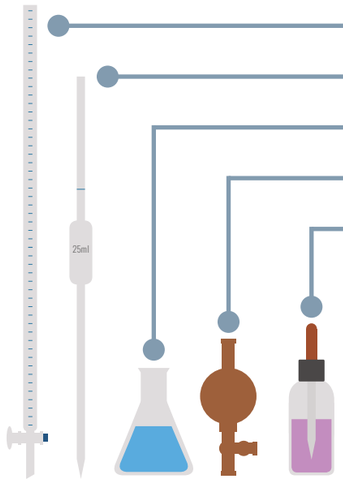
CHEMISTRY TECHNIQUES: TITRATION

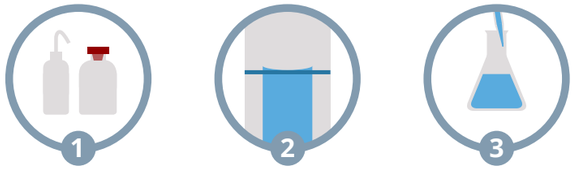
Used to determine the concentration of a particular solution, by measuring how much of a solution of known concentration reacts with a known volume of it.

EQUIPMENT



The pipette comes in a range of fixed volumes, or in graduated form, depending on the volume you need to measure. Burettes usually hold 50 cm^3 of solution.

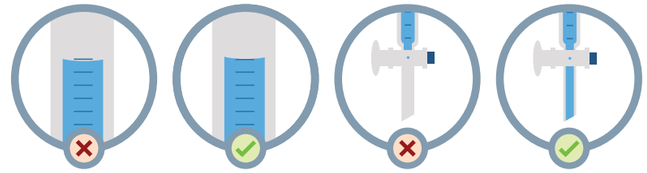
USING A PIPETTE



1. WASH OUT WITH DISTILLED WATER THEN THE SOLUTION TO BE USED
2. FILL USING PIPETTE FILLER, UNTIL BOTTOM OF MENISCUS IS LEVEL WITH LINE
3. SLOWLY DRAIN LIQUID INTO FLASK; TOUCH TIP TO WALL TO REMOVE HANGING DROPS

Pipettes should never be filled direct from stock bottles of solution as this could contaminate them. Instead, fill them from some of the solution poured into a beaker. They're calibrated to allow for a small amount of solution remaining in the tip after the correct volume has been delivered, so this remainder shouldn't be forced out.

FILLING THE BURETTE

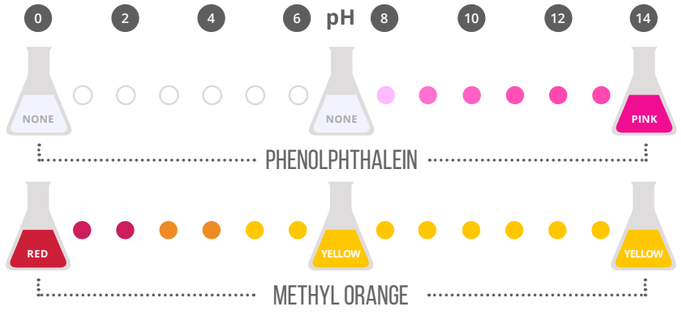


FILL THE BURETTE ABOVE THE ZERO MARK, THEN DRAIN UNTIL THE BOTTOM OF THE MENISCUS IS LEVEL WITH THE ZERO MARK

ALLOW SOME OF THE SOLUTION THROUGH THE BURETTE'S TAP SO THAT THE AREA UNDER THE TAP ALSO CONTAINS SOLUTION

As with the pipette, the burette should be rinsed with distilled water then the solution it is to be filled with before filling. It is necessary that the area under the tap also contains solution as the burette's scale includes this volume. Without doing this, the volume recorded for titrations would be higher than the actual value.

USING INDICATORS



In acid-base titrations, a range of indicators can be used. These are solutions which change colour at a specific pH, and can be used to precisely identify when the neutralisation reaction is complete (the end point). Different indicators are suitable for different acid-base combinations.

CARRYING OUT THE TITRATION

ROUGH	TITRE 1	TITRE 2	TITRE 3
20.30 cm^3	20.15 cm^3	20.00 cm^3	20.10 cm^3

—— = concordant titre values, used to calculate average

Average titre = (20.15 cm^3 + 20.10cm^3) ÷ 2 = 20.13 cm^3

To carry out the titration, the tap of the burette is opened to allow the solution inside to flow into a known volume of the solution in the conical flask. The amount of solution from the burette required to reach the end point is recorded. A rough titration is usually followed by more accurate runs. Multiple titrations are carried out until concordant titres are obtained (within 0.10 cm^3 of each other).

CARRYING OUT CALCULATIONS

$$n = cv$$

- **NO. OF MOLES** — *in moles*
- **CONCENTRATION** — *in moles per decimetre cubed (mol/dm^3 or $mol\ dm^{-3}$)*
- **VOLUME** — *in decimetres cubed (dm^3) (value in $cm^3 \div 1000$)*

Assuming that the concentration of the solution in the burette is known...

1. Calculate number of moles of solution added from the burette.
2. Determine the number of moles of solution in the conical flask using the equation for the reaction and reacting ratios.
2. Calculate the concentration of the solution in the conical flask by rearranging the equation (c = n ÷ v).