

Carry out a practical investigation into a substance present in a consumer product using quantitative analysis. [4 Credits, Internal Assessment]

## Glossary

**Acid-base** - reaction between acid and base e.g. ethanoic acid and sodium hydroxide, hydrochloric acid and ammonia solution.

**Aliquot** - the volume of reactant provided by the pipette.

**Burette** – narrow diameter tube with a tap that delivers a known amount of liquid. They should be rinsed with the solution they will be used to measure.

**Chemical species** – any atom, molecule or ion.

**Concentration** – the amount or mass of a substance in a given volume of solution. It can be expressed as:

- grams per litre       $\text{g L}^{-1}$       where  $c = m/V$
- moles per litre       $\text{mol L}^{-1}$       where  $c = n/V$

**Concordant results** – titres for repeat titrations which agree to within 0.20\* mL of each other. (This value\* will vary depending on the analysis being done).

**Controlled variables** – experimental elements which are kept constant and unchanged throughout the course of the investigation.

**Dependent variable** – the variable that changes as a result of the changes to the independent variable.

**End-point** – the end point of an acid-base titration is indicated by a coloured indicator, which changes colour when one drop of acid or alkali completes the neutralisation.

**Equivalence point** - the point at which the reacting species (in the flask) has completely reacted with the reacting species (in the burette).

**Independent variable** – the variable that is changed by the person doing the investigation.

**Measuring cylinders** – glassware used to measure approximate volumes.

**Meniscus** - the curve in the upper surface of a liquid close to the surface of the container

**Pipette** – glassware that delivers a precise volume (also known as aliquot). Usually a 10.0 mL, 20 mL, 25 mL. They should be rinsed with the solution they will be used to measure.

**Primary Standard** – solution prepared by accurately weighing a mass of a pure substance.

**Rough titration** – titration to get an approximate idea of the volume e.g. titre is 25 mL or 15 mL.

**Solute** – the chemical, often a solid, that is dissolved by a solvent to become a solution.

**Solvent** – the chemical, usually water, that will dissolve a solute to become a solution.

**Secondary standard** - a secondary standard is a standard that is prepared in the laboratory for a specific analysis. It is usually standardised against a primary standard.

**Standardising** – standardising a solution means finding its concentration using a primary standard.

**Standard solution** – a solution whose exact concentration is known.

**Stoichiometry** - expresses the quantitative relationship between reactants and products in a chemical equation. Stoichiometric coefficients in a balanced equation indicate molar ratios in that reaction.

**Titration** – a solution of unknown concentration is reacted with a solution of known concentration. (A known volume of one solution is placed in a flask; the other reacting solution is slowly released from a burette into the flask; the volume needed for the complete reaction is measured.)

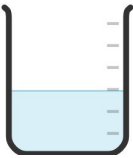
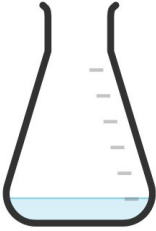
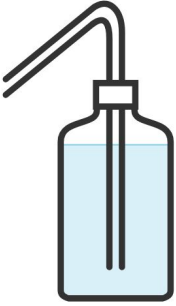
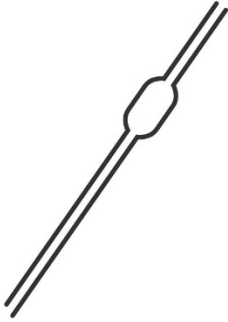

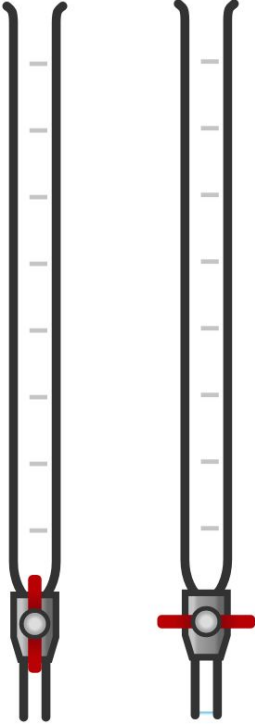
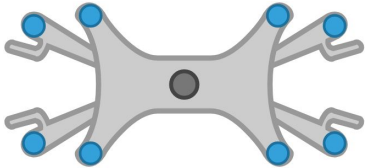
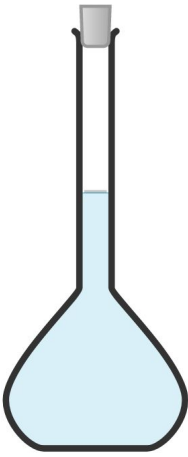
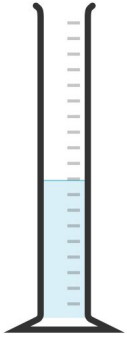
**Titre** – the minimum volume of solution (from the burette) which is required for the complete reaction of the solution in the flask. Titre values should be within 5 mL and 30 mL.

- Less than 5 mL is very inaccurate. The percentage error will be huge.
- More than 30 mL is both wasteful of solutions AND means you will have to refill your burette (capacity 50 mL) each time you do a titration.

**Variable** – any factor that can be changed during an investigation.

**Volumetric flask** – flask used to accurately make up a known volume of solution.

Some of the apparatus [Not to scale]

|   |   |   |
|---|---|---|
|    |    |    |
| beaker  | conical flask   | wash bottle   |
|   |   |   |
| pipette   | pipette filler  | burette (open / closed)   |
|  |  |  |
| burette clamp   | volumetric flask  | measuring / graduated cylinder  |