

Making your own indicator

We have run out of Universal indicator stock; but we have a selection of dyes.

- Your task

Select from these dyes and make a suitable indicator.

The indicator that you make must be able to distinguish between:-

strong acid

weak acid

neutral

weak alkali

strong alkali

- Use only small quantities of solutions.

Based on a suggestion by R.F. Kempa.

Time

70 minutes.

Group size

2–3.

Equipment & materials

Eye protection (goggles to BS EN166 3).

Per group

Test tubes and racks or spotting tiles, plastic droppers, small measuring cylinder, selection of beakers, glass stirring rod, scissors, labels.

Labelled solutions:

strong acid (sulfuric acid) – 50 cm³

weak acid (ethanoic acid) – 50 cm³

distilled water or tap water (**NB** check that water is neutral)

weak alkali (sodium carbonate) – 50 cm³

strong alkali (sodium hydroxide) – 50 cm³

dye solutions A to H:

Must include

A= methyl red – 5 cm³

B= phenolphthalein – 5 cm³

C= thymol blue – 5 cm³

D= bromo-thymol blue ... – 5 cm³

E= litmus – 5 cm³

F= a red food dye – 5 cm³

G= a blue food dye – 5 cm³

H= a green food dye – 5 cm³

- **NB** Emphasise to students that only small quantities of solutions are to be used.

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>].

Sulfuric acid, 1M H₂SO₄ (aq) is a skin/eye IRRITANT.

Sodium hydroxide solution, 1 mol dm⁻³ NaOH (aq), is CORROSIVE.

Phenolphthalein is a carcinogen, mutagen and reproductive toxin. Normal laboratory solutions, however, are of low hazard. – except for flammability from the ethanol/propanol solvent.

Thymol Blue and the other indicators are generally of low hazard but may be harmful if swallowed and/or irritant to skin/eyes. The solutions are all of low hazard..

Disposal: Any acid or alkaline solutions should be neutralised with weak acid or alkali (as appropriate) before being washed to waste.

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

Curriculum links

Indicators. Acids and alkalis.

Possible approaches

An answer grid could be given to less able students so that they start by testing all the solutions with all the indicators. Although the food dyes are not essential to the indicator made, they are a useful distraction. Spotting tiles would be easier to use than test tubes.

Evaluation of solution

Whether an indicator mixture was found that does the job.

Credits

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Health & safety checked May 2018

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