



# Which is the Best Fuel?

## The Scenario

Civilisation has always needed fuels for cooking, for keeping warm and often for protection against predators. But it is only with modern technology that a range of fuels has been possible.

Anna, a student studying science, was concerned that today it is not enough to identify suitable fuels, but that it was important to determine the best fuel. This caused her much anxiety and she pondered for some time about how it is possible to determine the meaning of 'best'. Does it matter whether the fuel is a solid, a liquid or a gas? Is cost a factor? Is safety a factor? Is the best fuel one which burns the slowest, or gives out the most heat, or are there other factors to consider?

Anna decided to undertake an investigation to try to decide which fuel is best for heating. To do this she considered that it was most convenient to use the fuel to heat water, much as we do with the gas stove at home (assuming you cook at home using a gas stove rather than electricity). But to actually carry out the investigation Anna needs your help.

## Your task

1. Read the scenario and suggest the most appropriate way to define 'best' for a fuel.
2. Plan an experiment in which a fuel (we will take a liquid or a solid for convenience) is used to heat water. You can suggest suitable fuels and the quantity of water to use.
3. Once the equipment and procedure has been accepted by the teacher, undertake the experiment on different fuels (different members of the group can study their own fuel)
4. By means of an appropriate procedure that gives sufficient accuracy, determine the rise in water temperature per standard amount of fuel burned, and also the time taken for the water to rise 1°C.
5. Compare data for at least 4 fuels and record this information in an appropriate format.
6. Calculate the calorific value of each fuel per gram. Also determine the heat of combustion (per mole).
7. Prepare a report of the experiment undertaken and results obtained, paying attention to the limitations of the apparatus used and ways in which the accuracy of the experiment could be improved.
8. From a consideration of a number of such experiments, decide, with justification, the most appropriate meaning of 'best' fuel taking into consideration both a social and a scientific point of view.

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