

Neutralisation circles

Introduction

Drops of dilute acid and alkali are placed a few centimetres apart on a sheet of filter paper and allowed to spread out until they meet. A few drops of universal indicator are then placed over the moist area of the filter paper and a band of colours showing the range of colours of the universal indicator is seen on the paper.

This experiment will take around 10 minutes.

Equipment

Apparatus

- Eye protection
- Three dropping pipettes
- A pencil
- A white tile
- A sheet of filter paper, approximately 12.5 cm diameter

Chemicals

- Hydrochloric acid 0.1 mol dm⁻³
- Sodium hydroxide, 0.1 mol dm⁻³
- Universal indicator solution

Health, safety and technical notes

- Read our standard health and safety guidance here <https://rsc.li/3fcSnXB>
- Wear eye protection throughout.
- Hydrochloric acid is low hazard (see CLEAPSS Hazcard [HC047a](#)).
- Sodium hydroxide is an irritant (see CLEAPSS Hazcard [HC091a](#)).
- Universal indicator solution is highly flammable (see CLEAPSS Hazcard [HC032](#)).
- Other acids and alkalis and other indicators (or mixtures of indicators) including 'homemade' ones (from red cabbage, for example) could be tried.
- Toilet roll and other white tissue may be used instead of filter paper, but they appear to dry less successfully.
- A hair drier or oven may be found useful to dry the filter papers quickly.

Procedure

1. Students should be given a piece of filter paper and asked to draw on it in pencil two circles about 1 cm in diameter and about 2 – 3 cm apart, which they label 'acid' and 'alkali' respectively.
2. The filter paper should then be placed on a white tile and students use dropping pipettes to place a few drops of the appropriate solution in each circle.
3. The concentrations of the acid and alkali are not critical, but they should be approximately the same.
4. The solution will begin to spread out on the filter paper.
5. The students should wait for a few minutes until the solutions have soaked through the filter paper towards each other and have met.
6. Students should then place drops of universal Indicator solution on the area of the filter paper where the acid and alkali have met and reacted.
7. A 'rainbow' will be produced, showing the range of colours produced by universal indicator.

Notes

- This experiment is quicker, simpler and safer than the traditional method of illustrating neutralisation by titrating acid with alkali using a burette. It also uses more familiar equipment (a dropping pipette rather than a burette), uses little of the reagents and has the advantage of producing a permanent record of the colour changes.
- The reaction is:
- $\text{HCl(aq)} + \text{NaOH(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$
- Whatman paper no. 1 works well, but chromatography paper appears to be less successful.

This practical is part of our Chemistry for non-specialists collection. This experiment has been adapted from a version written by Ted Lister on behalf of the RSC.