The meal deal

Food tests

Tests for starches

Place a small sample on a spotting tile. Add a few drops of iodine solution. A dark blue-black colour shows starch is present.

Test for sugar

Dissolve a small amount of the sample in water in a test tube and add an equal amount of Benedict's solution.
Heat the mixture in a water bath. A brick-red colour shows sugar is present.

Planning your investigation

The food tests above can test for starch and sugar. Use these and some of the clues below to plan an investigation into how cooking affects our food.

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Stove cards

Name	Three stone fire
Fuel	Wood, straw or grass
Fumes	Lots of fumes
Country	Kenya
Environmental impact	Medium, fuel is sustainable but can produce local deforestation.

Name	Charcoal barbecue
Fuel	Charcoal
Fumes	Few when charcoal is alight
Country	Borneo
Environmental impact	Medium, fuel sustainable but can produce local deforestation

Name	Clay stove
Fuel	Wood
Fumes	Lots of fumes
Country	Bangladesh
Environmental impact	Medium, fuel is more sustainable since stove makes efficient use of wood.

Name	Solar cooker
Fuel	Sunlight
Fumes	None
Country	Tibet and China
Environmental impact	None

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Stove cards

Name	Improved stove
Fuel	Wood, straw or grass
Fumes	Very few, removed by chimney
Country	Nepal
Environmental impact	Medium, fuel is more sustainable since stove makes efficient use of fuel.

Name	Anagi stove
Fuel	Wood, straw or grass
Fumes	Few
Country	Sri Lanka
Environmental impact	Medium, fuel is more sustainable since stove makes efficient use of fuel.

Name	Jiko stove
Fuel	Wood, straw or grass
Fumes	Few when stove in use
Country	Kenya
Environmental impact	Medium, fuel is more sustainable since stove makes efficient use of fuel.

Name	Gas barbecue
Fuel	Gas
Fumes	Few when stove in use
Country	Australia
Environmental impact	High, as gas is a fossil fuel.

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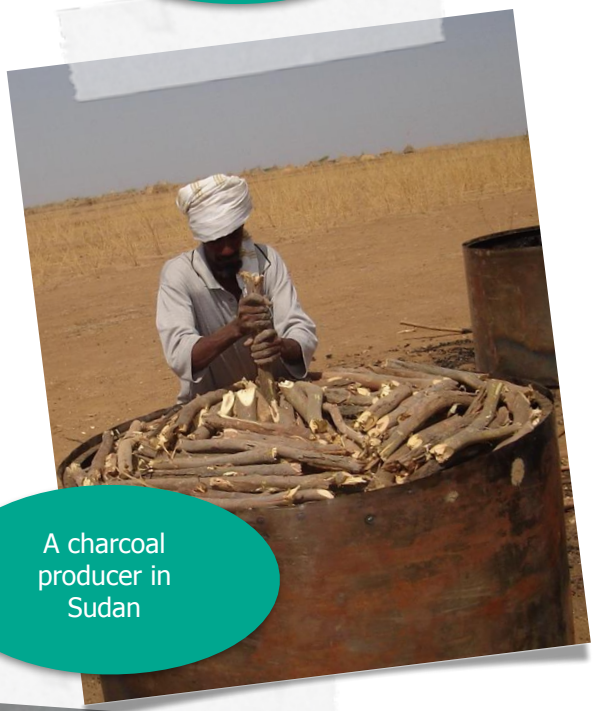
Stove supply

We all need to eat and most of us end up cooking our food. But which of the stoves you have studied might be suitable for these people? Give reasons for your choices.

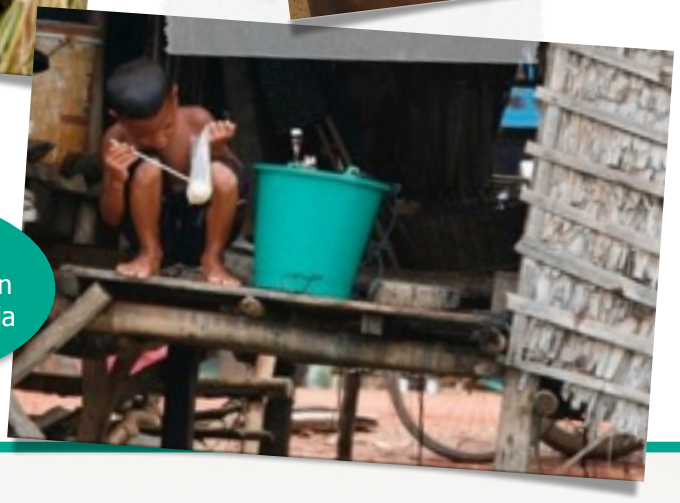
Festival goers camping near the Borneo rainforest

A fried noodle-seller in Hanoi old market



A charcoal producer in Sudan

A rice farmer in rural China



A family living in a wooden stilt house in Tonle Lake, Cambodia

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Sarah's story

Name: .....

Class: .....

Date: .....

Write a diary entry for Sarah for each of the scenarios given below. Draw ideas from her talk on the video clip and your own understanding of what her life is like.

Before receiving her new stove...

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After receiving her new stove...

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Name: .....

Class: .....

Date: .....

Investigating fuels

The photographs show lamps in a temple in Lhasa, Tibet that burn butter not oil. Have you ever thought of butter as a fuel? What other things might make good fuels?

Burn samples of the fuels on a heat-proof mat and make any observations you think are relevant. Add these to a table like the one below. You will probably need to draw up your own table with a row for each fuel you use.

Use small amounts of each fuel - you can always burn more again if you want to check your observations.

SAFETY NOTE: Only burn fuel samples that you have checked with your teacher.

Fuel	Observations
Butter	

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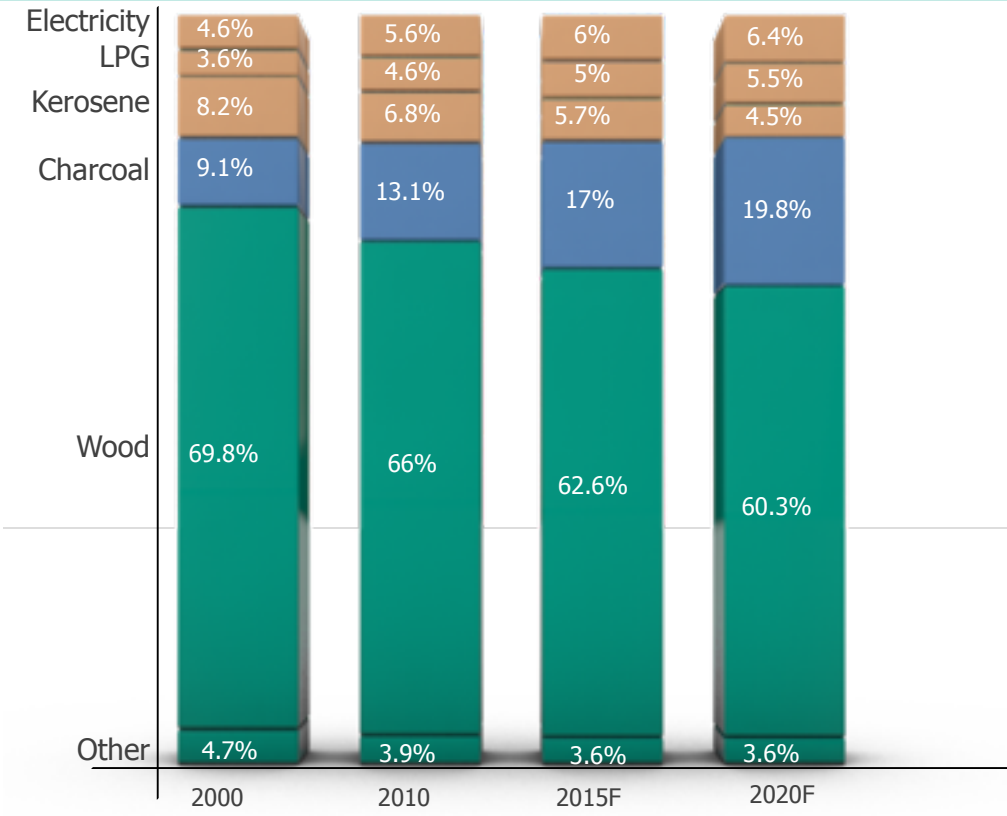
Fuels in Uganda

Name: .....

Class: .....

Date: .....



Natalie's smart business move

The chart shows the proportions of fuels used in Uganda with suggestions for likely changes over the next few years. 2015 and 2020 are forecast figures not actual data.

Natalie Akumu used to spend many hours collecting firewood for her stove. In 2010 she set up a small business making charcoal that she sells in the local market. Since starting her business two years ago she has managed to send both of her children to school with the profit she has made.

Use the data in the chart and the information about Natalie to answer the following questions

1. What is the most popular fuel?

   .....

2. Why do you think it is the most used?

   .....

   .....

   .....

Fuels in Uganda

Name: .....

Class: .....

Date: .....

3. Why do you think Natalie would want to stop using firewood for her cooking stove and use charcoal instead?

.....

.....

.....

.....

.....

4. Can you give two main benefits Natalie's family have had as a result of her new business?

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5. What changes in the fuels market in Uganda made Natalie's decision to go into the charcoal business a smart one?

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6. Why do you think so few people in Uganda use electricity to cook their food?

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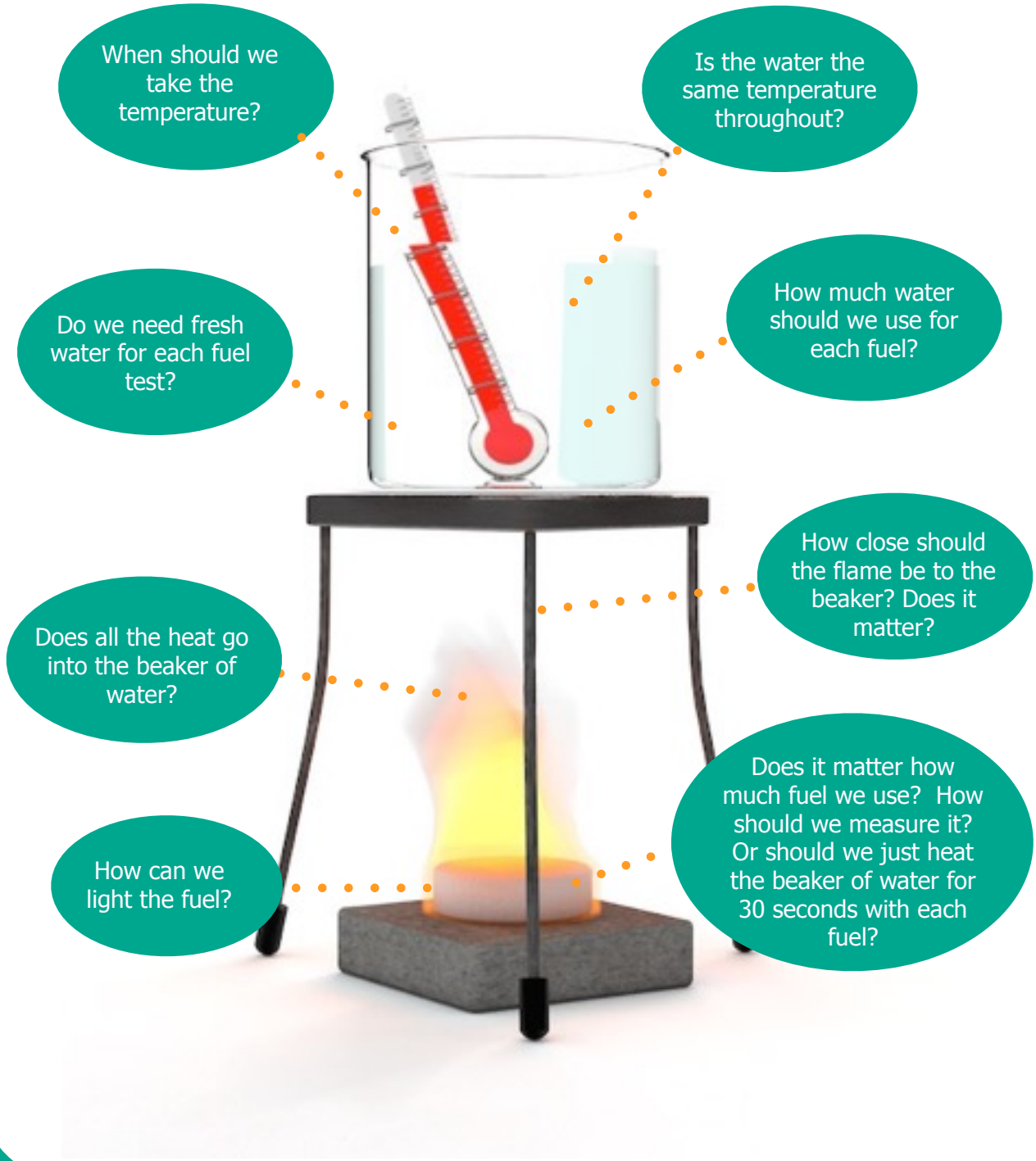
Energy output

Use the diagram below to give you some clues about the best way to produce an accurate measure of heat output from a burning fuel.



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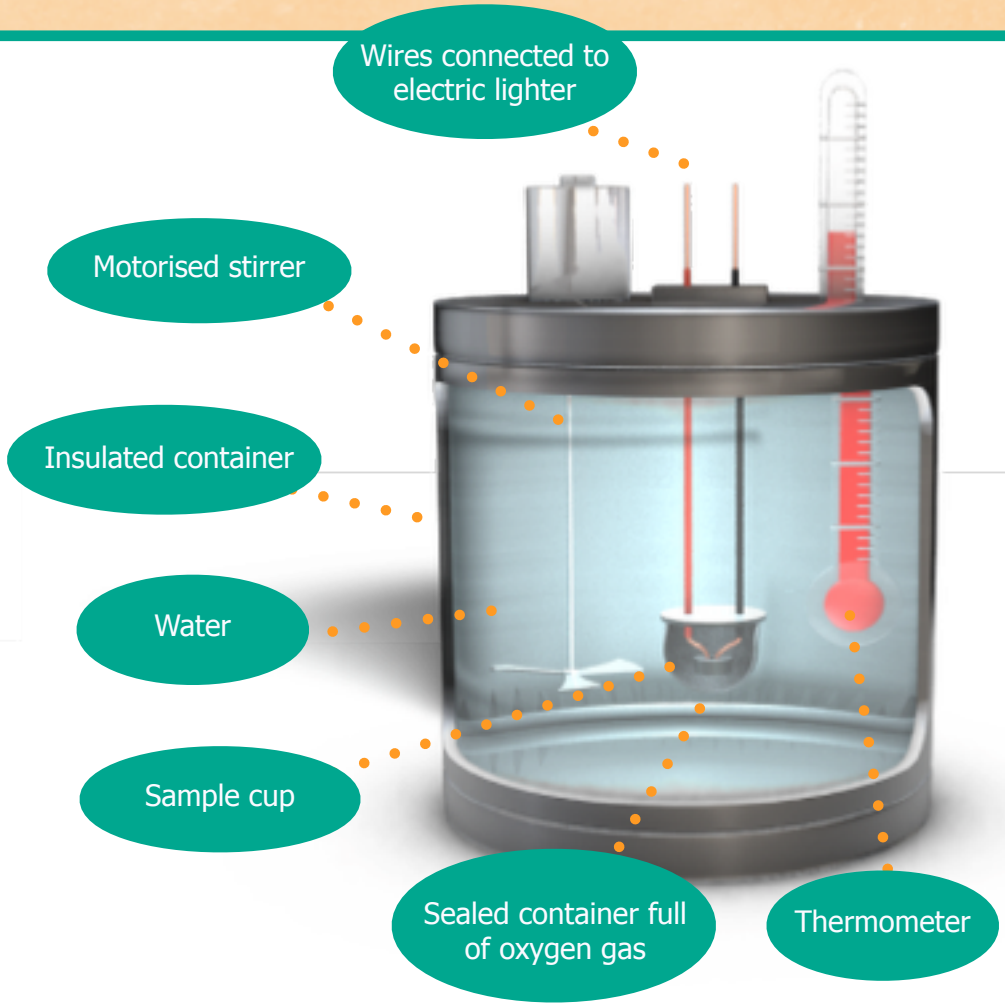
Name: .....

Class: .....

Date: .....

The bomb calorimeter

This calorimeter gives very accurate measures of the energy released when a fuel is burnt. Explain why each part of the device helps to increase the accuracy of the final result.



Component	How does it improve accuracy of final result?
Motorised stirrer	
Wires connected to electric lighter	
Thermometer	
Insulated container	
Sealed container full of oxygen gas	
Water	

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Smokin'!

It is easy to make a simple chimney out of aluminium foil (a piece of sticky tape keeps it rolled up) but how can you use this to investigate the factors that control chimney efficiency? The diagram below and the clues might give you some ideas.

SAFETY NOTE: You cannot hold the chimney in your fingers while the flame is burning. Use a clamp or some other system to hold it in place.

How can we get a measurement of the smoke that escapes outside the chimney?

What happens if the chimney outlet is narrowed or blocked?

Is it the width or the height of the chimney more important?

Would a hood at the bottom of the chimney help to capture more smoke?

How does the distance between the chimney and the flames affect how well the chimney works?

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A stove for Isaac

You will need to develop a stove for Isaac Okello and his family. They live in the northern part of Kenya. The area where they live is quite dry but they can collect limited amounts of firewood from the trees that grow there. Draw on your understanding of the key scientific ideas and your knowledge of stoves and heaters from around the world. Make your stove a real Superstove!

Your design should be presented as an annotated diagram. The design will be judged on the following criteria.

For the stove:

- Is it a low-cost device?
- Is it easy to manufacture and repair with local materials and skills?
- Can it be used in a wide range of countries? Does it solve the 'cooking problem' for everyone?
- Can it use a range of fuels?
- Is it safe to use? Are the fumes conducted away safely? Does it have very hot parts that might burn the cook?
- Does it burn the fuel efficiently and make sure the heat produced gets quickly to the cooking pots?
- Can the heat levels be controlled easily?
- Does it allow the types of foods that are available in Kenya to be cooked easily?

For the poster:

- Are your designs clear and easy to understand? Could someone make the stove from your diagrams?
- Does it show the science behind your thinking so that people can understand why you have designed it that way?
- Is the language clear and easy to understand? Could it be understood by people whose first language is not English?

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Taking action

Name: .....

Class: .....

Date: .....

Set a target

From your understanding of the stove project set a target that you think, as a team, would be good to hit. It may be that you think your updated designs should be manufactured and distributed free or you could suggest supplying the parts and people make them themselves or even that you do nothing. Agree in your team a good target and add it to the space below.

Our agreed target

- .....
  .....
  .....

Now give reasons why you think this is a good target. Again, agree these reasons as a team.

- .....
  .....
  .....
- .....
  .....
  .....
- .....
  .....
  .....

Now, decide what each of the groups below can do to make sure your targets is achieved.

We can:

- .....
  .....
  .....
- .....
  .....
  .....

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Taking action

Name: .....

Class: .....

Date: .....

Our local community could:

- .....
  .....
  .....
- .....
  .....
  .....

Charities like Practical Action, Oxfam or the United Nations could:

- .....
  .....
  .....
- .....
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  .....

Governments in this country and elsewhere could:

- .....
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  .....
- .....
  .....
  .....

Individuals like Isaac Okello could:

- .....
  .....
  .....
- .....
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