Energy content of food

Driving Question:
How much energy is there in food?

Thinking about the question

Foods, depending on their carbohydrate/fat composition, have a different energy content. Which food do you think produces the most energy?

In this activity you will determine the energy of food items like potato chips, marshmallows, popcorn and any other (dry) food you want to investigate.

Materials

In your investigations you will use:

- Data-logger e.g. CMA €Lab,
- Temperature sensor,
- Metal calorimeter or metal can,
- Measuring cylinder (50 mL),
- Heat resistant mat,
- Stand and clamp,
- Mounted needle or another food holder,
- Measuring scale
- Bunsen burner,
- Lab coat and safety goggles
- Variety of dry food items like potato crisps, mini-marshmallows, popped popcorn, peanuts (do not use and eat an item of food when you allergic to it!).

Safety

Make sure you tell your teacher if you have any food allergies and make sure those foods are not being investigated. If you start to feel ill during this activity, inform your teacher immediately.

Wear eye protection and a lab coat while heating the foods.

Take care with mounted needles – especially as you are impaling food on them.

Investigations

1. Connect the temperature sensor to input 1 of your data-logger.
2. Measure 50 cm^3 of water into the calorimeter.
3. Clamp the calorimeter in the stand and above a heat resistant mat.
4. Open the Coach Activity 'Energy content of food'.
5. Suspend the temperature sensor in the calorimeter; it should be immersed in water but should not touch the bottom of the calorimeter.
6. Weigh an item of food you will burn and record its mass.
7. Fix the food on the end of the mounted needle or on a food holder.
8. Ignite the food using a Bunsen burner, start the measurement immediately and place the burning food directly under the centre of the calorimeter and above the heat resistant mat.
9. Hold the food in place until the food has burnt. If the flame goes out, but the food is not completely burnt, quickly light it again using the Bunsen burner. Carefully stir the water using the temperature sensor.
10. Weigh and record the final mass of food left at the end of the measurement.
11. Determine the mass of water heated in the calorimeter.
12. Find the rise in temperature of the water.
13. Determine the amount of heat that was produced when the food was burnt. Explain how you do it.
14. Determine the energy content of the food per gram.
15. Repeat the experiment with other food items.
16. Which food produces the most energy? Are they rich in fat, carbohydrates or proteins?
17. Compare the experimental results with the official values of energy content given for the food on its packet.
    a. Are your results close to the official numbers? Are they higher or lower? If they are lower, you must be underestimating the energy released from the food. How can you improve the experiment?
18. Which foods give the most energy per gram?

Resources:

Coach Activity: Energy content of food.cma7

Coach Result: Energy content of food.cmr7