

Cool it

Time

1 h.

Curriculum links

Chemical reactions that involve temperature changes.

Group size

2– 4.

Materials and equipment

Materials per group

- deionised water
- 10 g citric acid
- 10 g sodium hydrogencarbonate.

Equipment per group

- polystyrene cup
- –10 to +100°C thermometer
- stirring rod
- stop clock
- spatula
- two 50 cm³ measuring cylinders
- safety glasses.

Safety

Citric acid is an eye irritant. Eye protection must be worn.

Risk assessment

A risk assessment must be carried out for this activity.

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/>].

Commentary

The reaction produces an effect similar to that of sherbet in the mouth. It is an endothermic reaction and the best results are obtained when a slurry is used. Students need to ensure that their results are reproducible. Younger students may need help in choosing the volume of water to be measured.

Evaluation of solution

This problem has been used as a competition. Judges measured the temperature fall 1 minute after the reaction started. The order of merit depended on how close the temperature was to the target and how quickly teams were ready to be judged.

Extension

The temperature given in the problem can be changed; 10.5°C would have served just as well.

Credits

© Royal Society of Chemistry

Health & safety checked May 2018

Page last updated October 2018