

Lesson 4 -Volumetric

Volumetric analysis involves finding the concentration of an unknown sample by reacting it with an accurately known volume of a solution whose concentration is known accurately. This solution is known as the standard solution.

So what do we need to perform a volumetric analysis.

- 1- A balanced chemical equation of the reaction between the two solutions
- 2- The volume and concentration of the standard solution.

Let's do the first example.

An unknown sample of brick cleaner is to be analysed for its concentration of HCl.

5 conical flasks with exactly 20.00 mL of the unknown brick cleaner solution are prepared and titrated against a 0.100 M NaHCO₃ solution. The average titre is calculated at 25.26 mL. Find the concentration, in %m/v of HCl in the brick cleaner.

Step 1 Write a balanced chemical equation for the reaction between HCl and NaHCO₃.



Step 2 Find the mol of NaHCO₃ that reacted.

$$\text{mol of NaHCO}_3 = C \times V = 0.2526 \times 0.100 = 0.02526 \text{ mol}$$

Step 3 Now find the mol of HCl that reacted with the NaHCO₃ in the conical flask. Use the balanced equation to get the mol ratios

$$\Rightarrow \text{Mol of NaHCO}_3 = \text{mol of HCl} = 0.02526 \text{ mol}$$

Step 4 Find the mass of HCl represented by 0.02526 mol

$$\Rightarrow 0.02526 \times 36.5 = 0.922 \text{ g}$$

Step 5 Find the %m/v = $(0.922/20.00 \text{ mL}) \times 100 = 4.61\% \text{m/v}$

Let's do a second example

An unknown sample of acid wash is to be analysed for its concentration of H₂SO₄.

Five conical flasks with exactly 20.00 mL of the unknown acid wash solution are prepared and titrated against a 0.100 M NaHCO₃ solution. The five titres were, 25.62 mL, 23.29 mL, 23.20 mL, 23.25, 23.19. Find the concentration, in %m/v of H₂SO₄ in the acid wash.

Step 1 Write a balanced chemical equation for the reaction between H₂SO₄ and NaHCO₃.

Step 2 Find the average titre. Only include the concordant results.

Step 3 Find the mol of NaHCO₃ that reacted.

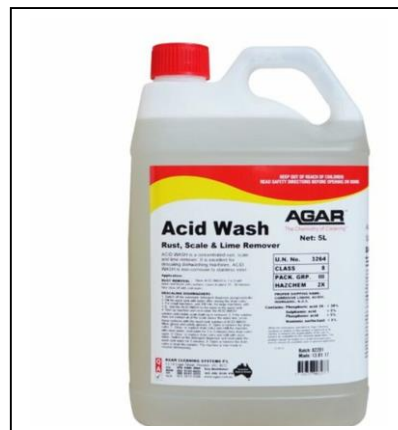
Step 3 Now find the mol of H₂SO₄ that reacted with the NaHCO₃ in the conical flask. Use the balanced equation to get the mol ratios

Step 4 Find the mass of H₂SO₄ represented by 0.01162 mol

Step 5 Find the %m/v



1. An unknown sample of acid wash is to be analysed to determine its concentration of H_2SO_4 .
A 20.00 mL aliquot is taken from the original sample and placed in a 200 mL volumetric flask and made to the mark with distilled water. A 20.00 mL aliquot is taken from the volumetric flask and placed in a 100mL conical flask and titrated against a 0.114 M Na_2CO_3 solution. This was repeated several times until concordant titres were recorded and an average titre of 18.98 mL was calculated.
- a. Write a balanced chemical equation for the reaction between H_2SO_4 and Na_2CO_3 .



- b. Find the mol of Na_2CO_3 present in an average titre.
- c. Find the mol of H_2SO_4 present in the conical flask.
- d. Find the mol of H_2SO_4 in the volumetric flask
- e. Find the concentration, in mol/L, of H_2SO_4 in the original solution of acid wash.

