

RS•C

13. Energy values of food

Topic

Energy in food.

Timing

45–60 min.

Description

Students burn various foods of known mass. They heat a known volume of water and calculate the amount of energy in the food.

Apparatus and equipment (per group)

- ▼ Stirring thermometer
- ▼ Boss, clamp and stand
- ▼ Test-tube/metal calorimeter
- ▼ Access to balance
- ▼ Bunsen burner
- ▼ Mounting needle
- ▼ Teaspoon.

Chemicals (per group)

- ▼ Different foods.

Teaching tips

Mini-marshmallows, crisps, pasta, bread, potatoes, bacon, broad beans (dried) and cheese can be used.

Students could weigh any unburnt food.

Data logging sensors and software can be used in this experiment to provide a large screen display of the temperature change. If the food stops burning too soon and the tube of water starts to cool, the graph will show a brief drop in temperature. This potential source of error makes a good discussion point – in fact the temperature drop can be accounted for in the calculation.

Safety

Wear eye protection

Do not permit tasting of foods.

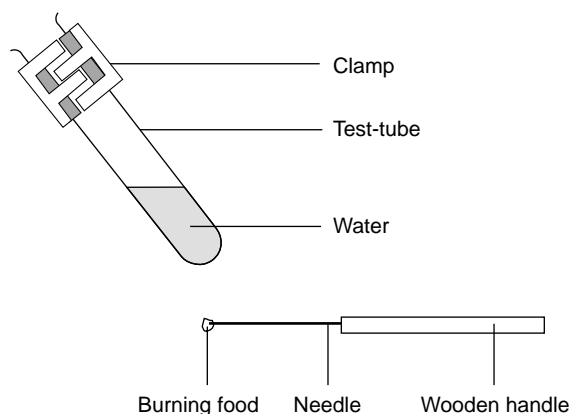
Answers

1. Some heat is lost to the surroundings, not all the food may have burnt.
2. Exothermic.
3. 16380 J. Heat losses to surroundings will produce a lower figure from experiment.

Energy values of food

Introduction

In this experiment various foods are tested to find how much energy they contain.



What to record

Measurement	Food		
Mass/g			
Temperature of water before heating/ $^{\circ}\text{C}$			
Temperature of water after heating/ $^{\circ}\text{C}$			
Change in temperature/ $^{\circ}\text{C}$			
Heat absorbed by water/J (Temperature change $\times 4.2$)			
Heat absorbed by water per gram of food/J			

What to do

- Put 10 cm^3 of water in a test-tube. Clamp the test-tube in the retort stand at an angle as shown in the diagram.
- Weigh a small piece of food and record the mass in your table.
- Take the temperature of the water in the test-tube and record it in the table.
- Fix the food on the end of the mounted needle. If the food is likely to melt when heated put it on a teaspoon instead of on the needle.
- Light the food using a bunsen burner. As soon as the food is alight, hold it about 1 cm below the test-tube. If the flame goes out, quickly relight it.
- When the food stops burning, stir the water in the test-tube with the thermometer and note the temperature. Record it in your table.
- Empty the test-tube and refill it with another 10 cm^3 of water. Repeat the experiment using a different food each time.

Safety

Wear eye protection.

RS•C**Questions**

1. Suggest reasons why this experiment may not be a fair test?
2. Burning gives out heat. What is the name given to this sort of reaction?
3. The label on a packet of cheese says 100 g provides 1638 kJ. Calculate how many joules this is per gram of cheese and compare it to the cheese in your experiment. (1 kJ = 1000 J)