# C1 ACTIVITY 1: FOOD ENERGY

## Background

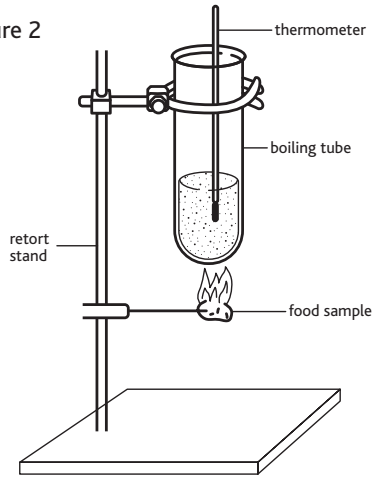
This investigation provides students with a visual and measurable example of how food provides energy. The activity is carried out in two stages; stage one is a teacher-led activity which serves to introduce the concept of burning food to supply sufficient heat energy to cause the temperature of water to rise. Although the activity is carried out by the teacher only, the students are involved through taking various readings and carrying out the calculations involved. This activity is an ideal opportunity for questions to be asked by both the teacher and the students rather than the teacher always being the questioner!

Stage two provides the students with an opportunity to apply what they learned in stage one. This time the students investigate the energy supplied by a selection of food types and compare their calculated energy with the energy information provided on the food labels. A follow-up challenge for the students might be to explain why their calculated results differ from those on the labels.

## Equipment required:

- Bunsen burner
- Heatproof mat
- Retort stand with clamp
- Boiling tubes
- Measuring cylinder
- Thermometer
- Mounted needle or similar
- Food sample (i.e. a cracker or a piece of bread)
- Safety goggles
- Electric scales

Figure 2




STAGE 1 – TEACHER ACTIVITY WITH STUDENTS ACTING AS ASSISTANTS

## What to do:

1. Ask one student to measure approx. 25 ml cold water into a boiling tube and clamp it onto the retort stand.
2. Assign a group of students the job of calculating the mass of water used.
   (Hint: density of water = 1 g/cm$^3$ and mass = volume/density)
3. Ask another student to record the temperature of the water in the boiling tube.
4. Ask another student to record the mass of the food sample being investigated.
5. Show the students how to carefully skewer the food sample onto the mounting needle taking care not to lose any crumbs.
   Possible questions:
   - ***Why is it important not to lose any crumbs?***
   - ***What measurement might be affected if some crumbs are lost?***
6. Now hold the food in the lighted Bunsen burner until it catches fire.
7. As soon as it is alight, place the burning food under the boiling tube as shown in Figure 2 until the flame goes out.
8. As soon as the flame goes out stir the water before reading the temperature.
9. Possible questions:
   - ***Why should the water be stirred first?***
   - ***How is water heated?***
   - ***How might this affect the temperature of the water?***
10. Let one of the students record the highest temperature.
11. Set the class the task of calculating the energy released from the food, using the recorded values and the formula shown in Figure 1.

STAGE 2 – STUDENTS INVESTIGATING THE ENERGY RELEASED BY DIFFERENT FOOD TYPES

## Equipment required:

- Bunsen burner
- Heatproof mat
- Retort stand and clamp
- Boiling tubes
- Measuring cylinder
- Thermometer
- Mounted needle or similar
- Selection of food types together with their individual food labels
- Safety goggles
- Electric scales

## What to do:

1. Measure approx. 25 ml cold water into the boiling tube and clamp it onto the retort stand.
2. Calculate the mass of water used.
   (Hint: density of water = 1 g/cm$^3$ and mass = volume/density)
3. Stir and record the temperature of the water in the boiling tube.
4. Record the mass of the food sample being investigated.
5. Carefully skewer the food sample with the mounting needle taking care not to lose any crumbs.

   ? ***Why is it important not to lose any crumbs?***
6. Hold the food in the lighted Bunsen burner until it catches fire.
7. As soon as it is alight, hold it under the boiling tube as shown above until the food flame goes out.
8. As soon as the flame goes out stir the water before reading the temperature.

   ? ***Why is it important to stir the water?***
9. Record the highest temperature reached and log it on the record sheet.
10. Repeat the procedure for the other food samples.
11. Review the data and decide on a suitable graph to draw.
12. Draw the graph and comment on it.
13. Compare the results for the individual food items with the energy information written on the food labels.

    ? ***Is there a discrepancy between the values?***

    ? ***If so, can you offer a possible explanation for this?***

## C1.1 WORKSHEET A: FOOD ENERGY RECORD SHEET

| | Food Sample Name | Mass (g) | Mass of water (g) | Temp. rise | Energy used = $\frac{\text{mass of water (g) x temperature rise (°C) x 4.2}}{\text{mass of food sample (g)}}$ |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

Graphing Results