

Friday worksheet 8 – Volumetric analysis.

60.00 mL of a brand of brick cleaner, claiming to contain 33.00% m/m HCl, was pipetted into a 250 mL volumetric flask. The volumetric flask was weighed and its mass recorded as 110.59 g. A sample of 20.00 mL was then placed in the flask and reweighed and the mass recorded as 180.49 g. The volumetric flask was then made up to the mark with distilled water.



Four 100 mL conical flasks were prepared by placing 20.00 mL of the diluted brick cleaner from the volumetric flask into each of the four conical flasks with two drops of phenolphthalein. Each flask was then titrated against a 1.00 M NaHCO_3 standard solution. The following titres were obtained.

34.53 mL, 33.00 mL, 32.92 mL, 32.95 mL.

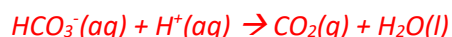
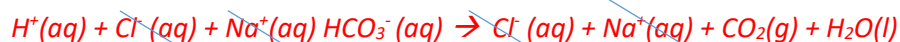
1) a. What are the properties of NaHCO_3 that make it a suitable compound to use as a primary standard?

- high molecular mass
- it doesn't decompose or react with the atmosphere
- can be obtained in pure form
- has a known chemical formula

b. What is the colour change of the indicator.

Clear to pink

2) Write a balanced ionic equation for the reaction between HCl and NaHCO_3 .



3) Calculate the average titre delivered.

34.53 mL, 33.00 mL, 32.92 mL, 32.95 mL.

average titre = 32.96 mL

4) Calculate the amount, in mol, of acid present in each 100 mL conical flask.

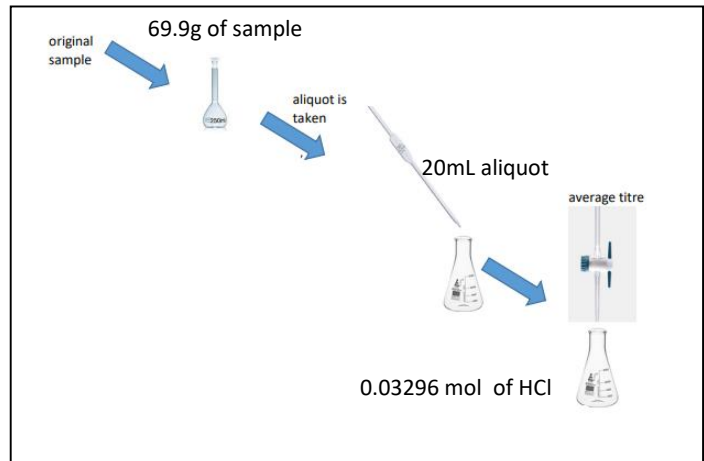
Step 1 calculate the mol of HCO_3^- delivered into the conical flask

$$\Rightarrow C \times V = n$$

$$\Rightarrow 1.00 \times 0.03296 = \text{mol of } \text{HCO}_3^- = 0.03296 \text{ mol}$$

Step 2 mol of HCl = 0.03296

5) Calculate the amount, in mol, of acid present in the *volumetric flask*.
=> *mol of HCO_3^- = mol of HCl according to the ionic equation*
=> *$0.03296 \times (250/20) = 0.412 \text{ mol of HCl}$*



6) Calculate the concentration of HCl in the original brick cleaner in %m/m
=> *%m/m (mass of compound (g)/mass of sample(g)) X 100*
=> *mass of HCl = mol X Formula mass = $0.412 \times 36.5 = 15.04\text{g}$*
=> *mass of original brick cleaner 60mL solution = $180.49 - 110.59\text{g} = 69.9\text{g}$*
=> *%m/m = $(15.04/69.6) \times 100 = 21.6\%m/m$*