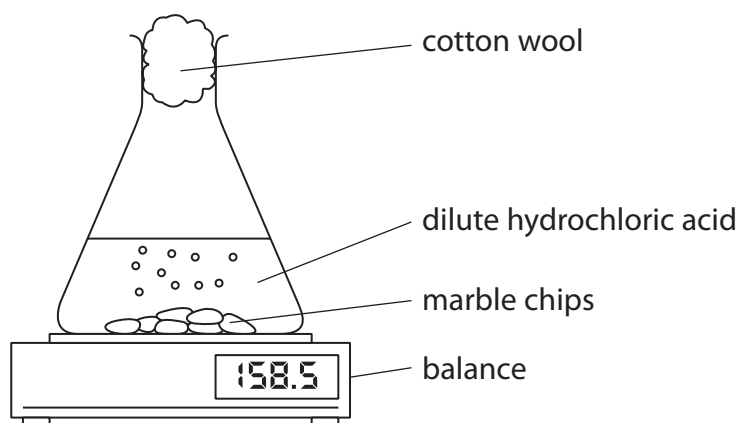


- 5 A student uses this apparatus to investigate the rate of reaction between marble chips and dilute hydrochloric acid.



- (a) During the reaction, the reading on the balance decreases because mass is lost from the flask.

- (i) Explain how using the cotton wool increases the accuracy of this investigation. (2)

.....

.....

.....

.....

- (ii) Why is mass lost from the flask?

(1)

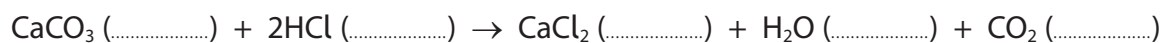
- ☐ **A** acid particles are moving
- ☐ **B** gas is given off
- ☐ **C** heat energy is produced
- ☐ **D** marble chips are dissolving



(b) This is the equation for the reaction between marble chips and dilute hydrochloric acid.

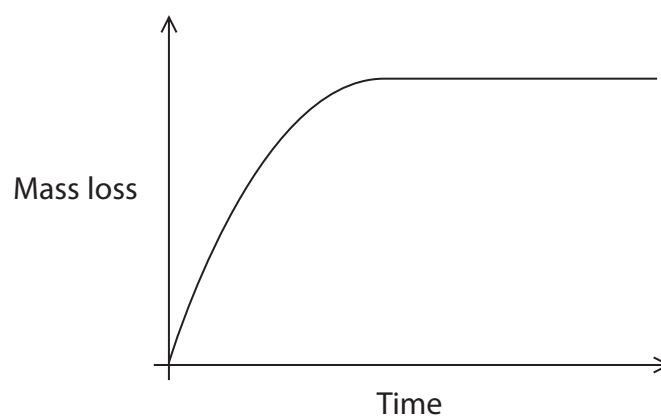
Complete the equation by adding the state symbols.

(2)



(c) The student uses large marble chips in the investigation.

This is a graph of his results.



The student repeats the experiment using the same total mass of smaller marble chips.

On the graph, draw the curve that would be obtained.

[assume the marble chips are in excess]

(2)



8 A student investigates the neutralisation reaction between sodium hydroxide and nitric acid.

This is her method.

- pour 20 cm<sup>3</sup> of sodium hydroxide solution into a polystyrene cup
- record the temperature of the sodium hydroxide solution
- add 5 cm<sup>3</sup> of dilute nitric acid to the cup
- stir the mixture and record the highest temperature reached
- add further 5 cm<sup>3</sup> portions of dilute nitric acid, recording the highest temperature reached each time, until a total of 40 cm<sup>3</sup> of acid has been added

(a) (i) Give a word equation for this neutralisation reaction.

(1)

(ii) Explain why a polystyrene cup is used rather than a beaker.

(2)

(iii) Give a safety precaution that the student should take when using sodium hydroxide solution.

(1)

(b) The table shows the student's results.

Total volume of acid in cm <sup>3</sup>	0	5	10	15	20	25	30	35	40
Temperature of reaction mixture in °C	20.5	22.5	24.4	26.4	28.5	28.3	27.5	26.7	26.0

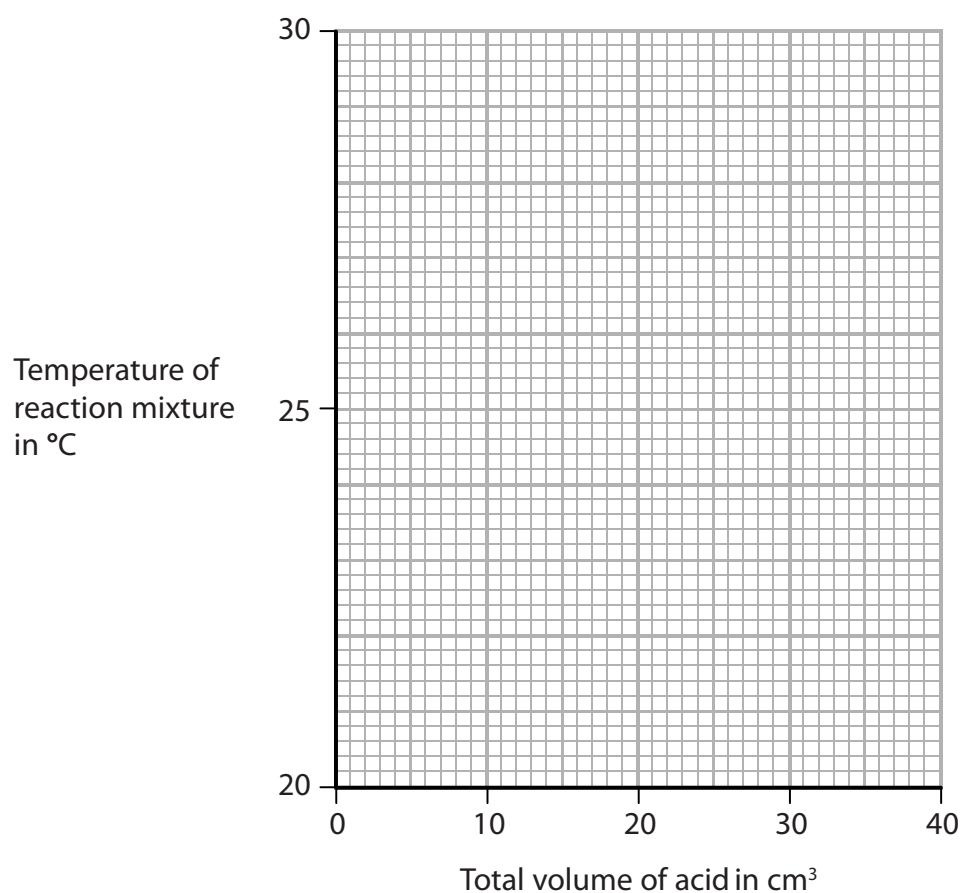


(i) Plot the results on the grid.

Draw a straight line of best fit through the first five points and another straight line of best fit through the last four points.

Make sure that the two lines cross.

(3)



(ii) The point where the lines cross shows

- the volume of acid needed to exactly neutralise the alkali
- the maximum temperature reached

Use your graph to determine these values.

(2)

volume of acid = ..... cm<sup>3</sup>

maximum temperature = ..... °C

**(Total for Question 8 = 9 marks)**

