Do not write outside the box

0 6 This question is about carbon dioxide.

Carbon dioxide is soluble in water and forms an acidic solution.

0 6 . 1 Which ion makes the solution acidic?

[1 mark]

_____

0 6 . 2 Name an indicator that could be used to test if the solution is acidic.

Give the result of the test.

[2 marks]

Indicator _____

Result _____

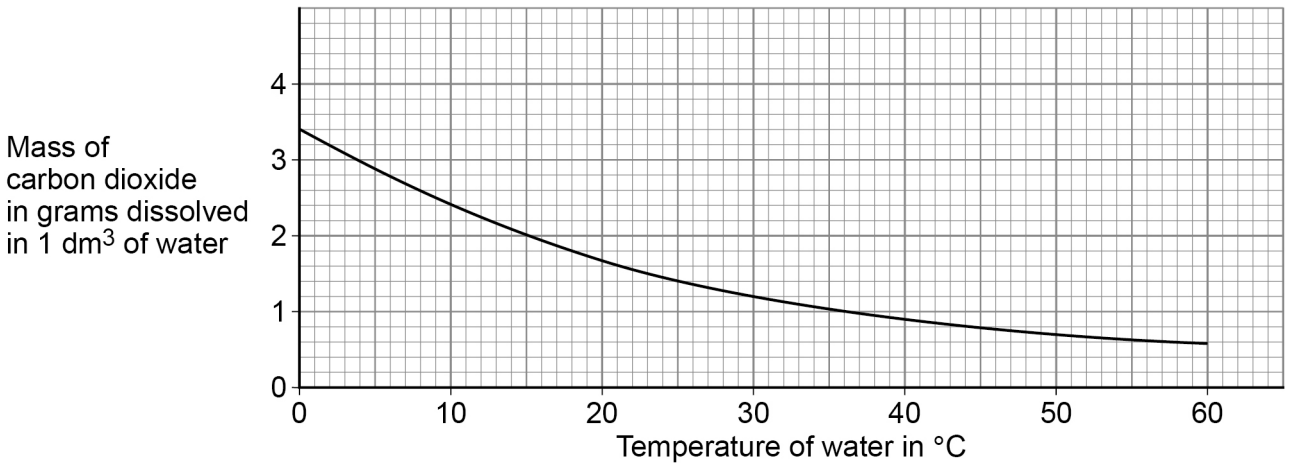
_____

Question 6 continues on the next page

Do not write outside the box

Figure 14 shows the mass of carbon dioxide that will dissolve in 1 dm^3 of water at different temperatures.

Figure 14



0 6 . 3 How does the solubility of carbon dioxide change as the temperature of the water increases?

[1 mark]

Tick (✓) **one** box.

The solubility decreases ☐

The solubility does not change ☐

The solubility increases ☐

Do not write outside the box

0 6 . 4 Carbon dioxide dissolves in water to form an acidic solution.

How does the pH of the solution change as the temperature of the water increases?

Use **Figure 14**.

[1 mark]

Tick (✓) **one** box.

pH of the solution decreases ☐

pH of the solution does not change ☐

pH of the solution increases ☐

Calcium carbonate reacts with hydrochloric acid to produce carbon dioxide.

The equation for the reaction is:

$$CaCO_3(s) + 2\,HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O(\mathbf{x})$$

0 6 . 5 What is the state symbol (**x**) in the equation?

[1 mark]

Tick (✓) **one** box.

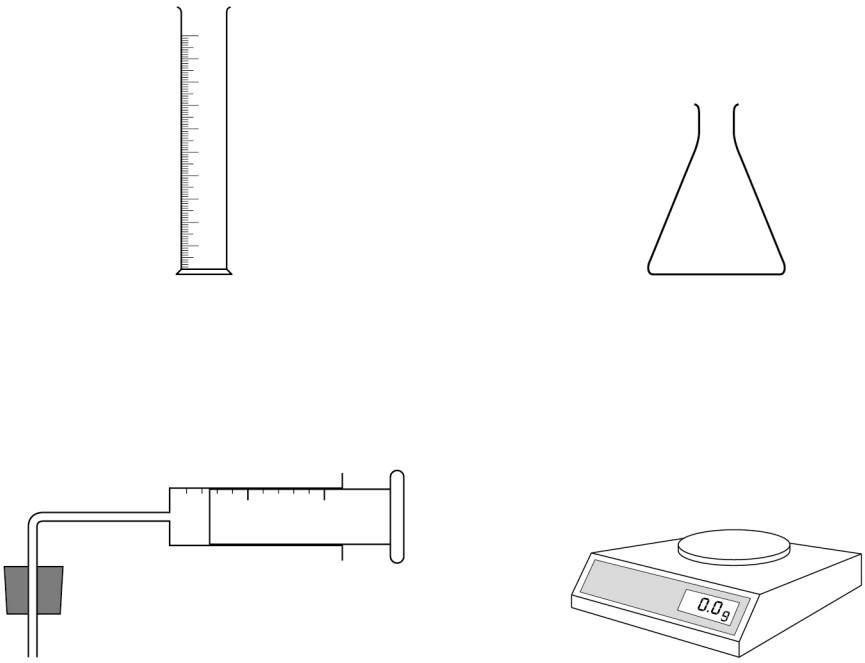
(aq) ☐ (g) ☐ (l) ☐ (s) ☐

Question 6 continues on the next page

Do not write outside the box

0 6 . 6 **Figure 15** shows equipment a student used for an investigation.

Figure 15



Gas syringe

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The student investigated the volume of carbon dioxide produced when different masses of calcium carbonate react with hydrochloric acid.

Describe a method the student could use.

[6 marks]

12

Turn over for the next question

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	hydrogen / H^+		1	AO1 5.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2		MP2 is dependent upon MP1 being awarded		AO1 5.4.2.4
	(indicator) universal	ignore pH meter	1	
	(result) (green to) red / orange / yellow		1	
	OR			
	(indicator) (blue) litmus (1)			
	(result) (turns) red (1)			
	OR			
	(indicator) methyl orange (1)			
	(result) (turns) red (1)			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	the solubility decreases		1	AO3 5.3.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	pH of the solution increases		1	AO3 5.3.2.5 5.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	(l)		1	AO2 5.2.2.2 AO2.2

Question	Answers	Mark	AO / Spec. Ref.
06.6	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO3 5.3.1.3 5.4.2.2
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative Content: • measure a (stated) mass of calcium carbonate • use a balance • add calcium carbonate into a conical flask • measure a (stated) volume of hydrochloric acid • use a measuring cylinder • add hydrochloric acid to the conical flask • immediately place the stopper (and delivery tube) in the conical flask • record the total volume of carbon dioxide gas **or** record volume of carbon dioxide collected in set time **or** time taken to collect fixed volume of gas • collected in the gas syringe • repeat • repeat method with different masses of calcium carbonate		

Total Question 6	**12**