GCSE

Rewarding Learning

CCEA GCSE TEACHER GUIDANCE

Double Award Science Practical Manual

Unit 7: Practical Skills

B2: Investigate the energy content of food by burning food samples

For first teaching from September 2017

Investigate the energy content of food by burning food samples.

Energy is stored in food. When we digest food it is carried by the blood to our cells where sugars react with oxygen to release energy in a process called *aerobic respiration.* This energy enables our bodies to carry out many important activities including movement and growth.

Different foods provide different amounts of energy. Athletes will require more energy than an office worker in a sedentary job and so they must eat the correct foods to provide this energy.

We can measure the amount of energy in a food sample by heating it to release the energy as heat. The burning food will release heat energy which can heat a sample of water. By comparing the differences in temperature we can compare the different amounts of energy in the food samples.

WARNING:
Do not use any food that can cause an allergic reaction. Nuts are not recommended, but it is best to check with all students taking part to find out whether anyone has an allergy to a food.

It is the responsibility of the centre to ensure that all safety rules are followed when carrying out an investigation which requires the use of Bunsen Burners and open flames.

Apparatus:

- Retort stand, bosshead and clamp
- Test tube
- Tongs or mounted needle
- Heatproof mat
- Bunsen burner
- Thermometer
- Measuring cylinder
- Food samples

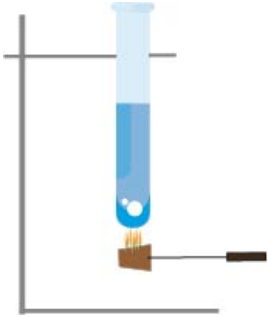
This investigation can be carried out using any food samples, but it is best to use dry samples that burn easily. The same mass of each food should be used.

- Crisps are easy to hold in a tongs and students can use similarly sized crisps.
- Olives dried for 3 days at 50°C can be mounted on a needle and used.
- Cubes of cheddar cheese or mini marshmallows can be dried on a paper towel on a window sill for a few days, but be careful this does not attract vermin.
- Food samples that cannot be easily held in a tongs or mounted on a needle can be placed in a wire dish or crucible and set alight. The crucible of burning food should be on a tripod and gauze and placed under the test tube.

Method:

1. Half fill a test tube with cold water. Mark the level with a permanent marker.
2. Measure the volume of the water using the measuring cylinder and return the water to the test tube.
3. Secure the test tube in a clamp attached to a retort stand.
4. Place the heat proof mat underneath the test tube.
5. Connect the Bunsen burner to a gas tap, ensuring that it is not too close to the test tube.
6. Record the starting temperature of the water.
7. Light the Bunsen burner and turn to the blue flame.
8. Hold the first sample in the flame until it begins to burn.

Hold the food in the flame until it is burning. *STEP 7*



Hold the burning food under the test tube of water. *STEP 8*

9. Place it under the test tube of water. As the food burns, drops of fat or burning food may fall down, the heat proof mat will prevent any damage.
10. If it goes out, relight.
11. When the food has stopped burning, all the energy has been released.
12. Record the final temperature of the water.
13. Calculate the temperature difference.
14. Pour out the water and fill to the line marked.
15. Repeat with an identical food sample and calculate the average temperature change for food sample 1.
16. Repeat the method with each food sample, changing the water before each new attempt.

Results

Record the temperatures in a suitable table. A sample table is given below but any appropriate table can be used.

FOOD SAMPLE	**Start Temperature (°C)**	**Final Temperature (°C)**	**Temperature change (°C)**	**Average temperature change (°C)**
Sample 1 (1)				
(2)				
Sample 2 (1)				
(2)				

We can use this temperature change to calculate the amount of energy in each food sample using the formula:

Energy (J) = 4.2 x volume of water (cm^3) x average temperature change (°C)

Calculate the energy change for both food samples

Sample 1 _____

_____

Sample 2 _____

_____

Conclusion

The food sample containing the most energy will heat the water the most.