C1.2.1 Calcium carbonate

1. The flow chart shows some of the substances that can be made from limestone.

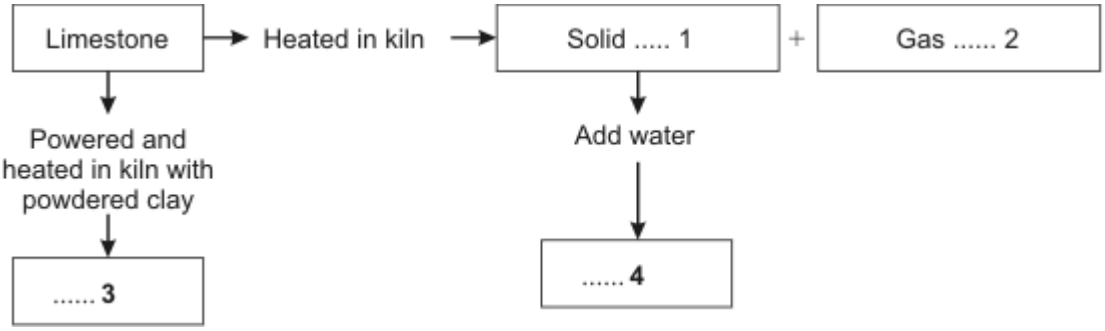
Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A calcium hydroxide

B calcium oxide

C carbon dioxide

D cement



2. In several parts of Britain, there are large limestone quarries in areas that otherwise are very attractive.

(a) Why are these large limestone quarries necessary?

1 They create rock ledges on which birds can nest.

2 They provide areas for rock-climbing.

3 There is a huge demand for limestone for building.

4 Farmers spread a lot of limestone on their fields.

(b) People who live near the quarries may benefit because . . .

1 they are able to buy cheap limestone.

2 they have a new recreational area.

3 more wildlife is attracted to the area.

4 there are more jobs in the area.

In one area, a new quarry is to be developed.

Local people are concerned because lorries from the quarry will drive down the village main street to reach the motorway.

The local people are to organise a petition for a village by-pass.

To support their petition, they plan to survey lorry numbers before and after the quarry opens.

(c) Which of these suggestions from local people do you think will provide the best evidence to support their petition?

1 count the number of lorries filling up at the local petrol station

2 count the number of lorries joining the motorway near the village

3 count the number of lorries passing down the village main street

4 count the number of lorries parked at the village transport café

(d) The residents should continue their survey until the quarry is fully working.

They should count the lorries . . .

1 at different times during the day.

2 only during daylight hours.

3 at the same times, day and night.

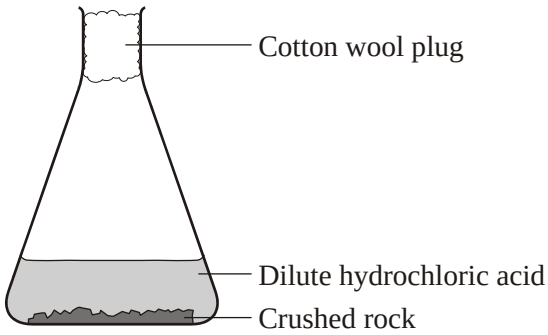
4 only during blasting times at the quarry.

3. In each part choose only **one** answer.

A student wanted to find the percentage (%) of calcium carbonate in a rock sample that she had collected.

She used a small piece of the sample, crushed it, weighed it, and then set up her experiment as shown.

Bubbles of carbon dioxide were given off as the calcium carbonate in the crushed rock reacted with the acid. She allowed the reaction to continue until no more bubbles were seen.



A The student assumed that all the calcium carbonate in the samples had reacted when the bubbles stopped.

What else should she do to be sure that it had all reacted?

1 test to see whether there is any acid left in the mixture

2 allow the contents of the flask to cool to room temperature

3 add alkali to neutralise the solution in the flask

4 test to see whether there is any carbon dioxide in the flask

B The student did the experiment four times and calculated the following results for the percentage of calcium carbonate in the rock.

67%, 50%, 39%, 56%

What is the mean of her results?

1 28%

2 53%

3 56%

4 67%

C One possible reason why there is so much variation in the four results is that . . .

1 there was an increase in the laboratory temperature.

2 there was a decrease in the laboratory temperature.

3 the hydrochloric acid was too strong.

4 calcium carbonate is not spread evenly through the rock sample.

D A systematic error in the student's technique that could produce incorrect results is that . . .

1 other substances in the rock may react with hydrochloric acid.

2 the same mass of crushed rock was not used in each experiment.

3 the balance was not zeroed before each weighing.

4 a mistake was made in a calculation.

4. Calcium carbonate decomposes on heating to give calcium oxide and carbon dioxide.

$$\mathbf{CaCO_3 \rightarrow CaO + CO_2}$$

100 g of calcium carbonate, on complete decomposition, produces 56 g of calcium oxide.

If the carbon dioxide is not allowed to escape, it will recombine with the calcium oxide. This can happen at any temperature.

The carbon dioxide formed could be:

- used by oil companies
- used by ice-cream companies
- reacted with sodium hydroxide to make sodium carbonate for glass-making.

(a) Calculate the mass of carbon dioxide that would be released by completely decomposing 400 tonnes of calcium carbonate.

(1 tonne = 1 000 000 g)

1 17.6 tonnes

2 22.4 tonnes

3 176.0 tonnes

4 224.0 tonnes

(b) If calcium oxide is left exposed to the air, it will increase in mass.

Which of the following could **not** be the reason for this?

1 The calcium oxide is recombining with carbon dioxide from the air.

2 The calcium oxide is reacting with water from the air.

3 The calcium oxide is still thermally decomposing.

4 The calcium oxide is reverting back to calcium carbonate.

(c) A company makes calcium oxide from calcium carbonate.

The best way for this company to benefit economically, and at the same time reduce environmental damage, is to . . .

1 store the carbon dioxide in holes in the ground made by oil companies.

2 offer the carbon dioxide to oil companies so that they can use it to flush oil out of the ground.

3 sell solid carbon dioxide to ice-cream companies for keeping ice-cream cold.

4 sell the carbon dioxide to glass-making companies for conversion into sodium carbonate.

(d) Graphs of global temperatures compared with the amount of carbon dioxide in the atmosphere over the past 50 years follow each other very closely.

The best conclusion that can be drawn from this is that . . .

1 burning fossil fuels causes global warming.

2 decomposing limestone causes global warming.

3 the heat from processing limestone causes global warming.

4 rising levels of carbon dioxide probably add to global warming.