

Which fuel is better?

You are going on a weekend camping expedition. During the expedition you will have to do all your own cooking and therefore you have to carry the cooking fuel with you. You have a choice of two fuels, 'Lotahot' or 'Superheat'.

- Your task

Decide which is the better fuel to use for boiling water and hence which fuel to take with you on the expedition. You will need to consider two things:

- 1 How long it takes to boil water.
- 2 The quantity of fuel needed.

Have your method checked for safety, before you try your experiment.

Based on a suggestion by R.F Kempa.

Time

Discussion and planning approximately 30 minutes. Practical – 60 minutes.

Group size

2–3.

Equipment & materials

Eye protection is essential.

General

Old tin cans, beakers, thermometers, tripods, gauzes, heat- resistant mats, measuring cylinders, clampstands, woodblocks, aluminium foil, metre rulers, stopclocks, top-pan balances.

Per group

Fuels – two solid fuels, *eg* for camping barbecues and paraffin/candle wax.

Health & Safety notes

This is an open-ended problem solving activity, so the guidance given here is necessarily incomplete. Teachers need to be particularly vigilant, and a higher degree of supervision is needed than in activities which have more closed outcomes. Students must be encouraged to take a responsible attitude towards safety, both their own and that of others. In planning an activity students should always include safety as a factor to be considered. Plans should be checked by the teacher before implementing them.

You must always comply with your employer's procedures and in some cases may decide that a particular activity is inappropriate in your situation. Further information on Health and Safety should be obtained from reputable sources such as CLEAPSS [<http://science.cleapss.org.uk/>] in England, Wales and Northern Ireland and, in Scotland, SSERC [<https://www.sserc.org.uk/>].

You need to check the current hazard classification of any fuel tablets, including their appropriate disposal. Some tablets absorb moisture from the air and can spit alarmingly when ignited. Paraffin wax is of low hazard, but for other solid fuels the manufacturer's safety data sheet should be consulted.

Ensure students use only small quantities of fuel, *ie* NO large containers of fuel.

NB Warn students that the fuel containers will become very hot – therefore do not touch.

It is the responsibility of the teacher to carry out a suitable risk assessment.

Curriculum links

Energy.

Possible approaches

Old small cans are very good for this experiment as they are easy to come by, and can be regarded as disposable.

Suggested write-up

Students write a report for the "Consumer watch-dog chemistry column" in a consumer magazine.

Evaluation of solution

These are suggestions only:

- 1 Scientific method, *ie* isolation of possible variables, changing one variable at a time (*eg* distance of flame from beaker).
- 2 Satisfactory solution achieved, *eg* burning all the fuel is not a good method.
- 3 Reasoning about which is best fuel to take on the expedition.

Extension work

How would you improve this experiment if you were doing it again?

Credits

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Health & safety checked May 2018

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