

1. Explain why Sam needs to use an indicator in the titration.

[2]

2. Strong acids are not used in the medicine.

Methanoic acid and ethanoic acid are weak acids.

(i) What is the formula for a hydrogen ion?

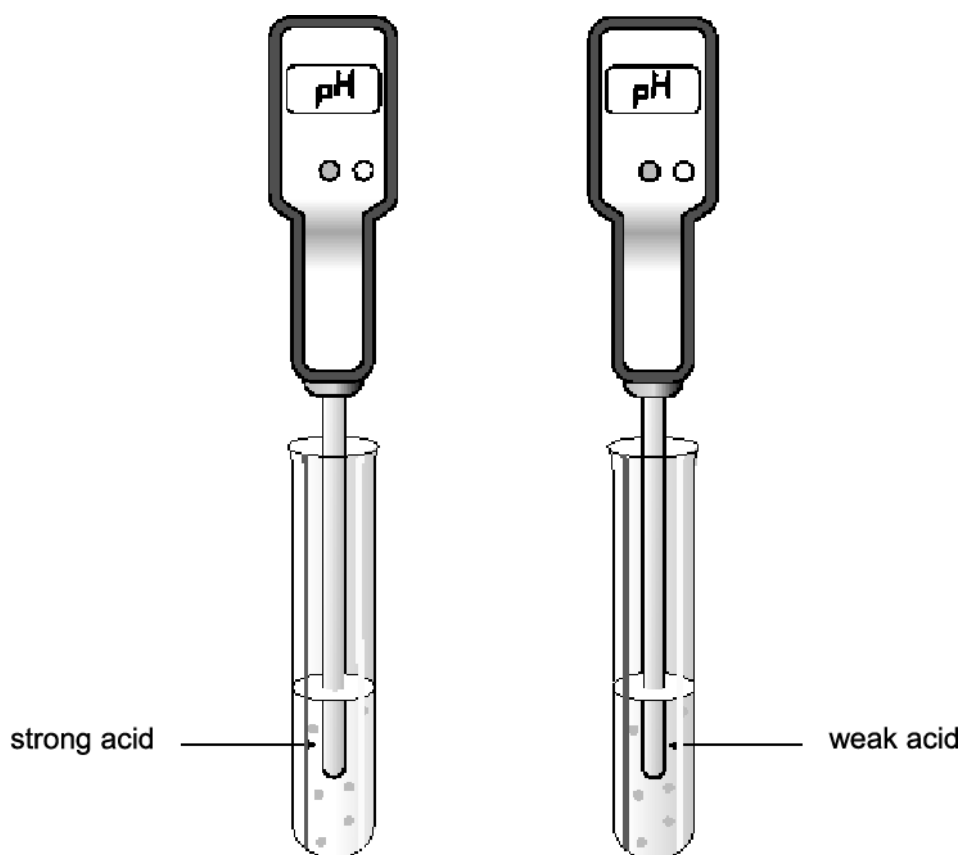
Put a **ring** around the correct answer.



[1]

(ii) Strong acids are more acidic than weak acids.

One way of telling the difference between a strong and a weak acid is testing the pH.



What results would you expect the pH meter to give for each acid?

[2]

3(a). Matt finds out about the bonding in some compounds.

He dissolves them in water and uses a pH meter to find out if each compound is an acid or an alkali.

The table shows his results.

| Compound | Bonding in compound | Acid or alkali? |
|-------------------|---------------------|-----------------|
| sodium hydroxide | ionic | alkali |
| ammonia | covalent | alkali |
| hydrogen chloride | covalent | acid |
| ethanoic acid | covalent | acid |
| calcium hydroxide | ionic | alkali |

How does a pH meter show whether each compound is an acid or an alkali?

[2]

(b). Matt has an idea.

The alkalis in the table have different types of bonding.



Do you agree with Matt's idea?

Use examples from the table to explain your reasoning.

[2]

(c). The pure compounds in the table have different states at room temperature and pressure.

They all dissolve in water to form a solution.

Draw straight lines to connect each **substance** to the correct **state symbol**.

| substance | state symbol |
|-------------------------------|--------------|
| solid sodium hydroxide | (g) |
| hydrogen chloride gas | (l) |
| liquid ethanoic acid | (s) |
| a solution dissolved in water | (aq) |

[2]

4(a). Two different copper compounds react with sulfuric acid to make copper sulfate.

Complete the word equations.

Choose from this list.

copper carbonate copper chloride copper oxide

copper nitrate copper sulfate



[2]

(b). Other acids also react to make copper compounds.

Draw lines to connect each copper compound to the correct acid that can be used to make it.

copper compound

acid that can be used to make it

[2]

(c). Pure acids have different states. Some are solids, some are liquids and some are gases.

Draw lines to connect each **acid** to its correct **state symbol**.

acid

state symbol

sulfuric acid (liquid)

citric acid (solid)

(s)

(g)

(aq)

(l)

[1]

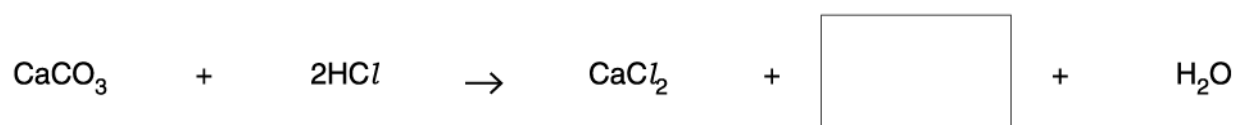
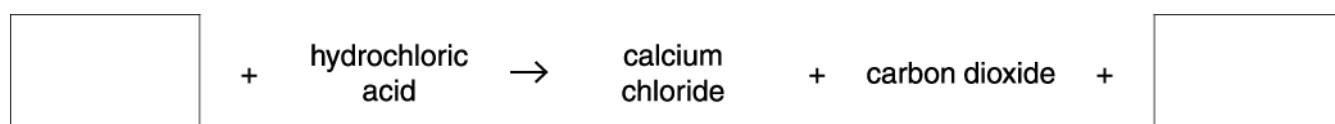
5. Alex adds dilute hydrochloric acid to solid calcium carbonate.

He sees that the reaction makes bubbles of gas.



Alex writes **word** and **symbol** equations for the reaction between calcium carbonate and hydrochloric acid.

Complete the equations by filling in the boxes.



[3]

6(a). Acid rain contains a dilute solution of sulfuric acid.

Acid rain causes some lakes to become too acidic, killing fish and other wildlife.

What can be used to measure acidity?

Put a tick (✓) in the boxes next to the **two** correct answers.

a gas syringe

Universal Indicator

a measuring cylinder

a pH meter

[1]

(b). A water company treats a lake with calcium hydroxide to neutralise acidity.

What is the pH when the water is neutral?

Put a **ring** around the correct answer.

1 4 7 9 14

[1]

(c). The water company measures the temperature of the surface of the lake after neutralisation.

They find that the temperature has increased.

Why do some reactions cause an increase in temperature?

Put a tick (✓) in the box next to the correct answer.

Some reactions give out energy.

Some reactions are endothermic.

Reactions need energy to start.

Reactions are faster at higher temperatures.

[1]

7. What is the name of the salt that is made when zinc reacts with hydrochloric acid?

-----[1]

END OF QUESTION PAPER

Mark Scheme

| Question | | Answer/Indicative content | Marks | Guidance |
|----------|----|---|----------|---|
| 1 | | changes colour / shows end point ✓ at the end point / when neutralisation happens / when enough NaOH has been added ✓ | 2 | |
| | | Total | 2 | |
| 2 | i | H+ ✓ | 1 | |
| | ii | idea that strong acid has a lower pH than a weak acid / gives values for both with strong acid below weak acid ✓ both are below 7 / gives both pH values below 7 ✓ | 2 | |
| | | Total | 3 | |
| 3 | a | acids have pH below 7; alkalis have pH above 7; | 2 | If neither mark awarded: allow 1 mark for idea of looking at numbers / number(s) quoted Ignore reference to colours <u>?Examiner's Comments??</u> Answers showed that few candidates can have seen/used a pH meter as most referred to 'colour' and indicator. Some did realise that they would get numbers but did not know the relevant ranges for acids and alkalis. A few tried to link it with the bonding given in the table. |
| | b | sodium hydroxide and/or calcium hydroxide have ionic bonding; ammonia has covalent bonding; | 2 | If neither mark awarded: allow 1 mark for idea of both ionic and covalently bonded alkalis <u>Examiner's Comments??</u> More candidates were able to use the information in the table to explain that alkalis can be covalent or ionic although some did not use examples from the table as requested. |

Mark Scheme

| Question | | Answer/Indicative content | Marks | Guidance |
|----------|---|--|-------|---|
| | c | <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">solid sodium hydroxide</div> <div style="margin-left: 20px;">→</div> <div style="border: 1px solid black; padding: 2px;">(g)</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">hydrogen chloride gas</div> <div style="margin-left: 20px;">→</div> <div style="border: 1px solid black; padding: 2px;">(l)</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">liquid ethanoic acid</div> <div style="margin-left: 20px;">→</div> <div style="border: 1px solid black; padding: 2px;">(s)</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">solution dissolved in water</div> <div style="margin-left: 20px;">→</div> <div style="border: 1px solid black; padding: 2px;">(aq)</div> </div> </div> | 2 | All correct (2) 2 or 3 correct (1) Examiner's Comments Most were able to link at least two substances with the correct state symbol with solid and gas most frequently linked successfully. Some seemed to think that (s) meant solution. |
| | | Total | 6 | |

Mark Scheme

| Question | | Answer/Indicative content | Marks | Guidance |
|----------|---|---|----------|--|
| 4 | a | copper oxide (1) copper carbonate (1) | 2 | Examiner's Comments This proved a challenging question for many; it was not very well answered on the whole. Often the correct copper compounds were selected and placed in the wrong boxes. |
| | b | <p>copper compound</p> <p>copper chloride</p> <p>copper nitrate</p> <p>copper citrate</p> <p>acid that can be used to make it</p> <p>citric acid</p> <p>ethanoic acid</p> <p>hydrochloric acid</p> <p>nitric acid</p> | 2 | <p>all correct = 2 1 or 2 correct = 1</p> <p>Examiner's Comments</p> <p>Candidates performed really well on this question; the vast majority achieved both marks for matching the correct salt with its acid.</p> |
| | c | <p>acid</p> <p>sulfuric acid (liquid)</p> <p>citric acid (solid)</p> <p>state symbol</p> <p>(s)</p> <p>(g)</p> <p>(aq)</p> <p>(l)</p> | 1 | <p>Examiner's Comments</p> <p>Candidates also performed really well on this question; the vast majority achieved both marks for selecting the correct state symbols.</p> |
| | | Total | 5 | |
| 5 | | calcium carbonate (1) water (1) CO ₂ (1) | 3 | Examiner's Comments There were many good responses from candidates for all or part of this question. The best responses were those where candidates had written clear formulae with no mistakes in the size or position of the numbers. Mistakes were most often seen with numbers for carbon dioxide that were not subscript, or the oxygen symbol was too small. |
| | | Total | 3 | |

Mark Scheme

| Question | | Answer/Indicative content | Marks | Guidance |
|----------|---|-----------------------------|----------|---|
| 6 | a | box 2 and box 4 (need both) | 1 | <p><u>Examiner's Comments</u></p> <p>Most candidates correctly identified a pH meter as a method for measuring acidity with many also correctly choosing Universal Indicator. Some chose a measuring cylinder instead of the Universal Indicator and others only made one selection even though they were asked for two.</p> |
| | b | 7 | 1 | <p><u>Examiner's Comments</u></p> <p>Most knew that 7 is the neutral pH. More chose values of less than 7, than values greater than 7.</p> |
| | c | box 1; (1) | 1 | <p><u>Examiner's Comments</u></p> <p>Many responses showed an understanding that an increase in temperature was caused by a release of energy from the reaction. Some thought that this was because the reaction was endothermic or due to the higher rate when temperature increases..</p> |
| | | Total | 3 | |
| 7 | | zinc chloride | 1 | <p>Allow ZnCl₂ Ignore incorrect formula if name is correct.</p> <p>Allow zinc chloride and hydrogen (1) Do not allow if other incorrect additional products are named.</p> <p>Examiner's Comments</p> <p>Some candidates successfully chose zinc chloride as the product of the reaction between zinc and hydrochloric acid. Common incorrect choices included zinc hydroxide and various sodium salts.</p> |
| | | Total | 1 | |