

Water for survival

You are on a 'Survival' Course, your group has been left in the 'wilds' for a few days with only a limited amount of water and food. It is a scorching hot summer's day. Early evening you discover that the person carrying the water has drunk it all and there is only powdered potatoes or packet soup to eat. Clearly, in order to eat and drink tonight you must obtain some water. Luckily you come across a muddy pond next to a rubbish tip. Fortunately, you also notice old bits of laboratory equipment in the rubbish tip. There is a wood fire beside the pond with charcoal in it.

- Your task

Obtain some pure water in order to prepare a meal and to have water to drink the following day. You must also find a way of showing that the water is pure.

Based on a suggestion by R.F. Kempa/K. Davies.

Time

100 minutes (this time can be split into a 30 minute planning lesson where students have all the apparatus available to look at, and a 70 minute practical session).

Group size

2–4.

Equipment & materials

Eye protection.

General

Glass beakers (100, 250, 400 cm³), large plastic trays, test tubes, boiling tubes, test tube holders, conical flasks & bungs to fit them with a glass through tube (or side-arm flasks or side-arm boiling tubes), straight & bent glass tubing, rubber tubing (5 cm & 30 cm lengths), funnels, filter papers, plastic sieves, glass droppers, evaporating basins, thermometers, paper towels. Bunsen burners, tripods, gauzes, heat-resistant mats, clampstands.

Charcoal.

Per group

'WATER SAMPLE FROM MUDDY POND':- tap water (400 cm³) mixed with soil (about half a handful), green ink to colour noticeably + salt (4 g) mixed.

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>].

Check students' apparatus before they start heating. Remind students that if their water boils too vigorously they are to turn down the flame. Small blue flame only required.

To avoid the (remote) possibility of infection from soil organisms, it is preferable to heat the soil in an oven first to sterilise it. (In case there is a temptation to taste the water in advance). If using compost, be careful it is not too dry to avoid the possibility of inhaling fungal spores.

Eye protection is advisable when boiling liquids.

Warn students that tasting it is NOT an acceptable way of showing the water is pure.

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

Curriculum links

Filtration, distillation, temperature.

Possible approaches

Fits in well with classwork on evaporation and condensation. Some help on cooling steam may be necessary. Pond contents could be varied, for example oil could be added to the water.

Suggested write-up

Student to write a diary entry for day 1 of the Survival Course (as part of the 'Survival Course' assessment procedure).

Evaluation of solution

These are suggestions only:

- 1 Firstly judge against students' criteria for success.
- 2 That some purification was achieved.
- 3 Does method take into account soluble impurities as well as insoluble impurities?
- 4 Some tests done on water (visual + boiling point + others).
- 5 Distillation.

Extension work

Students find out what is in pond water.

Credits

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Health & safety checked May 2018

Page last updated October 2018