611-2280 (10-030) Thermal Conductivity Bars

Introduction:
What is thermal conductivity? Many materials can transfer heat energy through the use of electrons. As the material is heated, the electrons in atoms gain more energy. Some of them will gain enough energy to leave one atom and go to the next. This process continues, spreading the heat throughout the substance. Different materials will conduct heat at different rates. Our set will demonstrate this.

Description:
Our 10-030 Thermal Conductivity Set consists of a plastic housing, containing four strips of metal: steel, brass, aluminum, and copper. On top of these strips are liquid crystal thermometers. Liquid crystals are materials which can flow like fluids, but whose molecules align like those of a crystal. When exposed to heat, these materials align in ways that reflect light, displaying a temperature.

To use, simply **put on safety goggles**, take hot water that has been boiled, let it sit for 5 minutes and immerse the ends of the metal strips into the water. See warning below. Watch as the thermometers indicate the temperature of each metal. Which conducts heat the best?

Warning: Never immerse the plastic housing or the liquid crystals in hot water. Only cover the ends of the bars. Do not apply this set to direct heat, such as a Bunsen burner. Use water that has been boiled, not actively boiling water. Store away from direct sunlight, as this may damage the liquid crystals. The steel sample is micro-coated with zinc to prevent rust; even so, be careful to completely dry the set after each use.

Suggested Experiments:

Thermal conductivity often parallels electrical conductivity, especially in metals. Connect a low voltage power supply to an individual heat strip and use a voltmeter to measure the current. If you know the initial voltage, you can determine which material conducts electricity the best. Is it also the best thermal conductor? Note, for some materials this is not the case. Diamonds are some of the best thermal conductors known but are electrical insulators.

There is enough space on the top of the bars for a fingertip. After heating the bars, place your finger on each metal and feel which is hottest. Take care not to burn your fingers.

Thermal conductivity works both ways. It measures how fast a material heats up, but what about cooling? Obtain cold water or crushed ice. After heating them, put the ends of the bars into the cold water and watch them cool. Is the fastest to cool also the fastest to heat?

Warranty and Parts:
We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.

May we also recommend:

612-1050 Heat Conductometer with Wax: This device demonstrates the diverse thermal conductivity of five distinct metals. Place small strips of the included wax over each metal spoke. Heat the central hub over a Bunsen burner flame and watch the differing rates at which the wax melts. Includes: brass hub; five labeled metal spokes (aluminum, brass, iron, nickel and copper); wax in reusable vial; wood handle; instructions. You need safety gloves and goggles.