Heating power of a candle

A timetable clash means your next chemistry lesson has to be in a classroom. Your teacher says you won't be able to do practical work as you won't be able to use Bunsen burners. Not wanting a double period of theory, you wonder whether you could use a candle instead. Would it produce a worthwhile amount of energy?

- Your task

Find the number of candles which have the heating power of one Bunsen burner.

Based on a suggestion by R.F. Kempa.

Time

50–70 minutes depending on ability.

Group size

2–3.

Equipment & materials

Eye protection should be worn when heating liquids.

General
Accurate balances should be available.

Per group
Candle, thermometer, small metal cans, glass beakers (100 cm^3), measuring cylinder (10, 50 cm^3), stopclock. Bunsen burner, tripod, gauze, heatproof mat, clampstand.

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/*].

NB Large pieces of wick cause very large flames (this requires careful supervision of the 'bright sparks'!).

Ensure that the activity takes place well away from any flammable or combustible substances.

Eye protection should be worn when heating liquids.

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

Curriculum links

Energy.

Possible approaches

Students should compare the effect of heating the same amounts of water, using a candle and a Bunsen burner, over the same time period, *eg* 2, 5 or 10 minutes. Many groups fail to appreciate that it is the temperature change that is important, *ie* they try to find an answer simply by comparing final temperatures. Other factors may be considered, such as the suitability of different heat sources, *eg* sooty candle flame.

Extension work

The experiment indicates to students the number of candles equivalent to a Bunsen burner. A simple extension of this would be to devise an experiment to test that hypothesis.

(The results from one school suggest that 2 candles = 1 Bunsen burner. If this is true why don't all schools use candles?)

Credits

Health & safety checked May 2018

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