

## Conduction of Heat

In this lab, you will demonstrate that heat travels through different substances at different rates due to a property called thermal conductivity. Conduction is a process where heat energy moves through a substance. Heat is transferred from one atom or molecule to another as they bump into each other. Molecules in warm substances move faster and bump into each other more often than molecules in cool substances. This means heat energy is transferred or conducted more quickly in warm substances than in cool substances.

In addition to temperature, a second factor that affects how well heat is conducted through a substance is the kind of matter the heat is conducted through. Heat travels through different substances at different rates. Scientists refer to the rate at which heat travels through a substance as the substance's thermal conductivity. Substances that conduct heat easily are good conductors and have high thermal conductivity values. Metals are good conductors. Nonmetals such as plastic are not good conductors and have low thermal conductivity values. They are often called insulators.

Thermal conductivity is a physical property. This property is useful for determining a substance's practical applications. For example, materials with low thermal conductivity values may be used as insulation for homes. Materials with high thermal conductivity values may be used to make cookware.

**Purpose:** To test different solids to determine which ones conduct heat faster.

### Procedure:

1. Place Crisco shortening on a paper plate.
2. Dip the end of one of the metal rods into the Crisco so that the end is covered in shortening.
3. Repeat with the other metal rods.
4. Light a candle.
5. Hold the metal bars over the candle so that the center circle is directly over the candle's flame. Be sure to use the wooden handle!
6. Observe which shortening drips first. Record this on the table.
7. Continue until all the shortening has melted.

### Data:

Order of Crisco melting/ sliding	1	2	3	4	5
Rod Material					

### Thermal conductivities for common materials

<u>Material</u>	<u>Thermal Conductivity</u>	<u>Material</u>	<u>Thermal Conductivity</u>
Silver	429	Concrete	1.05
Copper	401	Paraffin wax	0.25
Gold	310	Wood	0.13
Aluminum	250	Paper	0.05
Zinc	116	Fiberglass insulation	0.04
Brass	109	Cotton/ wool	0.029
Iron	80	Air	0.024
Steel	46	Glass	1.05

**Questions:**

1. Do all materials conduct heat at the same rate? \_\_\_\_\_
2. Which of your metals melted the Crisco first? \_\_\_\_\_
3. Which metal conducted heat the fastest? \_\_\_\_\_
4. List the rod materials in order of melting from fastest to slowest.
5. How do your results compare to the thermal conductivity tables on page one?
6. The higher the thermal conductivity, the \_\_\_\_\_ (faster/ slower) the Crisco melts.
7. According to the table, which substances would be the best 2 conductors?
  - a.
  - b.
8. According to the table, which substances would be the best 2 insulators?
  - a.
  - b.
9. Using the table, explain why we make handles for pans out of wood.
10. If silver has a higher thermal conductivity than copper, why isn't it used for cooking pots and pans?