1 Eggshells are made from a mixture of calcium carbonate and other insoluble substances.

Calcium carbonate reacts with dilute hydrochloric acid. The equation for the reaction is shown.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

The other substances in eggshells do **not** react with dilute hydrochloric acid.

A student finds the percentage by mass of calcium carbonate in an eggshell.

Fig. 1.1 shows the first three steps of the method the student uses.

step 1
Grind the eggshell into small pieces.

step 2
Find the mass of the small pieces of eggshell.

step 3
Add the small pieces of eggshell to excess dilute hydrochloric acid and warm the mixture while stirring it with a glass rod.

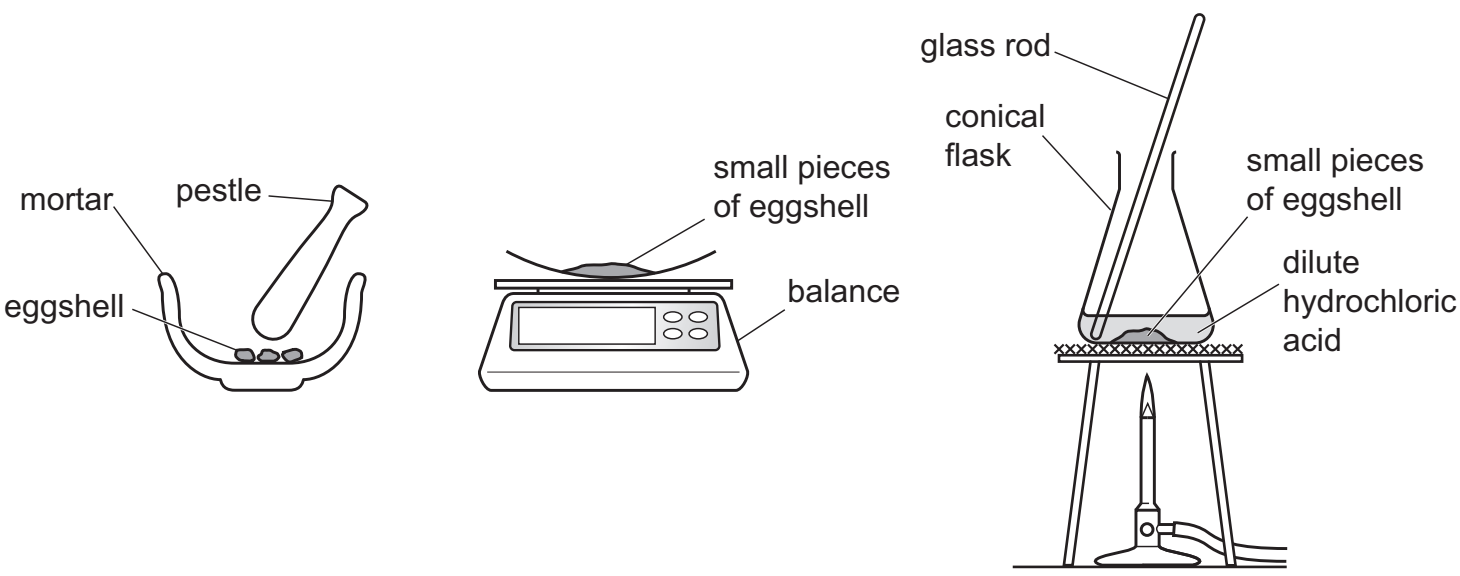

Fig. 1.1

(a) (i) Describe what is seen when the calcium carbonate in the eggshell reacts with dilute hydrochloric acid.

..... [1]

(ii) Describe what the student should do to make sure the acid is in excess and all of the calcium carbonate has reacted.

.....

.....

..... [2]

(b) After **step 3**, the student filters the mixture to obtain the unreacted solid left from the eggshell.

(i) Draw a labelled diagram of the apparatus the student should use to filter the mixture.

[2]

(ii) After the filtration, the student washes the residue.

Identify the **two** substances removed from the residue by washing.

substance 1 .....

substance 2 .....
[2]

(iii) After washing the residue, the student dries the residue in an oven.
The student then measures the mass of the dry residue.

The masses the student records are shown in Table 1.1.

Table 1.1

mass of small pieces of eggshell / g	2.00
mass of dry residue after filtration / g	0.11

Use the data in Table 1.1 to calculate the percentage by mass of calcium carbonate in the eggshell.

percentage of calcium carbonate = ... [2]

[Total: 9]