Measuring Heat

The most common units of heat measurement are the calorie and the joule (joule). One calorie is the amount of energy needed to raise the temperature of 1 gram of water by 1°C. The joule (J) is the standard scientific unit in which energy is measured. One calorie is equal to 4.18 joules.

You probably think of calories in terms of food. However, in nutrition, one Calorie—written with a capital C—is actually one kilocalorie, or 1000 calories. This means that one Calorie in food contains enough energy to raise the temperature of 1 kilogram of water by 1°C. So, each Calorie in food contains 1000 calories of energy.

How do we know how many Calories are in a food, such as a piece of chocolate cake? The cake is burned inside an instrument called a calorimeter. The amount of energy released from the cake through heat is the number of Calories transferred from the cake to the calorimeter. The energy transferred to the calorimeter is equal to the amount of energy originally in the cake. A thermometer inside the calorimeter measures the increase in temperature from the burning cake, which is used to calculate how much energy is released.

How is heat measured?

INVESTIGATE Heat Transfer

Which substances change temperature faster?

PROCEDURE

1. Using the graduated cylinder and the balance, separately measure 20 g of room-temperature water, 20 g of pennies, and 20 g of aluminum foil. Pour the water into a beaker until it is needed.

2. Using the graduated cylinder, pour 50 mL of hot water into each of the cups. Record the water temperature in each cup.

3. Pour the room-temperature water into one cup. Place the pennies in the second cup and the foil in the third. After 5 minutes, record the temperature of the water in each of the cups.

WHAT DO YOU THINK?

• How did the temperature changes in the three cups compare?
• What might account for the differences you observed?

CHALLENGE Why might items such as pots and pans be made of materials like copper, stainless steel, or iron?

VOCABULARY

Remember to make description wheel diagrams for calorie, joule, and other vocabulary terms.