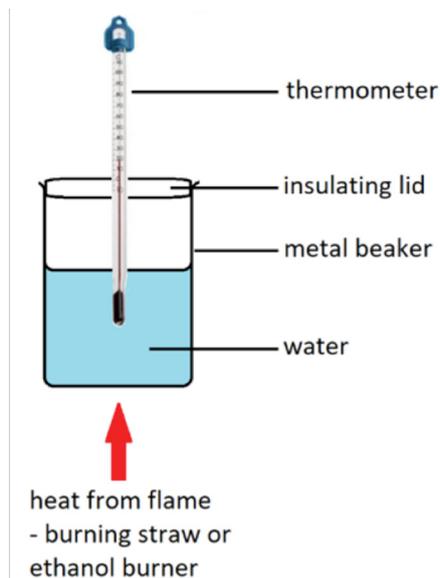




Investigating straw as a biofuel



Overview

You will use a piece of natural straw to heat water in a metal beaker.

You will measure the temperature rise of the water to work out how much heat the straw gives out when it burns.

Then, you will repeat the experiment with an ethanol burner to see which is the better biofuel per gram.

Key information:

You should use 240 ml of water in your metal beaker.

It takes 1 kilojoule of energy to raise the temperature of 240 ml of water by 10C.

To measure the temperature rise of the water, you need to measure the temperature before you start heating and the temperature after heating.

To measure the mass of straw burned, you need to measure its mass before you start and the mass after you have finished heating.

To measure the mass of ethanol burned, you need to measure the mass of the ethanol burner before you start heating and its mass after you have finished burning.

Safety:

- Wear eye protection
- Make sure the metal beaker is securely clamped and near the middle of the bench
- Do not move the ethanol burner when it is lit – move the metal beaker to the burner.





Planning and data collection

Before you start the investigation in your group, agree actions will make your data more reliable (accurate, precise, repeatable and reproducible):

Write down how you will control variables in this investigation (make it a fair test).

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Write down how you will reduce systematic and random errors in your measurements.

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Design and draw a suitable results table in the space below

Use your results to calculate the energy content of straw and ethanol. Use the equation:

$$\text{energy content of fuel (kJ/g)} = \frac{\text{energy gained by water (kJ)}}{\text{mass of fuel burned (g)}}$$





Evaluating data and drawing conclusions

Biofuel fact file

- Fuel pellets can be used in power stations and domestic heating systems. They cannot be used as a fuel for cars.
- Bioethanol can be used instead of petrol for cars. Unleaded petrol in the UK already contains up to 5% bioethanol, a grade known as E5. The Government is investigating increasing the bioethanol content to 10% but it is not yet available in the UK.
- For each tonne of straw, we can only get a maximum of 550 kg of ethanol. Most industrial processes can only produce about 350 kg of ethanol per tonne of straw.

Evaluation and conclusion

Use your results and information from the fact file to make a recommendation for the government. Remember, the recommendation should be supported by evidence.

