# ACTIVITY 5B / HOW POWERFUL AM I?

In this activity, you will get an idea of the amount of power involved when you go up stairs. If you go as quickly as you can up the stairs, you will measure your maximum power. If you climb at your usual rate, you will find the power you normally produce when you climb stairs.

## MATERIALS

(per class)
one or two bathroom scales

(per group of students)
stopwatch
metre stick

## PROCEDURE

1. With a partner, decide on a method to measure the height of a flight of stairs with a metre stick. Determine the height of the flight of stairs and record this value in your notebook. This is the distance you will raise your body.
2. Most bathroom scales give your mass in kilograms. For this activity, you need your weight in newtons. Stand on the scale and find your mass. Record this number. Then change your mass to weight by multiplying your mass in kilograms by the force with which the Earth's gravity pulls on each kilogram, 10 N/kg. If your mass is 45 kg, for example, your weight is 450 N. Record your weight. This is the amount of force you will use to raise your body up the height of the stairs.
3. To find your maximum power, run up the stairs as fast as you can while your partner times you with the stopwatch. To find your normal power, go up the stairs at your usual rate while your partner times you with the stopwatch. Record the time it takes for either method (or for each method).
4. Calculate the amount of work you did in climbing the stairs by multiplying your weight by the height of the stairs (work = force × distance). This amount of work is also the increase in your body's potential energy.
5. Calculate the power you produced by dividing the increase in your body's energy by the time taken (power = energy/time).

## DISCUSSION

1. When you climb the stairs, you increase your energy. Do you increase your energy more if you climb the stairs quickly than you do if you climb slowly? Explain your answer.
2. Would you produce more power if you climbed the stairs quickly than if you climbed slowly? Explain your answer.
3. A typical light bulb uses 60 W of power. Can you produce this much power? Can you produce this much power for 10 s? Would you like to produce 60 W of power steadily for an hour? Explain your answers.
4. On the back of a television set, a label like that shown in Figure 5.3 indicates how much power the TV uses. From the information shown in Figure 5.3 or the information on the back of the television set in your home, answer the following questions.
   (a) How much power does the TV use?
   (b) How much energy does the TV use in 1 s? (HINT: Remember that power = energy/time.)
   (c) If the TV is operated for 1 min, how much energy does it use? How much energy does it use in an hour?
   (d) If you had to provide the power to operate this TV by your own physical effort, how much TV would you choose to watch?
5. Most single fluorescent lighting tubes require 40 W of power for their operation. Count the number of these tubes in your classroom.
   (a) How many watts of electric power are used to light your classroom?
   (b) How much energy is used to light your classroom for 1 min? For 1 h?
6. A typical toaster uses 950 W of power. Is the toaster more powerful than you? Explain your answer. ❖

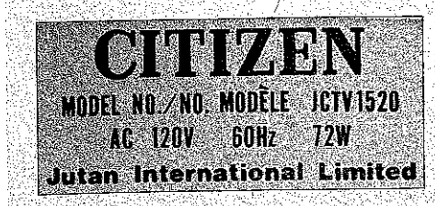


**FIGURE 5.3 ▲**
***The labels on appliances usually show their power requirements. What is the power required shown on this label?***