Testing acids and bases on a microscale – teacher notes

In this experiment, students test various substances with indicator solution and look for colour changes.

Topic

Acids and bases, indicators

Timing

15 minutes

Equipment

Apparatus

- Eye protection
- Student worksheet
- Clear plastic sheet (eg ohp sheet)
- Plastic pipettes

Chemicals

Solutions should be contained in plastic pipettes. See the accompanying guidance on apparatus and techniques for microscale chemistry (https://rsc.li/3nKSpWB), which includes instructions for preparing solutions.

- Sodium hydroxide, 1 mol dm^{-3}
- Hydrochloric acid, 1 mol dm^{-3}
- Sulphuric acid, 1 mol dm^{-3}
- Nitric acid, 1 mol dm^{-3}
- Sodium carbonate, 0.5 mol dm^{-3}
- Ammonia solution, 1 mol dm^{-3}
- Vinegar
- Lemon juice
- Household bleach (diluted 1:1 with water – see note 10 below)
- Soap solution
- Full-range indicator solution (diluted 1:1 with deionised water – see notes 11 and 12)

Health, safety and technical notes

1. Read our standard health and safety guidance (https://rsc.li/3yjoGsv).
2. Wear eye protection throughout (splash-resistant goggles to BS EN166 3).

3. Hydrochloric acid, HCl (aq), 1 mol $dm^{-3}$is low hazard – see CLEAPSS Hazcard HC047a and CLEAPSS Recipe Book RB043.
4. Nitric acid, HNO_3(aq), dilute 1 mol dm^{-3} is CORROSIVE – see CLEAPSS Hazcard HC067 and CLEAPSS Recipe Book RB061.
5. Sulfuric acid, H_2SO_4(aq), 1 mol $dm^{-3}$is an IRRITANT – see CLEAPSS Hazcard HC098a and CLEAPSS Recipe Book RB098.
6. Sodium hydroxide solution, NaOH(aq), 1 mol dm^{-3} is CORROSIVE – see CLEAPSS Hazcard HC091a and CLEAPSS Recipe Book RB085.
7. Sodium carbonate, $Na_2CO_3.10H_2O$, 0.5 mol dm^{-3} is low hazard – see CLEAPSS Hazcard HC095A and CLEAPSS Recipe Book RB080.
8. Vinegar, lemon juice and soap solution are all of low hazard.
9. Ammonia solution, NH_3(aq), 1 mol dm^{-3} is an IRRITANT – see CLEAPSS Hazcard HC006 and CLEAPSS Recipe Book RB006.
10. A 1:1 dilution of bleach is an irritant and if mixed with acid can release toxic chlorine – see CLEAPSS Hazcard HC089.
11. A 1:1 solution of universal indicator is (probably) flammable (depending on the formulation) – keep away from sources of ignition and see CLEAPSS Hazcard HC032.
12. Full-range indicator is a solution in propanol (or methylated spirits) which has a low surface tension and spreads out if used neat. Adding water increases the surface tension while still keeping the indicator in solution.