substances, as temperature increases, the density of the liquid or gas decreases. Convection occurs when a cooler, denser mass of a gas or liquid replaces a warmer, less dense mass of a gas or liquid by pushing it upward.

When you boil water in a pot, the water moves in roughly circular patterns because of convection. The water at the bottom of the pot gets hot because there is a source of heat at the bottom. As the water heats, it becomes less dense. The warmer water rises through the denser, cooler water above it. At the surface, the warm water begins to cool. The particles move closer together, making the water denser. The cooler water then sinks back to the bottom, is heated again, and the cycle repeats. This cycle causes a circular motion of liquids or gases. The motion is due to density differences that result from temperature differences. The motion is called a *convection current*.

# What is conduction?

The transfer of energy as heat through matter by direct contact is known as **conduction**. This is similar to passing a basketball from person to person. When particles with different amounts of kinetic energy collide, energy transfers from the faster moving particles to the slower moving particles.

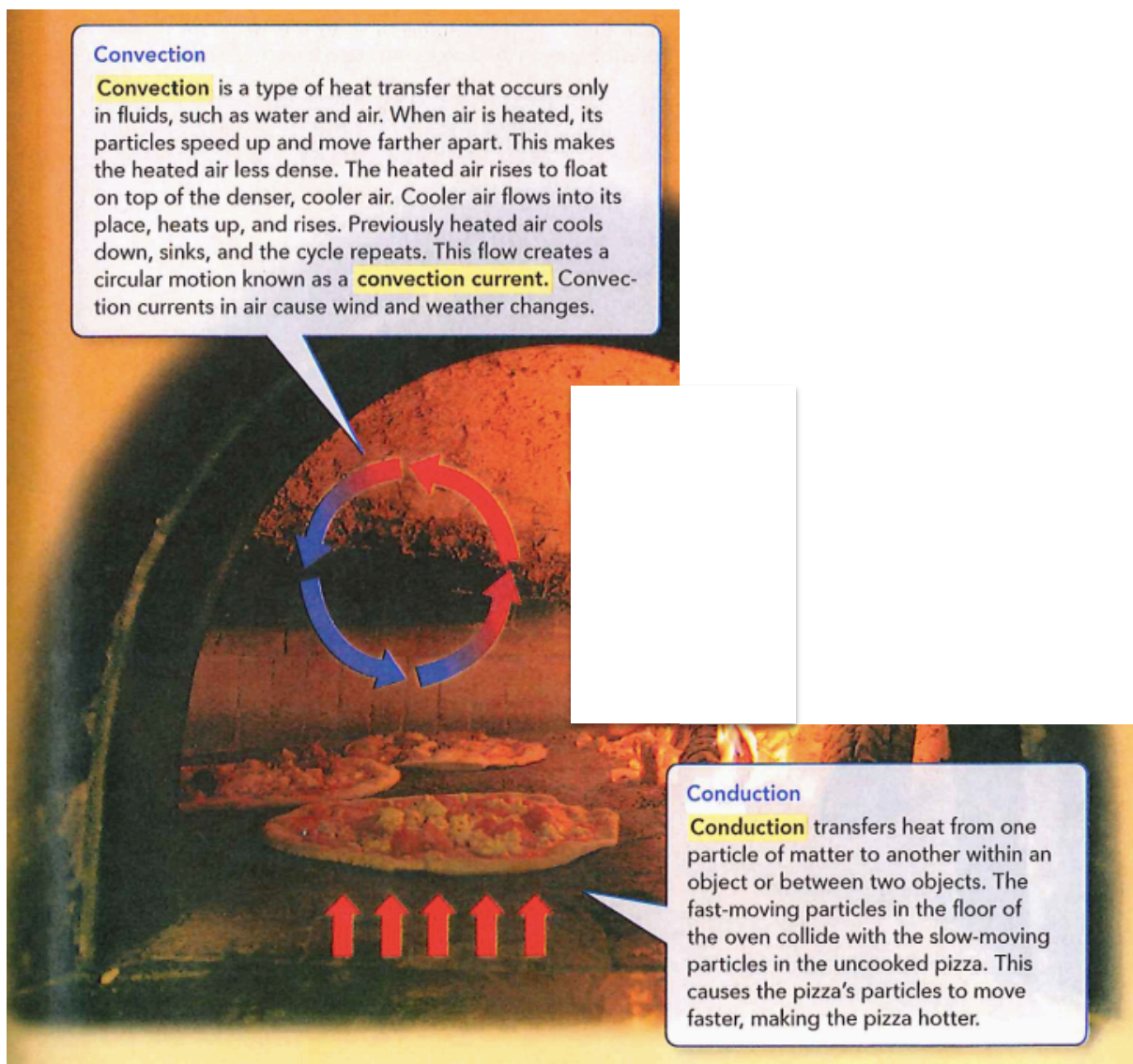
Conduction occurs when you put a metal spoon into a cup of hot cocoa. Energy as heat moves from the hot cocoa into the cold spoon and then travels up the spoon by conduction. This continues until the temperature of the entire spoon is the same as the cocoa.

## Convection

**Convection** is a type of heat transfer that occurs only in fluids, such as water and air. When air is heated, its particles speed up and move farther apart. This makes the heated air less dense. The heated air rises to float on top of the denser, cooler air. Cooler air flows into its place, heats up, and rises. Previously heated air cools down, sinks, and the cycle repeats. This flow creates a circular motion known as a **convection current**. Convection currents in air cause wind and weather changes.

## Conduction

**Conduction** transfers heat from one particle of matter to another within an object or between two objects. The fast-moving particles in the floor of the oven collide with the slow-moving particles in the uncooked pizza. This causes the pizza's particles to move faster, making the pizza hotter.



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**DON'T FORGET TO WATCH THE VIDEO TITLED: "Convection (Heat, Temperatures, and Energy)" AND THE VIDEO TITLED: "Conduction (Heat, Temperatures, and Energy)"**

☺ You may also want to review the video from Day #1: "Temperature and Heat" starting at the 3:40 mark.

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**QUIZ – These questions will need to be answered online.**

1. Which is an example of heat transfer by convection?

- A) the sun heating water in a swimming pool
- B) water in a beaker heated over a flame
- C) an ice cube melting in your hand
- D) a furnace duct heating your hand

2. Which is an example of heat transfer by conduction?

- A) the sun heating water in a swimming pool
- B) water in a beaker heated over a flame
- C) a furnace heating the air in your house
- D) an ice cube melting in your hand

3. Convection can only occur in \_\_\_\_\_.

- A) gases and solids
- B) liquids and gases
- C) solids and liquids
- D) solids and plasma

4. If you leave a metal spoon in a pot on the hot stove, the spoon gets hot, too. This is an example of \_\_\_\_\_.

- A) radiation
- B) conduction
- C) convection
- D) reflection

5. The process by which fast-moving molecules transfer their energy directly to neighboring slower-moving molecules is known as:

- A) convection.
- B) radiation.
- C) conduction.
- D) condensation.

6. Air, which is a mixture of **gases** can be classified or categorized as a fluid.

- A) True
- B) False

7. Heat transfers in convection from:

- A) warmer to cooler in a straight "line"
- B) cooler to warmer in a "circular" pattern
- C) warmer to cooler in a "circular" pattern
- D) cooler to warmer through waves in empty "space"

8. In order for conduction to occur, molecules/materials:

- A) do not need to be touching
- B) need to be touching

**DON'T FORGET TO SUBMIT YOUR ANSWERS ONLINE IN THE GOOGLE FORM.**