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 250mL volumetric flask. The volumetric flask was previously weighed and its mass recorded as 110.59g. After adding the 60.00 mL sample the volumetric flask and its content was reweighed and the mass recorded as 180.49g. The volumetric flask was then made up to the mark with distilled water Four 100mL 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 1.00M $NaHCO_3$ 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 $NaHCO_3$.

$HCl(aq) + NaHCO_3(aq) \rightarrow NaCl(aq) + CO_2(g) + H_2O(l)$

$H^+(aq) + Cl^-(aq) + Na^+(aq)\ HCO_3^-(aq) \rightarrow Cl^-(aq) + Na^+(aq) + CO_2(g) + H_2O(l)$

$HCO_3^-(aq) + H^+(aq) \rightarrow CO_2(g) + H_2O(l)$

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 100mL conical flask.

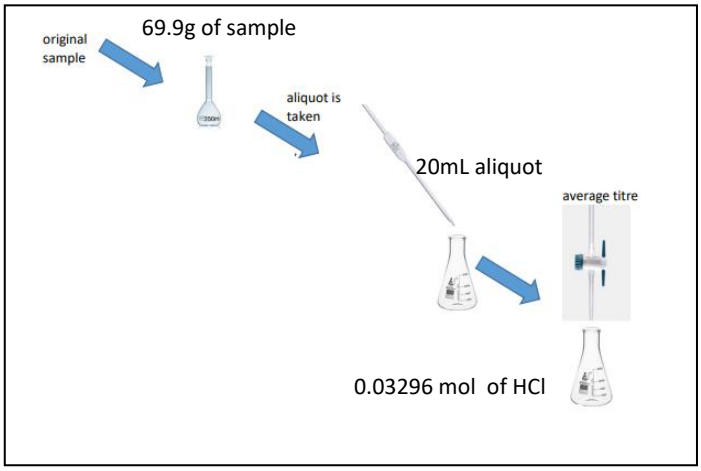
Step 1 calculate the mol of HCO_3^- delivered into the conical flask
=> C X V = n
=> 1.00 X 0.03296 = mol of HCO_3^- = 0.03296 mol

Step 2mol 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 X (250/20) = 0.412 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 X 36.5 = 15.04g

=> mass of original brick cleaner 60mL solution = 180.49 - 110.59g = 69.9g

=> %m/m = (15.04/69.9X 100 = 21.5 %m/m