FA 1 is solid 'washing soda', originally sodium carbonate decahydrate, $Na_2CO_3.10H_2O$.
FA 2 is 0.100 mol dm^{-3} hydrochloric acid, HCl.
Weigh a 100 cm^3 beaker. Record the mass in Table 2.1.
Tip the remaining **FA 1** from tube **Y** into the beaker and weigh the beaker and crystals.

Table 2.1

Mass of beaker	/ g	
Mass of beaker + **FA 1**	/ g	
Mass of **FA 1**	/ g	

Mass of FA1 = 7.00 g

[1]

Add distilled water to the beaker to dissolve the crystals. Carefully transfer the solution to a 250 cm^3 graduated (volumetric) flask. Rinse the beaker several times adding the rinse water to the graduated flask. Make the solution up to 250 cm^3 with distilled water and invert a number of times to ensure thorough mixing. Label this solution **FA 3**.

Pipette 25.0 cm^3 of **FA 3** into a conical flask and add a few drops of the indicator provided. Titrate the solution with **FA 2**, contained in a burette. Record your results in Table 2.2. **Repeat the titration as many times as you think necessary to obtain accurate results. Make certain that the recorded results show the precision of your practical work.**

Table 2.2 Titration of FA 3 with FA 2

Final burette reading / cm^3				
Initial burette reading / cm^3				
volume of **FA 2** used / cm^3				

Volume of FA2 = 24.0 cm^3
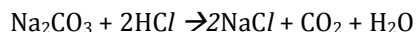
[2] + [6]

Summary

25.0 cm^3 of **FA 3** reacted with .... cm^3 of **FA 2**.
Show which results you used to obtain this volume of **FA 2** by placing a tick under the readings in Table 2.2.

(a) Calculate the number of moles of hydrochloric acid run from the burette.

[1]

(b) Sodium carbonate reacts with hydrochloric acid
$$Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$$
Calculate the number of moles of sodium carbonate, Na_2CO_3, in 250 cm^3 of **FA 3**.

[2]

(c) Calculate the mass of sodium carbonate, Na_2CO_3, dissolved in 250 cm^3 of **FA 3**.
[Na, 23.0; C, 12.0; O, 16.0.]

[1]

(d) Calculate the mass of water present in the washing soda crystals.

[1]

(e) Calculate the percentage (%) of water in the sodium carbonate crystals, **FA 1**.

[1]
[Total : 15]