

The Nature of Matter ▪ 2.3 *Enrich***Transforming Energy To Make Hot Chocolate**

Brrr! It's a cold day, and hot chocolate is just the thing to warm you up. You heat the water in a microwave oven, stir in the hot chocolate mix, and drink up. As you drink, you begin to wonder where the energy to heat the water came from.

You probably already know that electricity powers the microwave oven. Electricity is electrical energy. The microwave oven converts electrical energy into microwaves, a form of electromagnetic energy. The water absorbs the energy of the microwaves, which increases the average energy of motion of the water particles. The temperature of the water increases. The hot water, in turn, releases thermal energy to cooler matter around it.

Where did the electrical energy come from? Electrical energy can be generated at power plants. At a power plant, large turbines rapidly spin a coil of wire within a magnet. The turbines convert the energy of matter in motion (kinetic energy) to electrical energy. Many power plants use steam to turn the turbines. Steam is often produced by burning coal to heat water. Burning is a chemical change in which chemical energy is changed to thermal energy and electromagnetic energy.

How did coal get chemical energy? Coal is made up of the remains of dead plants that lived millions of years ago. When the plants died, they were buried under layers of sediment. The pressure of these sediments, along with heat from Earth's interior, slowly turned the plant remains into coal. The chemical energy in coal ultimately comes from the sun. In photosynthesis, plants change the electromagnetic energy of the sun into chemical energy stored in the plant.

Answer the following questions on a separate sheet of paper.

1. From where does the energy to heat water for hot chocolate originally come?
2. Make a flow chart that traces the path that energy takes when you heat water for hot chocolate.
3. On your flow chart, identify the form that energy takes at each step along the path.
4. Was any energy lost during the energy transformations that heated the water for hot chocolate?