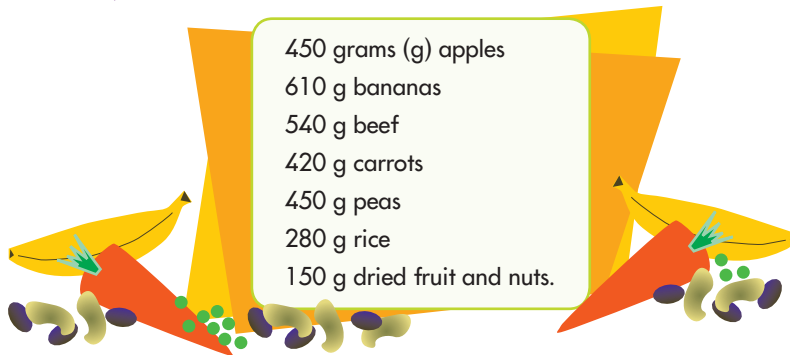# Energy Density

> **You need**
> ★ the water content and energy density table (see copymaster) ★ a calculator (optional)
> ★ access to the Internet or other sources of information on the energy values of food
> ★ scales ★ an oven or a dehydrator ★ food items ★ a classmate

Activity One

Henry and two friends are planning a tramp. They need enough food for 3 days plus extra in case of emergencies.

1. Henry has worked out his food for 1 day:

   > 450 grams (g) apples
   > 610 g bananas
   > 540 g beef
   > 420 g carrots
   > 450 g peas
   > 280 g rice
   > 150 g dried fruit and nuts.

   There's a lot of stuff! It's too much to carry.

   He needs 11 000 kilojoules (kJ) per day to meet his energy needs while tramping.

   a. Will Henry's food give him enough energy? *(Hint: Use the information in the water content and energy density table. You will need to fill in column D, which is column B × column C.)*

   b. Which food will give him the most energy?

2. If Henry ate the same menu every day, how many kilograms of food would he have to carry for a 3-day tramp?

3. Do foods have more or less energy per gram if they are dehydrated? Discuss with a classmate.

4. Henry decides to take only dehydrated food.

   a. On your copy of the table below, complete columns F and G.

   We could take dehydrated food. It's had all the water removed from it!

| A	B	C	D	E	F	G	H
Water Content and Energy Density							
Food	Original mass (g)	Energy density (kJ/g, dehydrated)	Energy (kJ)	Normal water content (% by mass)	Dry mass (g)	Mass saved (g)	Energy density (kJ/g, dehydrated)
Apples	450	1.5		85			

   b. By taking only dehydrated food, how many kilograms will Henry save himself carrying?

10

5.   **a.**   How many grams of beef does it take to make 300 g of dehydrated beef?

      b.   If 200 g of mandarin pieces weighs 24 g when dehydrated, what percentage of mandarin is water?

6.   **a.**   Fill in column H of your table. Which food on Henry's menu has the lowest energy density when dehydrated?

      b.   Bananas have more kilojoules per gram than peas, so why are dried peas more energy-dense than banana chips?

      c.   Which three dehydrated foods on Henry's list are the most energy-dense?

Activity Two

1.   With a classmate, decide on some food items to dehydrate at school. Predict which of these foods will contain the most water.

2.   **a.**   Weigh your food items and record their masses.

      b.   Decide how you will determine the water content.

          i.   How will you calculate the percentage of water by mass?

          ii.   How will you know when all the water has gone?

3.   **a.**   How accurate were your predictions about water content?

      b.   Which of these foods would you recommend for Henry's tramping trip and why?
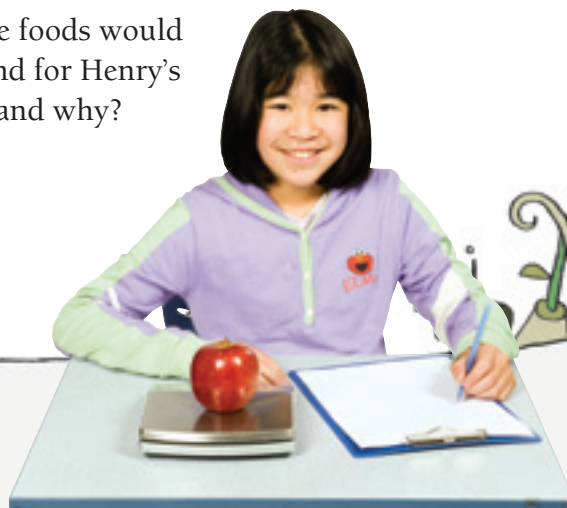
Activity Three

Using the Internet or other sources of information on the energy value of foods, develop a menu that would meet your energy requirements for a 3-day tramp. Calculate the mass of your food.

Discuss the suitability of your menu with a classmate.

Focus   Calculating with proportions and percentages