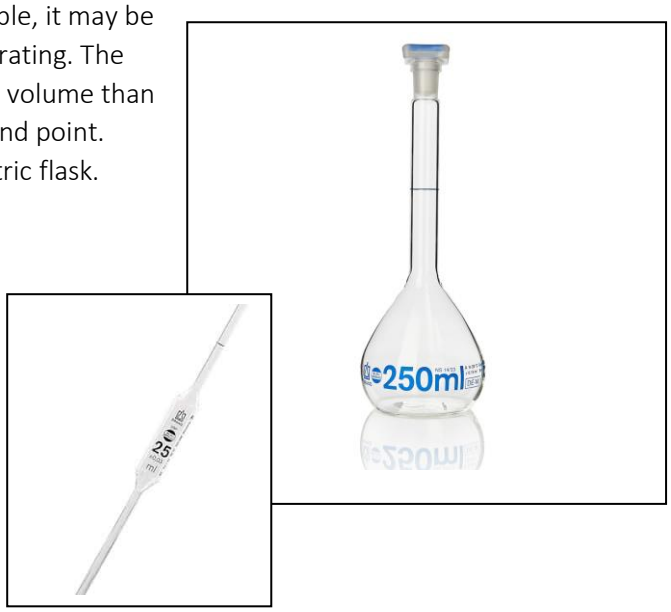
Lesson 3 – dilution before titration- solutions

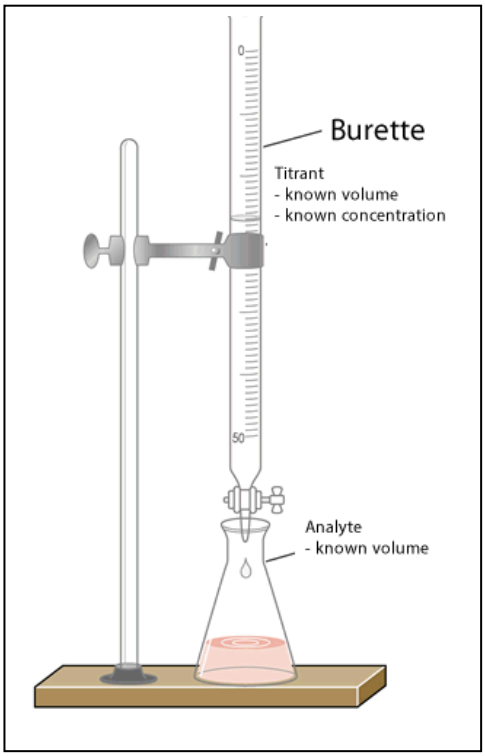
When using a concentrated original sample, it may be necessary to dilute the sample before titrating. The reason for this is that it would take more volume than can be held in the burette to reach the end point. Dilution involves a pipette and a volumetric flask.



All titrations procedures have a common theme, the following must be known accurately.

- The concentration and the volume of the titrant delivered into the conical flask.

- The volume of the analyte placed in the conical flask.



Let's look at an example.
The HCl acid concentration of a brand of brick cleaner is to be determined using volumetric analysis. Since the original solution is concentrated, it is decided to dilute a sample of this brick cleaner before titrating.
A 25.00 mL aliquot is taken from the original bottle of brick cleaner and placed in a 250 mL volumetric flask and made to the mark using distilled water.
A volume of 20.00 mL was transferred from the volumetric flask to a 100mL conical flask and titrated to the end point using a standard solution of 0.143 M $NaHCO_3$. An average titre of 25.16 mL was obtained. Find the concentration of HCl in the original sample in %m/v.

a) Write the balanced overall equation for the reaction taking place in the conical flask between the HCl and the $NaHCO_3$.
   $HCl\ (aq) + NaHCO_3(aq) \rightarrow NaCl(aq) + H_2O(l) + CO_2(g)$
b) Find the mol of $NaHCO_3$ in the average titre
   Mol of $NaHCO_3$ = C X V = 0.143 X 0.02516 = 3.6 X 10^{-3}mol
c) Find the mol of HCl in the conical flask.
   Mol of HCl = 0.00360
d) Find the concentration, in mol/L, of HCl in the volumetric flask
   0.00360 mol of HCl was in 20 mL of the volumetric flask
   (250/20) X 0.00360 = 0.045 mol
   => 0.045/ 0.250 L = 0.18 M
e) Find the concentration in mol/L in the original undiluted sample
   $C_1V_1 = C_2V_2$
   => $C_1 = C_2V_2/V_1$
   => C_1 = 0.18 X 0.250 / 0.0250 = 1.8 M
f) Find the concentration of HCl, in %m/v, in the original sample .
   Convert 1.8 M into %m/v
   => ((1.8 X 36.5)g / 1000 mL) X 100 = 6.57 %m/v

Unpacking all this information is difficult so draw a flow diagram.