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Examiners' Report
June 2025

GCSE Chemistry 1CH0 2F

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June 2025

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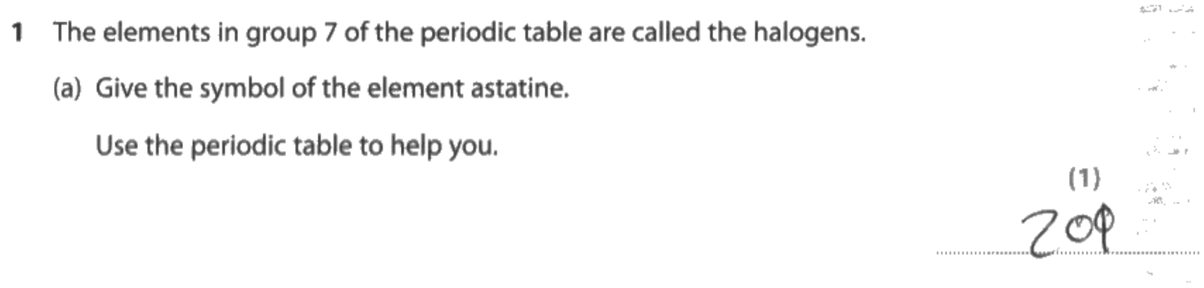
Introduction

This is the second of two papers for Foundation Tier GCSE Chemistry. Six of the ten questions form one of the Combined Science papers. Two of the later questions in the paper also appear in Higher Tier Combined Science, and these and a further question appear in Higher Tier GCSE Chemistry. Candidates that did well this series were familiar with the practical aspects of the qualification and could apply their understanding to a range of practical contexts, they were able to interpret data in different forms and make predictions. More able candidates could recall results of tests for different substances and explain observations in terms of the chemistry that is taking place. They were able to substitute values in equations and evaluate them correctly, converting units where necessary. Candidates were able to recall key ideas and use them to explain their answers carefully, using key scientific vocabulary accurately.

Question 1(a)

Question 1 on the paper focused on the group 7 of the periodic table, the Halogens. Q01(a) asked candidates to give the symbol of the element astatine and told that they could use the periodic table to help. It was pleasing to see that the majority of candidates were able to find the element and give the symbol correctly to gain the mark.



1 The elements in group 7 of the periodic table are called the halogens.

(a) Give the symbol of the element astatine.

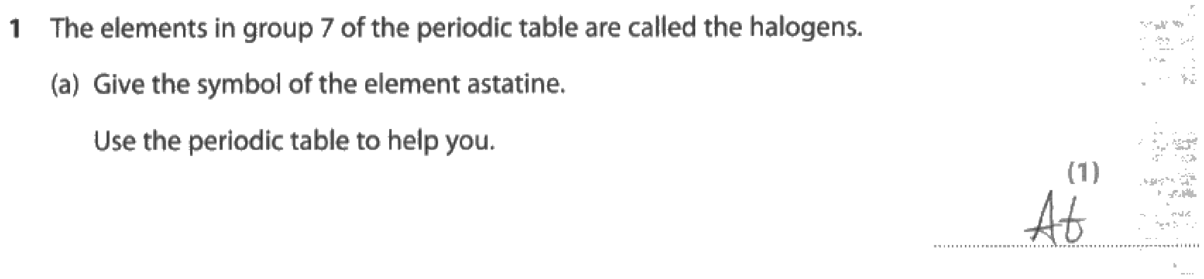
Use the periodic table to help you.

(1)

209

Examiner Comments

This response scored zero marks. Where candidates did not score it was often because they did not read the question carefully and gave the atomic mass or number of astatine or gave the symbol of another element altogether as in this example.



1 The elements in group 7 of the periodic table are called the halogens.

(a) Give the symbol of the element astatine.

Use the periodic table to help you.

(1)

At

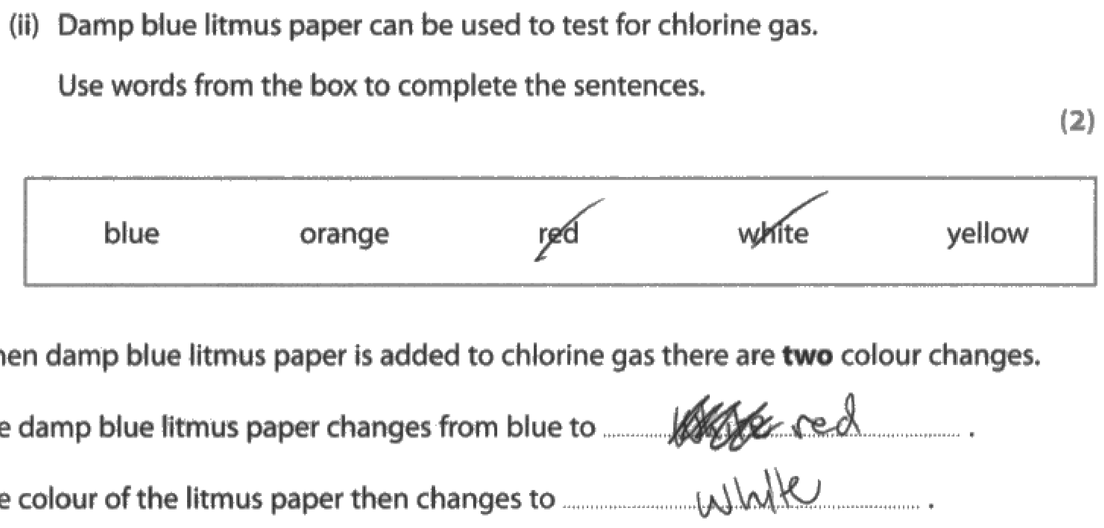
Examiner Comments

This example gained the mark.

Question 1(b)(ii)

Part (ii) of question 1 asked candidates about the test for chlorine gas. Candidates were given a list of colours and asked to give the colour that damp blue litmus changes to initially and then the final colour of the litmus paper using the colours from the box.

A good proportion were able to access the question to score both marks for knowing that chlorine initially shows red and then bleaches white.



(ii) Damp blue litmus paper can be used to test for chlorine gas.

Use words from the box to complete the sentences.

(2)

blue	orange	red	white	yellow

When damp blue litmus paper is added to chlorine gas there are **two** colour changes.

The damp blue litmus paper changes from blue to ~~[illegible]~~ red .

The colour of the litmus paper then changes to white .

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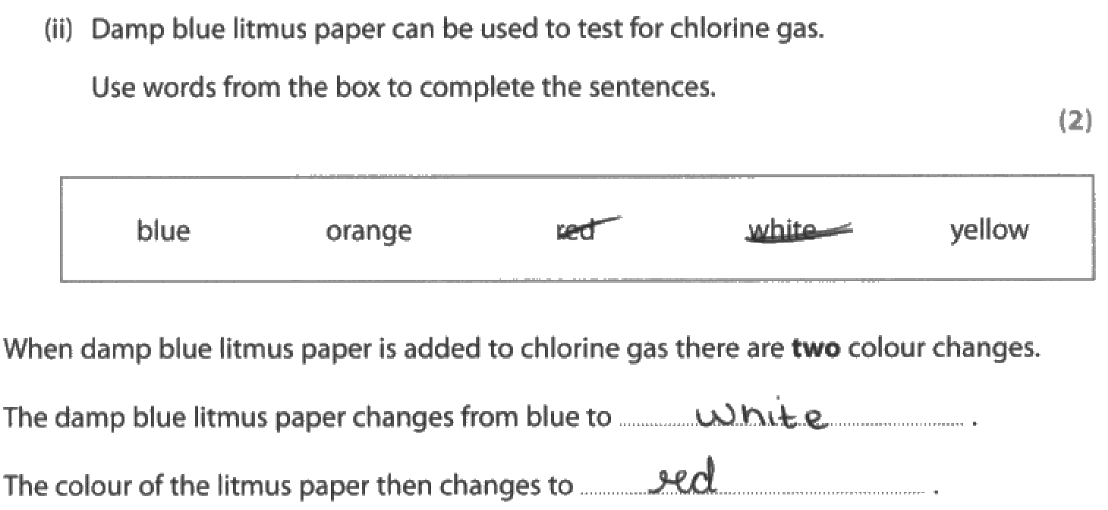
Examiner Comments

This example shows a good answer which scored both marks.



(ii) Damp blue litmus paper can be used to test for chlorine gas.

Use words from the box to complete the sentences.

(2)

blue	orange	~~red~~	~~white~~	yellow

When damp blue litmus paper is added to chlorine gas there are **two** colour changes.

The damp blue litmus paper changes from blue to white .

The colour of the litmus paper then changes to red .

ResultsPlus
Examiner Comments

In some cases, candidates knew that the colours were red and white but got them in the wrong order and so gained just one mark as in this example.

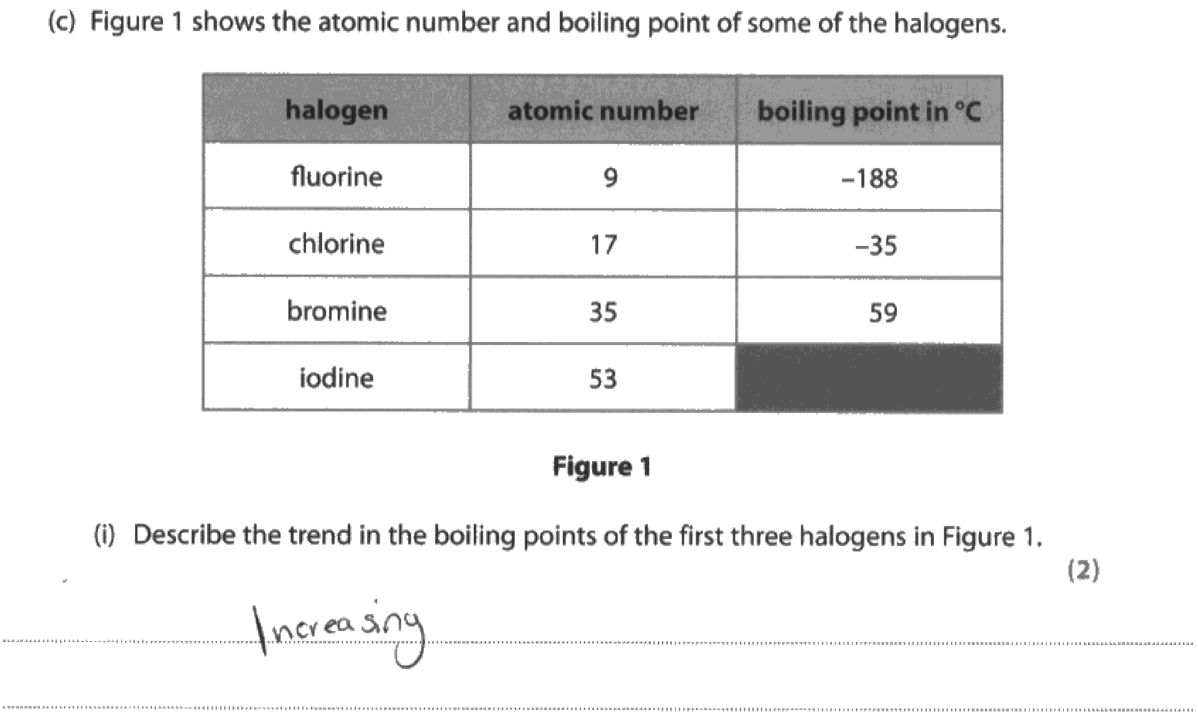
Question 1(c)(i)

Q01(c) showed candidates a table of the atomic numbers of fluorine to iodine and the boiling points of fluorine to bromine.

Part (i) asked candidates to describe the trend in the boiling points of the first three halogens in the table.

A large proportion of candidates were able to score with the majority scoring both marks for giving the full trend.

In some cases, candidates scored just one mark as they simply stated that the boiling points increase but they did not say in which direction they increased.



(c) Figure 1 shows the atomic number and boiling point of some of the halogens.

halogen	**atomic number**	**boiling point in °C**
fluorine	9	−188
chlorine	17	−35
bromine	35	59
iodine	53	

Figure 1

(i) Describe the trend in the boiling points of the first three halogens in Figure 1.

(2)

Increasing

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Examiner Comments

This example scored one mark, the question asked about the trend in boiling points so if they just stated that they increased then this gained the mark.

(c) Figure 1 shows the atomic number and boiling point of some of the halogens.

halogen	atomic number	boiling point in °C
fluorine	9	−188
chlorine	17	−35
bromine	35	59
iodine	53	

Figure 1

(i) Describe the trend in the boiling points of the first three halogens in Figure 1.

(2)

the boiling point increases for each of the three halogens

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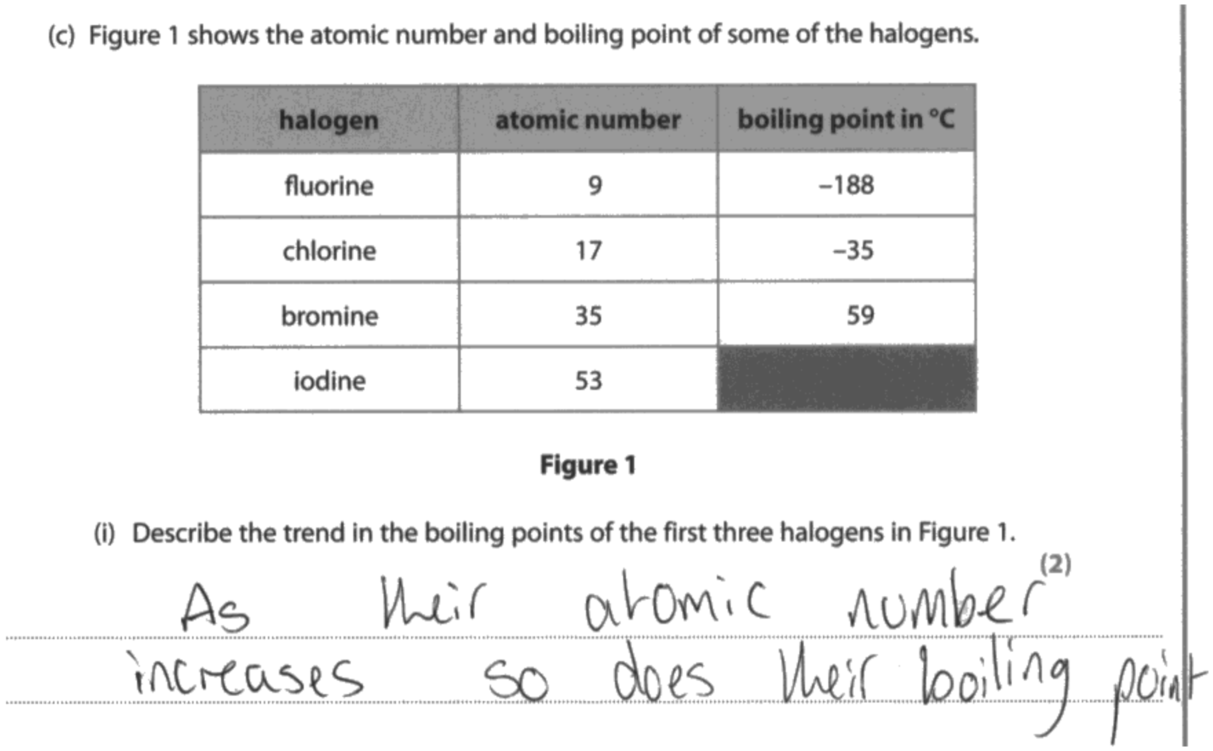
Examiner Comments

This example scored one mark. They state that the boiling points increase for each of the halogens but do not say in which direction, so just scored one mark.



(c) Figure 1 shows the atomic number and boiling point of some of the halogens.

halogen	atomic number	boiling point in °C
fluorine	9	−188
chlorine	17	−35
bromine	35	59
iodine	53	▨

Figure 1

(i) Describe the trend in the boiling points of the first three halogens in Figure 1.

(2)

As their atomic number increases so does their boiling point

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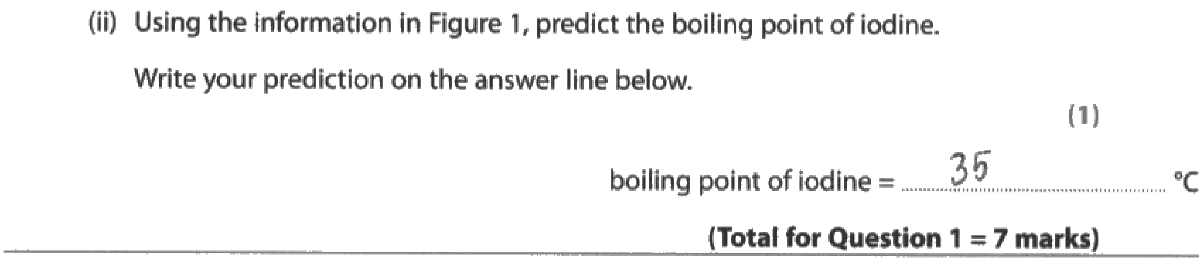
Examiner Comments

This example scored two marks for stating that the boiling points increase as the atomic number increases.

Question 1(c)(ii)

Q01(c)(ii) asked learners to predict the boiling point of iodine. Many candidates tried to calculate the value by calculating the difference between fluorine and chlorine and chlorine and bromine and then using that to predict the value for iodine. Any number above 59 was allowed and the vast majority of candidates scored the mark.



(ii) Using the information in Figure 1, predict the boiling point of iodine.

Write your prediction on the answer line below.

(1)

boiling point of iodine = 35 °C

(Total for Question 1 = 7 marks)

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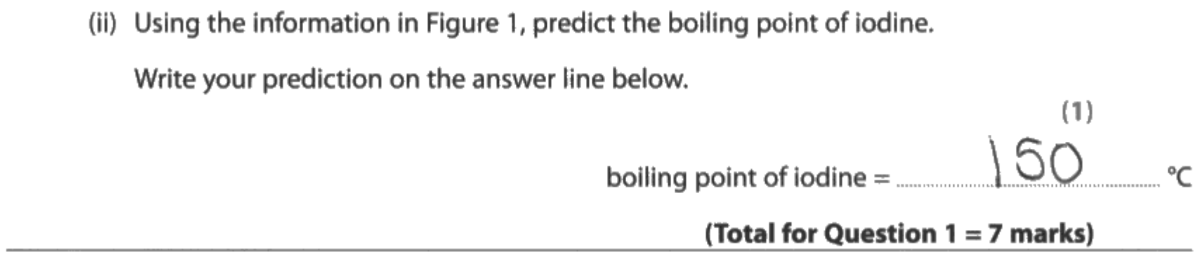
Examiner Comments

As the number is less than that of bromine, this example did not score.



(ii) Using the information in Figure 1, predict the boiling point of iodine.

Write your prediction on the answer line below.

(1)

boiling point of iodine = 150 °C

(Total for Question 1 = 7 marks)

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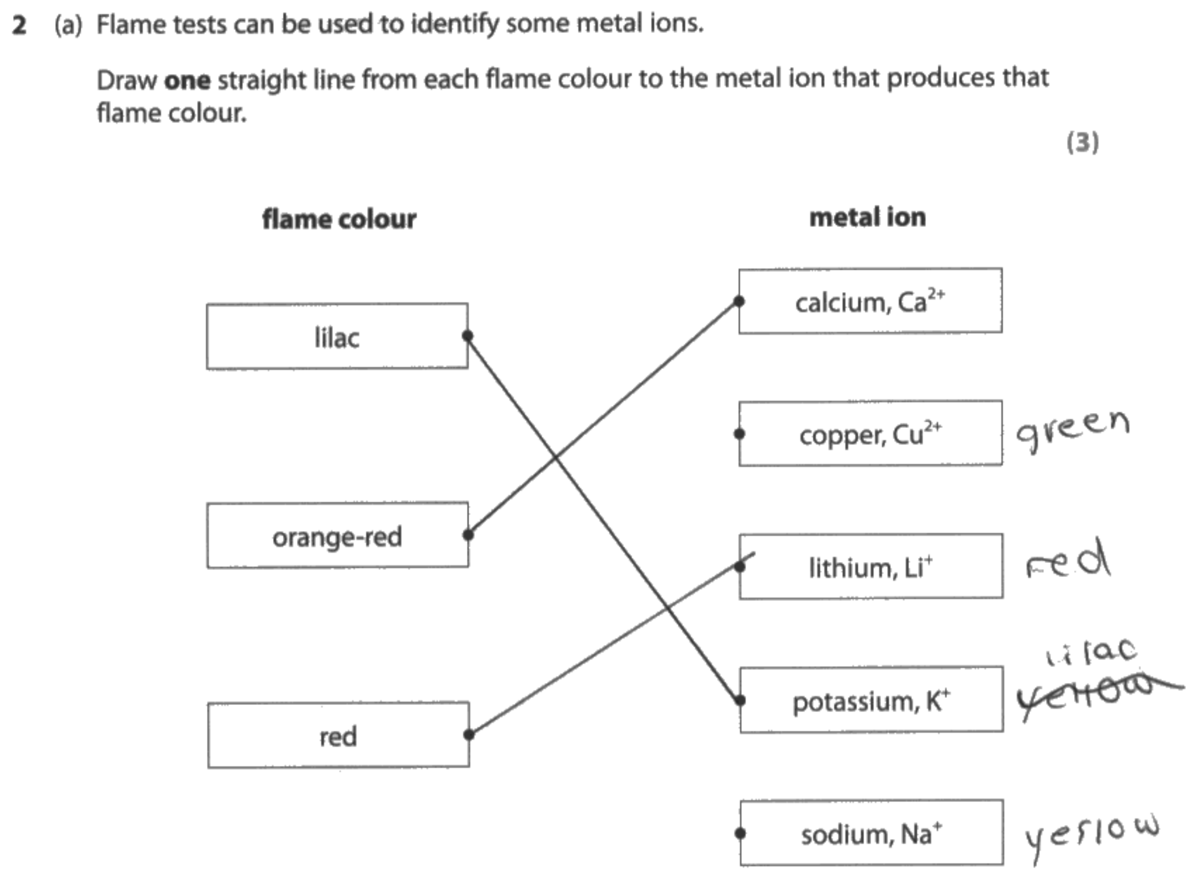
Examiner Comments

This example scored the mark.

Question 2(a)

Q02(a) asked candidates about the flame test results for three positive metal ions. They were given three flame colours and asked to link these colours to the metal ion that produces that flame colour. Candidates found this challenging with only the more able scoring the full three marks for correctly identifying all three metal ions.

Where candidates did not score full marks, potassium seemed to be the most recognised flame colour.



2 (a) Flame tests can be used to identify some metal ions.

Draw **one** straight line from each flame colour to the metal ion that produces that flame colour.

(3)

flame colour

lilac

orange-red

red

metal ion

calcium, Ca^{2+}

copper, Cu^{2+} green

lithium, Li^{+} red

potassium, K^{+} lilac ~~yellow~~

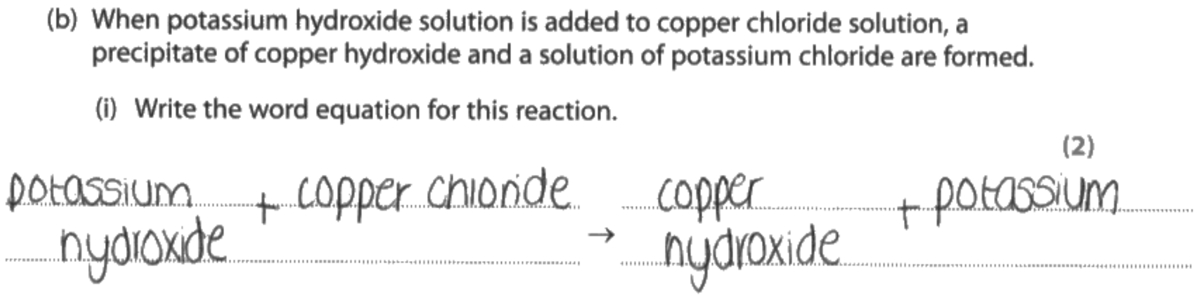
sodium, Na^{+} yellow

ResultsPlus
Examiner Comments

This example shows a good answer that scored all three marks.

Question 2(b)(i)

In part (b), candidates where given the reactants and products of the reaction between potassium hydroxide solution and copper chloride solution. They were then asked to write the word equation for the reaction. A good proportion of candidates scored both marks for correctly giving the reactants to the left of the arrow and products to the right.



(b) When potassium hydroxide solution is added to copper chloride solution, a precipitate of copper hydroxide and a solution of potassium chloride are formed.

(i) Write the word equation for this reaction.

(2)

potassium hydroxide + copper chloride → copper hydroxide + potassium

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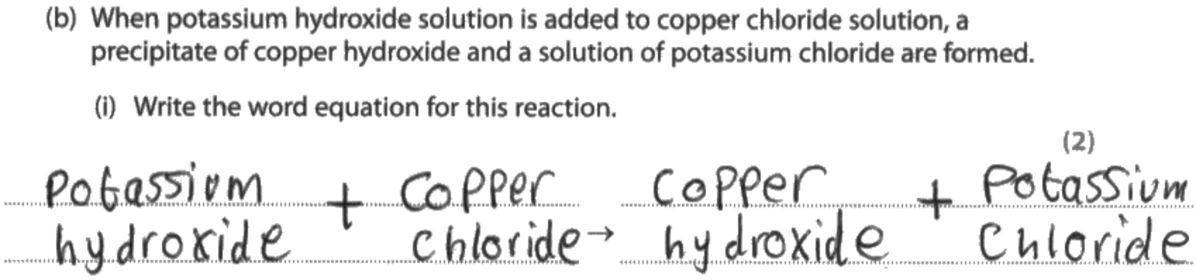
Examiner Comments

In this example, the candidate has given the correct reactants on the left hand side of the arrow to gain one mark. However, as they have given potassium rather than potassium chloride as a product they did not gain the second mark.



(b) When potassium hydroxide solution is added to copper chloride solution, a precipitate of copper hydroxide and a solution of potassium chloride are formed.

(i) Write the word equation for this reaction.

(2)

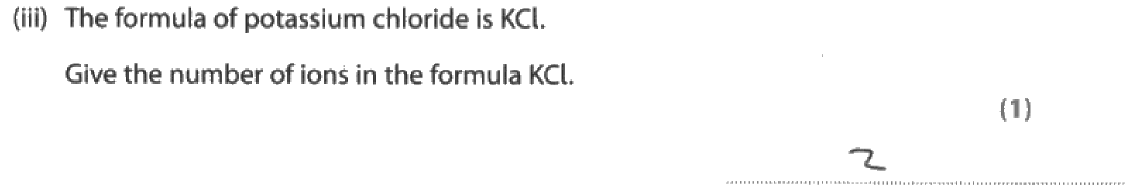
Potassium hydroxide + Copper chloride → copper hydroxide + Potassium Chloride

ResultsPlus
Examiner Comments

This example shows a good answer that scored both marks.

Question 2(b)(iii)

In Q02(b)(iii), candidates were given the formula of potassium chloride and asked to give the number of ions in the formula. Candidates found this challenging with only the more able knowing that the formula contains two ions.



(iii) The formula of potassium chloride is KCl.

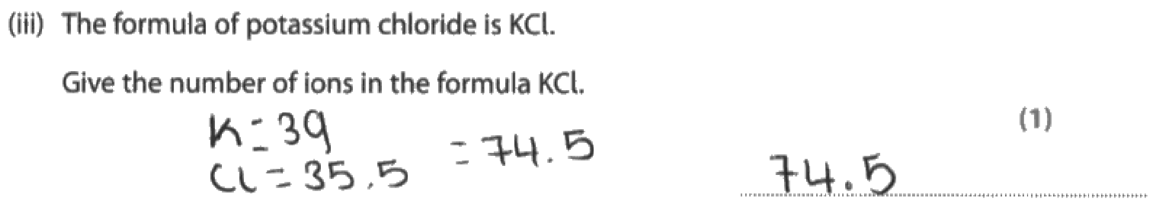
Give the number of ions in the formula KCl.

(1)

2

ResultsPlus
Examiner Comments

This example scored one mark.



(iii) The formula of potassium chloride is KCl.

Give the number of ions in the formula KCl.

(1)

K = 39
Cl = 35.5 = 74.5

74.5

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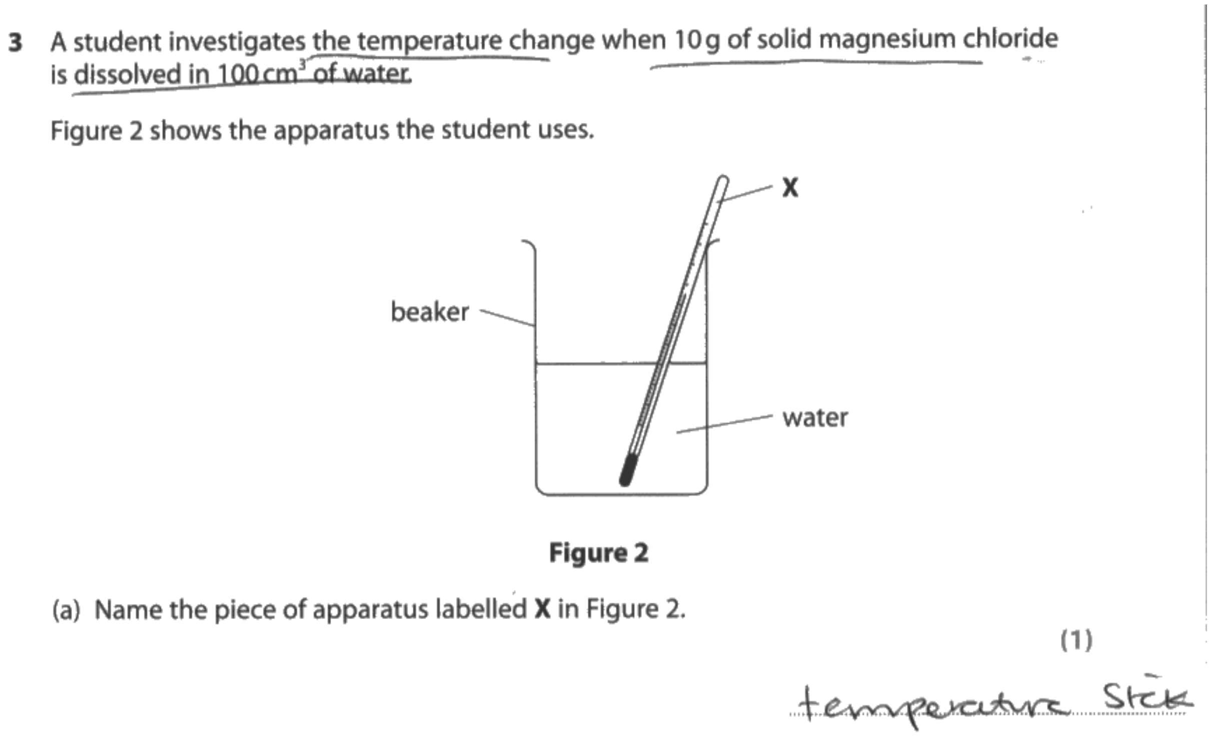
Examiner Comments

Where candidates did not score, it was often as they were not clear what was meant by the question, with many attempting to give the relative formula mass of the compound, rather than the number of ions in the formula as in this example which did not sore.

Question 3(a)

Question 3 started by showing candidates the apparatus that a student uses to investigate the temperature change when magnesium chloride is dissolved in water. Q03(a) asked learners to name the piece of apparatus labelled X in the diagram. Candidates performed well in the question with the vast majority knowing that the piece of apparatus was a thermometer.



3 A student investigates the temperature change when 10 g of solid magnesium chloride is dissolved in 100 cm^3 of water.

Figure 2 shows the apparatus the student uses.

Figure 2

(a) Name the piece of apparatus labelled **X** in Figure 2.

(1)

temperature Stick

ResultsPlus
Examiner Comments

Where candidates did not score, it was often clear that they knew that the thermometer was used for but were not able to name it. This example scored zero marks as temperature stick was not an allowable alternative to thermometer.

3 A student investigates the temperature change when 10 g of solid magnesium chloride is dissolved in 100 cm^3 of water.

Figure 2 shows the apparatus the student uses.

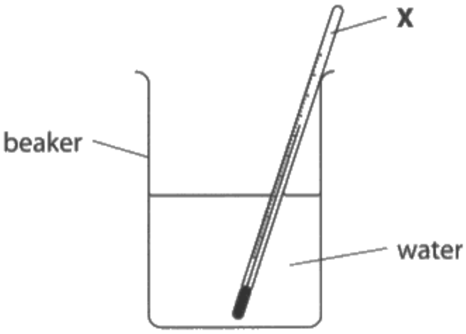


Figure 2

(a) Name the piece of apparatus labelled **X** in Figure 2.

(1)

Thermoniter

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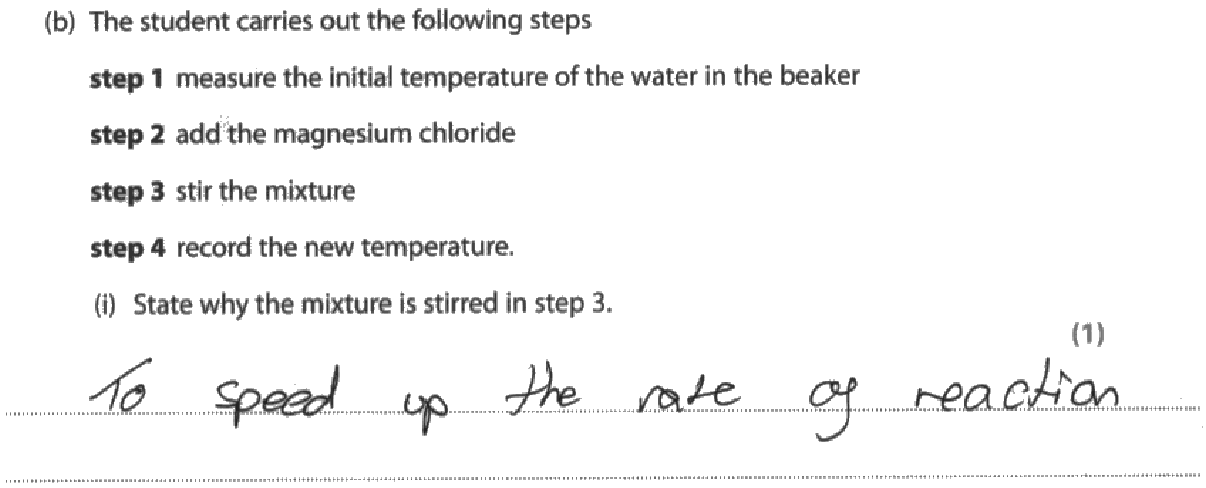
Examiner Comments

Although the spelling is not perfect, it is clear what the candidate means and the answer gained the mark.

Question 3(b)(i)

Part (b) gave candidates the method that the student used to carry out the investigation. In Q03(b)(i) candidates were then asked to state why the mixture was stirred in step 3. In general, candidates showed a good understanding that the mixture was stirred to make the magnesium dissolve. Other allowable answers commonly seen were to increase the rate of reaction, to mix the magnesium chloride or to make it react, all of which scored the mark. Some just stated to make it more accurate or more reliable, this was ignored and did not score.



(b) The student carries out the following steps

step 1 measure the initial temperature of the water in the beaker

step 2 add the magnesium chloride

step 3 stir the mixture

step 4 record the new temperature.

(i) State why the mixture is stirred in step 3.

(1)

To speed up the rate of reaction

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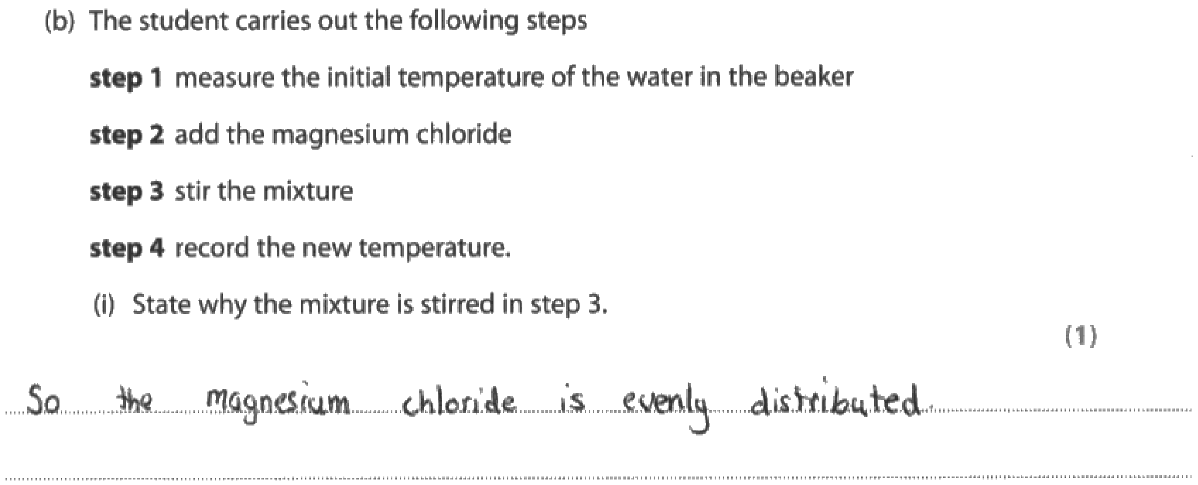
Examiner Comments

To speed up the reaction scored the mark.



(b) The student carries out the following steps

step 1 measure the initial temperature of the water in the beaker

step 2 add the magnesium chloride

step 3 stir the mixture

step 4 record the new temperature.

(i) State why the mixture is stirred in step 3.

(1)

So the magnesium chloride is evenly distributed.

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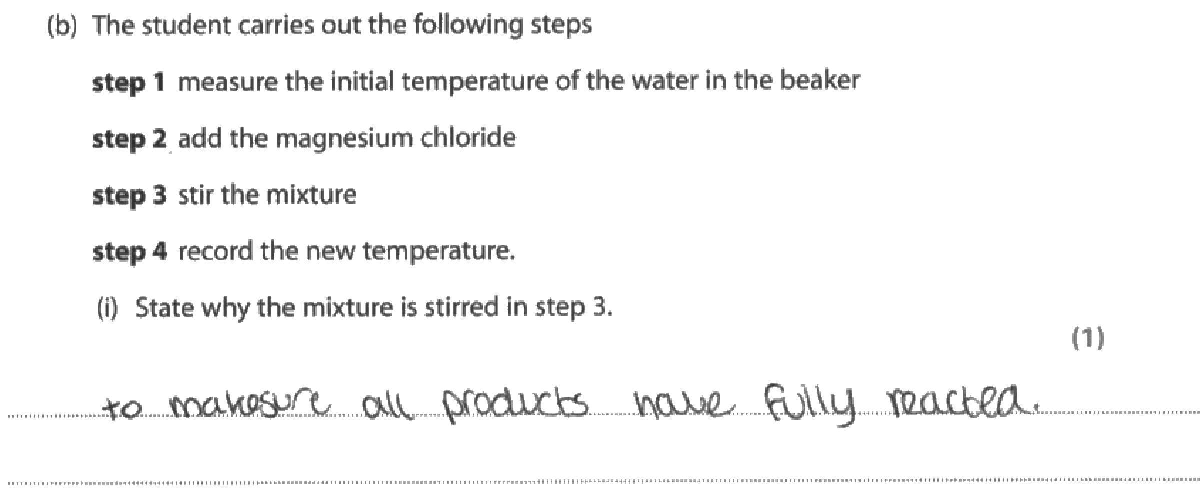
To evenly distribute the magnesium was an allowable answer which scored the mark.



(b) The student carries out the following steps

step 1 measure the initial temperature of the water in the beaker

step 2 add the magnesium chloride

step 3 stir the mixture

step 4 record the new temperature.

(i) State why the mixture is stirred in step 3.

(1)

to makesure all products have fully reacted.

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Examiner Comments

This example scored no marks. The candidate has not gained the mark as they have stated that the mixture is stirred so that the products react. This is incorrect and so does not score. If they had stated to make the reactants or it react this would have scored.

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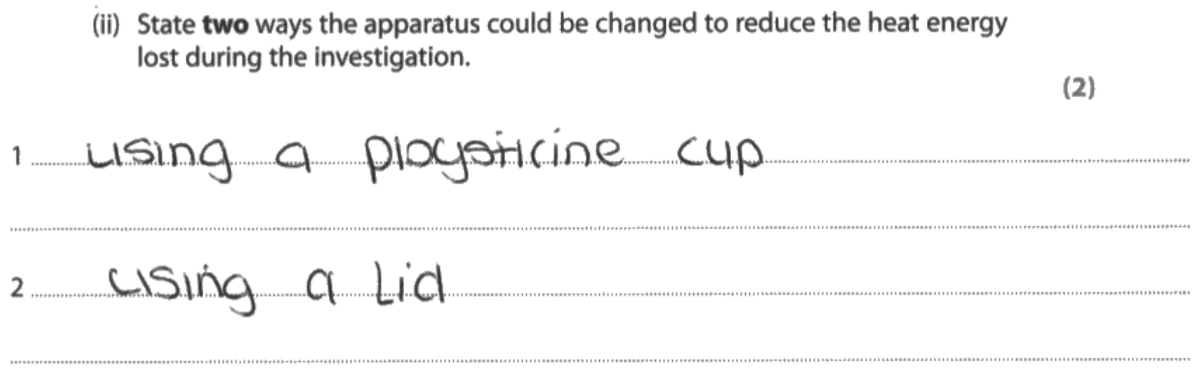
Examiner Tip

Take care with the use of key terms such as reactant and product as using the wrong term can negate an answer that would otherwise have gained a mark.

Question 3(b)(ii)

Q03(b)(ii) asked candidates to state two ways that the apparatus could be changed to reduce the heat energy lost during the investigation. A good proportion of learners were able to score both marks on the question for stating that the beaker should be insulated and that a lid should be added to the beaker. Some stated that a polystyrene cup should be used instead of a beaker, and this scored.

In some cases learners did not understand or misread the question and stated that the beaker should be heated with a Bunsen burner or put in a water bath, this did not score and, if this was given with two other correct answers also, a maximum of one mark could be scored for the question.



(ii) State **two** ways the apparatus could be changed to reduce the heat energy lost during the investigation.

(2)

1 using a ploysticine cup

2 using a Lid

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Examiner Comments

This example shows a good response which gained both marks.

(ii) State **two** ways the apparatus could be changed to reduce the heat energy lost during the investigation.

(2)

1 add a lid

2

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Examiner Comments

This example gained one mark.

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Examiner Tip

Always remember that when two sets of lines are given in this manner, two ideas are required to gain full marks.

(ii) State **two** ways the apparatus could be changed to reduce the heat energy lost during the investigation.

(2)

1 cover beaker

2 Place foil around the beaker

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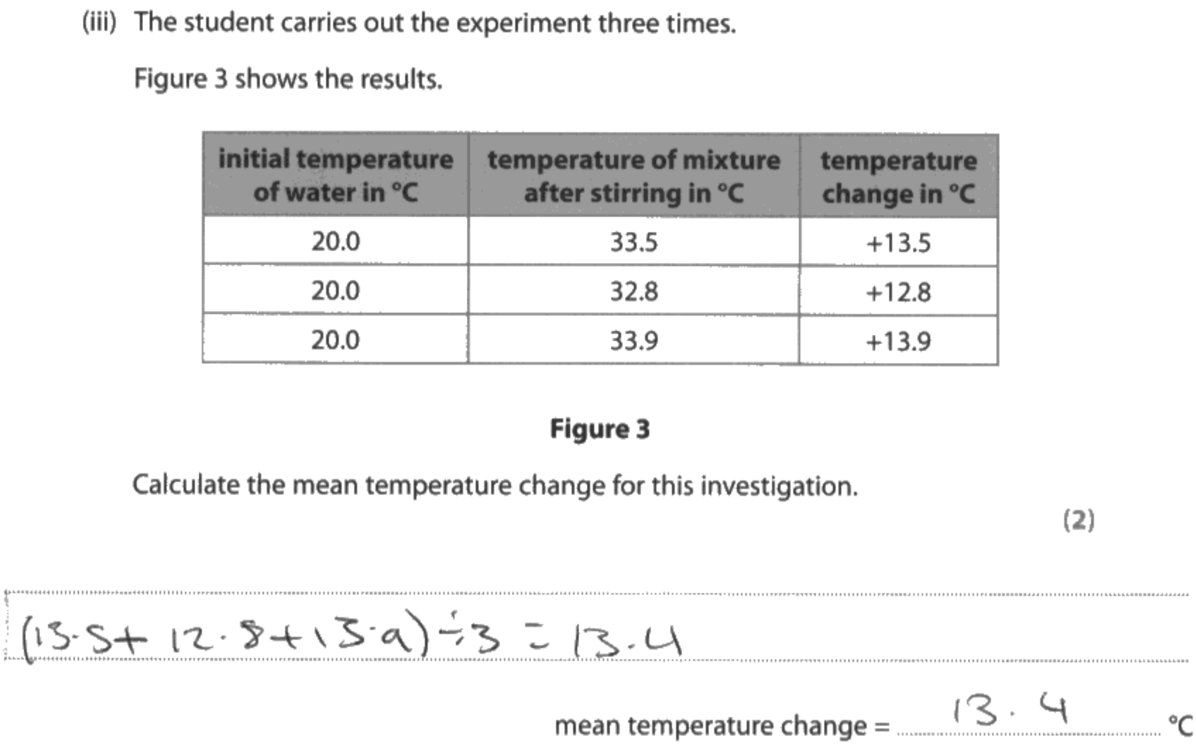
Examiner Comments

This example scored one mark. Cover the beaker was not considered sufficient for adding a lid or for the idea of insulating the beaker. However, place foil around the beaker did score the first marking point for giving a relevant wrapping for the beaker.

Question 3(b)(iii)

Q03(b)(iii) gave candidates the results of the student’s investigation into temperature change and were asked to calculate the mean temperature change for the investigation. It was pleasing to see that the majority of candidates were able to score the full two marks for being able to calculate the mean temperature change by adding the three values and dividing by three. Some felt that the second reading was an anomaly and so disregarded it in their mean coming to an answer of 13.7, this was allowed and both marks still awarded but only if working was shown. This highlights the importance of showing working in calculation questions.



(iii) The student carries out the experiment three times.

Figure 3 shows the results.

initial temperature of water in °C	temperature of mixture after stirring in °C	temperature change in °C
20.0	33.5	+13.5
20.0	32.8	+12.8
20.0	33.9	+13.9

Figure 3

Calculate the mean temperature change for this investigation.

(2)

$(13.5 + 12.8 + 13.9) \div 3 = 13.4$

mean temperature change = 13.4 °C

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Examiner Comments

This example scored two marks. Other candidates lost a mark as, although they had the correct working, their use of the calculator meant that the answer did not come out correctly, if working was shown the first mark could still be awarded for the method even if the evaluation was incorrect.

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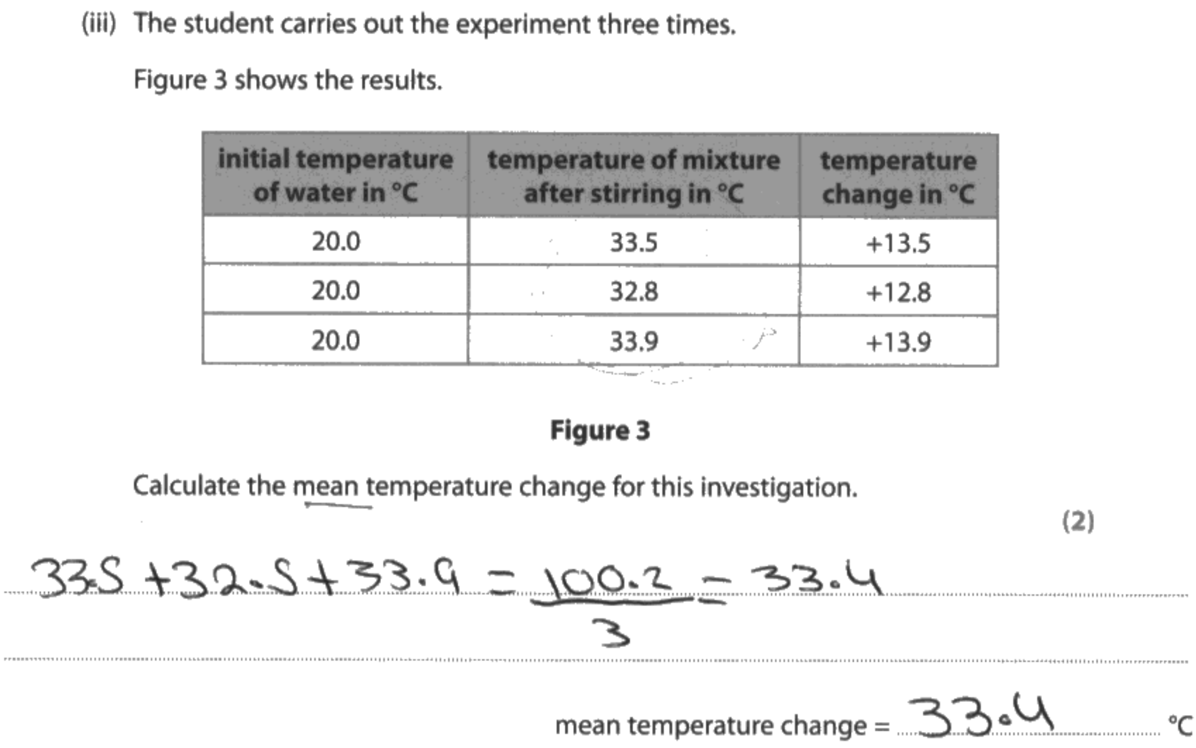
Examiner Tip

Always remember to show your working in calculation questions even if you think that the calculation is an easy one.



(iii) The student carries out the experiment three times.

Figure 3 shows the results.

initial temperature of water in °C	temperature of mixture after stirring in °C	temperature change in °C
20.0	33.5	+13.5
20.0	32.8	+12.8
20.0	33.9	+13.9

Figure 3

Calculate the mean temperature change for this investigation.

(2)

$33.5 + 32.5 + 33.9 = \frac{100.2}{3} = 33.4$

mean temperature change = 33.4 °C

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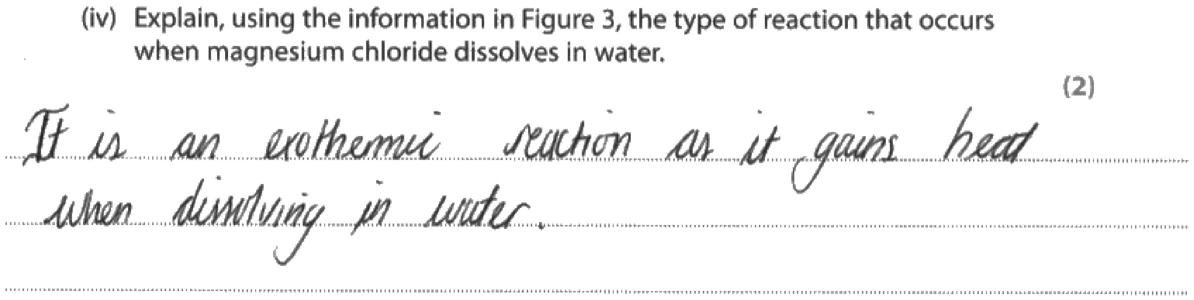
Examiner Comments

In some cases, candidates did not read the question carefully and calculated the mean of the temperature of mixing after stirring giving an answer of 33.4. These candidates gained one mark.

Question 3(b)(iv)

Q03(b)(iv) asked candidates to explain what type of reaction occurs when magnesium chloride dissolves in water. Candidates found this quite challenging with around half not scoring. Many candidates thought that the reaction was endothermic as it had gained heat from the surroundings, this gained no credit.

Those that did score, often did so for understanding from the data that heat had been released or that it got hotter or warmer to gain the second marking point.



(iv) Explain, using the information in Figure 3, the type of reaction that occurs when magnesium chloride dissolves in water.

(2)

It is an exothermic reaction as it gains heat when dissolving in water.

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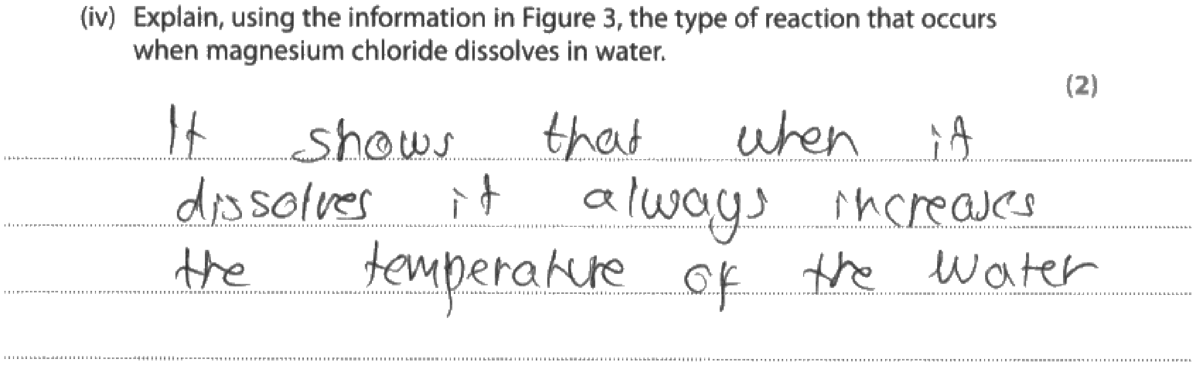
Examiner Comments

This example scored one mark. The candidate knows that it is an exothermic reaction but explains that heat is gained which is incorrect and so does not gain the second mark.



(iv) Explain, using the information in Figure 3, the type of reaction that occurs when magnesium chloride dissolves in water.

(2)

It shows that when it dissolves it always increases the temperature of the water

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This second example also gained one mark. There is no reference to exothermic for the first marking point but as they explain that the temperature of the water increases the second mark point was awarded as the marking points were awarded independently.

(iv) Explain, using the information in Figure 3, the type of reaction that occurs when magnesium chloride dissolves in water.

(2)

exothermic reaction as the solution has given out heat energy making the Solution hotter causing tempeture rise

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This last example shows a good response which gained both marks.

Question 4(a)(i)

Question 4 focused on the structure of the three molecules A, B and C which were shown in Figure 4. In Q04(a)(i) they were asked which of the compounds is an alkene. In general, this was well answered with around half of the candidates scoring both marks for explaining that molecule B was an alkene due to the presence of the double bond.

4 Figure 4 shows the structure of molecules of three compounds, **A**, **B** and **C**.

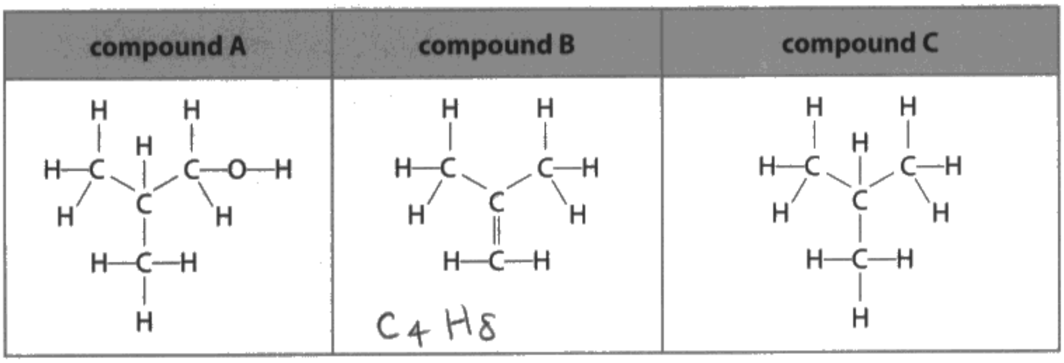

Figure 4

(a) (i) Explain which compound, **A**, **B** or **C**, is an alkene.

(2)

compound A → has OH, the functional group of alkene.

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Examiner Comments

Where candidates did not score, it appeared that they may not have come across the word alkene before and were simply looking for differences between the molecules. This led many to believe that molecule A was the alkene because it had an 'O' or the functional group OH, as in this example which scored zero marks.

4 Figure 4 shows the structure of molecules of three compounds, **A**, **B** and **C**.

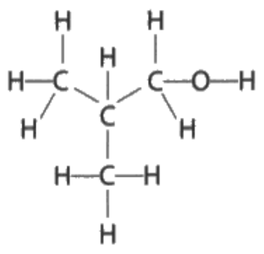
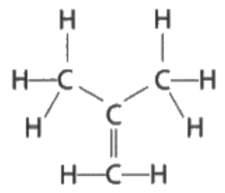
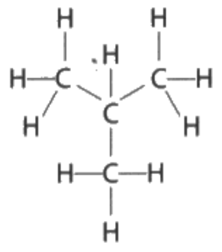
compound A	compound B	compound C
		

Figure 4

(a) (i) Explain which compound, **A**, **B** or **C**, is an alkene.

(2)

B ,

ResultsPlus
Examiner Comments

This example scored one mark. The candidate has identified the molecule correctly as molecule B, but has not given a reason as to why this is.

ResultsPlus
Examiner Tip

When asked to explain, it requires a justification/exemplification of a point. The answer must contain some element of reasoning or justification to gain the mark.

4 Figure 4 shows the structure of molecules of three compounds, **A**, **B** and **C**.

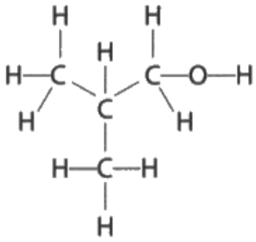
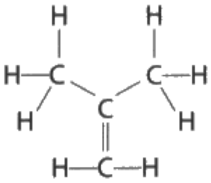
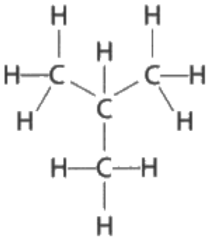
compound A	**compound B**	**compound C**
		

Figure 4

(a) (i) Explain which compound, **A**, **B** or **C**, is an alkene.

(2)

Compound B is an alkene since it has a double bond.

ResultsPlus
Examiner Comments

This last example shows a good answer that scored both marks.

Question 4(b)(i)

Part (b) looked at the test to distinguish between compounds B and C. The label on the solution used was shown in Figure 5. Q04(b)(i) asked candidates to state the meaning of the hazard symbol shown. Candidates found this challenging with only the more able recognising the hazard symbol as meaning hazardous. Those that scored, often did so for stating that it meant harmful which was also accepted.

(b) The test to distinguish between compounds **B** and **C** involves shaking separate samples of each compound with an orange solution.

The label on the orange solution is shown in Figure 5.

Figure 5

(i) State the meaning of the hazard symbol shown.

(1)

Toxic

ResultsPlus
Examiner Comments

Other hazards given such as toxic or corrosive were rejected. This example scored no marks.

(b) The test to distinguish between compounds **B** and **C** involves shaking separate samples of each compound with an orange solution.

The label on the orange solution is shown in Figure 5.

Figure 5

(i) State the meaning of the hazard symbol shown.

(1)

~~Dang~~ Dangerous

ResultsPlus
Examiner Comments

Many candidates lost the mark as they stated that the symbol meant dangerous or caution. This gained no marks.

(b) The test to distinguish between compounds **B** and **C** involves shaking separate samples of each compound with an orange solution.

The label on the orange solution is shown in Figure 5.

Figure 5

(i) State the meaning of the hazard symbol shown.

(1)

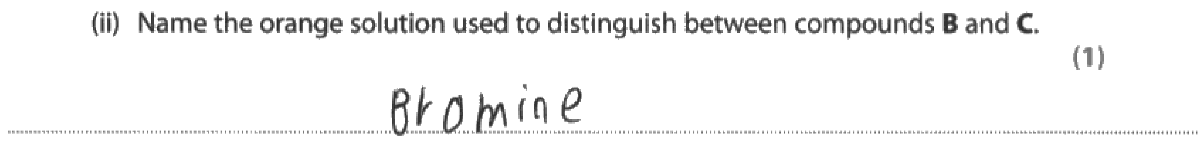
harmful hazardous

ResultsPlus
Examiner Comments

This example gained the mark. Either harmful or hazardous would have scored.

Question 4(b)(ii)

Q04(b)(ii) asked candidates to name the substance used. Again, candidates found this challenging with fewer gaining the mark. It was clear that some candidates did not study the Figure, which had the symbol of the orange solution on it, to help inform their answer.



(ii) Name the orange solution used to distinguish between compounds **B** and **C**.

(1)

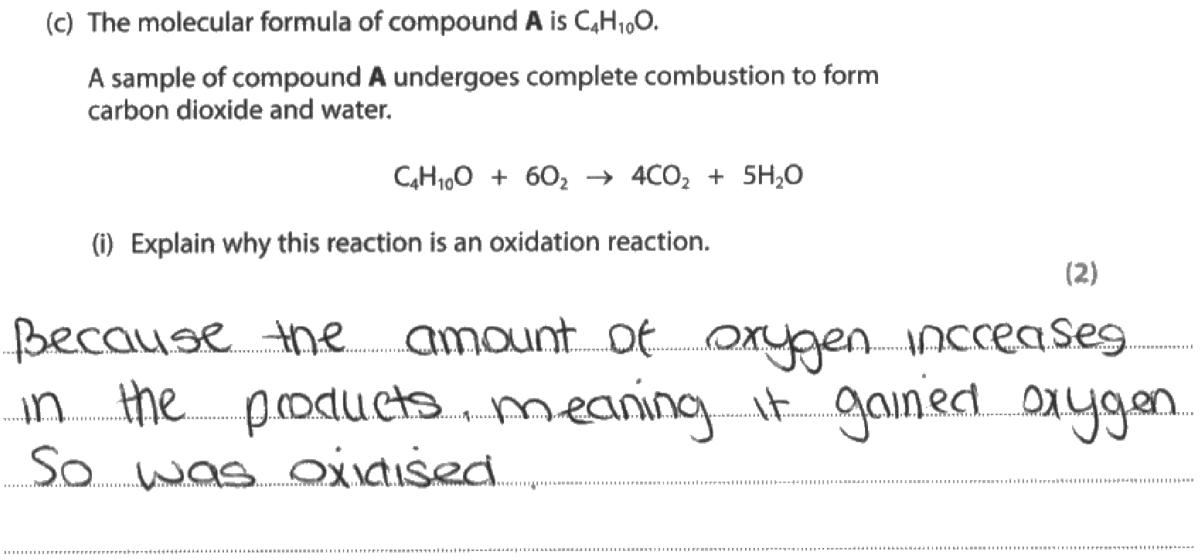
Bromine

ResultsPlus
Examiner Comments

This example gained the mark.

Question 4(c)(i)

Q04(c) focused on molecule A of the three molecules. Candidates are shown the equation for the complete combustion of molecule A and are asked to explain why this is an oxidation reaction. Candidates found this very difficult with the majority not scoring and only the very able scoring two marks. In some cases, when no other marks had been scored, candidates were awarded one mark for stating that oxidation is the loss of electrons.



(c) The molecular formula of compound **A** is $C_4H_{10}O$.

A sample of compound **A** undergoes complete combustion to form carbon dioxide and water.

$$C_4H_{10}O + 6O_2 \rightarrow 4CO_2 + 5H_2O$$

(i) Explain why this reaction is an oxidation reaction.

(2)

Because the amount of oxygen increases in the products, meaning it gained oxygen So was oxidised.

ResultsPlus
Examiner Comments

This example scored one mark for stating that oxygen had been gained.

(c) The molecular formula of compound **A** is $C_4H_{10}O$.

A sample of compound **A** undergoes complete combustion to form carbon dioxide and water.

$$C_4H_{10}O + 6O_2 \rightarrow 4CO_2 + 5H_2O$$

(i) Explain why this reaction is an oxidation reaction.

(2)

-There is a loss of oxygen which means oxidation is occuring.

ResultsPlus
Examiner Comments

A common misconception was using OIL RIG as a mnemonic for remembering oxidation and reduction but then saying oxygen rather than electrons. Therefore, stating that it was an oxidation reaction because oxygen had been lost as in this example which scored no marks.

ResultsPlus
Examiner Tip

OIL RIG is a useful mnemonic, for oxidation is loss of electrons and reduction is gain of electrons, but remember that when using this mnemonic, it is electrons that are lost and gained not oxygen.

(c) The molecular formula of compound **A** is $C_4H_{10}O$.

A sample of compound **A** undergoes complete combustion to form carbon dioxide and water.

$$C_4H_{10}O + 6O_2 \rightarrow 4CO_2 + 5H_2O$$

(i) Explain why this reaction is an oxidation reaction.

(2)

Oxidation is loss of electrons. The Carbon has gained oxygen to make Carbon dioxide which means it has been oxidised

ResultsPlus
Examiner Comments

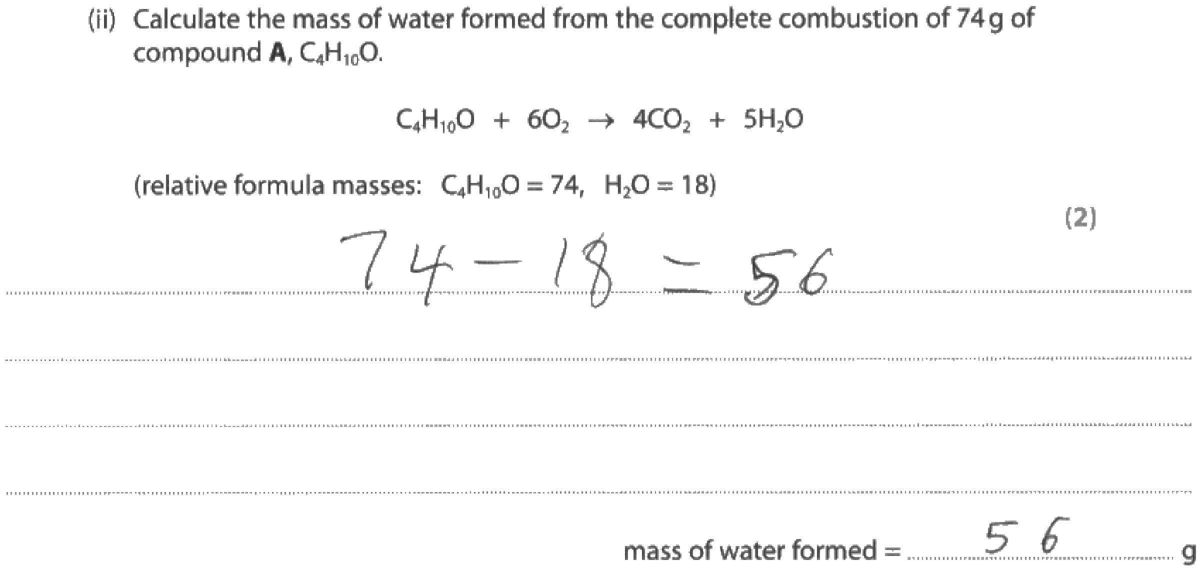
This example shows a good answer that scored both marks.

Question 4(c)(ii)

Q04(c)(ii) asked learners to calculate the mass of water formed from the complete combustion of 74g of compound A. They were given the equation again and the relative formula masses of compound A and of water.

This was well attempted with the more able being able multiply the relative formula mass of water by 5 to give an answer of 90 and gain both marks.

Many candidates lost a mark as they calculated the 90, but then completed an additional step so lost the second mark point.



(ii) Calculate the mass of water formed from the complete combustion of 74 g of compound **A**, $C_4H_{10}O$.

$$C_4H_{10}O + 6O_2 \rightarrow 4CO_2 + 5H_2O$$

(relative formula masses: $C_4H_{10}O = 74$, $H_2O = 18$)

(2)

$74 - 18 = 56$

mass of water formed = 56 g

ResultsPlus
Examiner Comments

This example shows a common incorrect answer seen, which gained no marks.

(ii) Calculate the mass of water formed from the complete combustion of 74 g of compound **A**, $C_4H_{10}O$.

$$C_4H_{10}O + 6O_2 \rightarrow 4CO_2 + 5H_2O$$

(relative formula masses: $C_4H_{10}O = 74$, $H_2O = 18$)

(2)

18×5

mass of water formed = 90 g

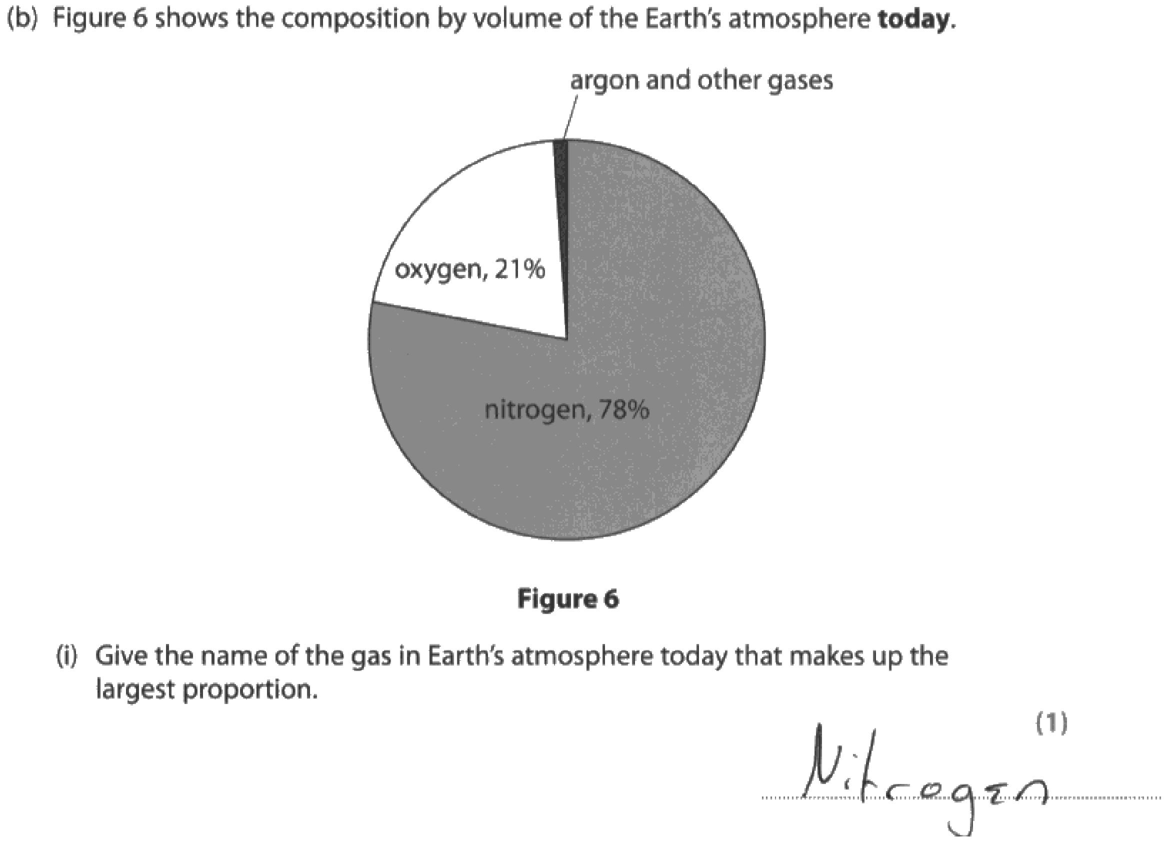
ResultsPlus

Examiner Comments

This shows a good answer which gained both marks.

Question 5(b)(i)

Question 5 asked candidates about gases in the atmosphere. Part (b) showed candidates a pie chart showing the composition by volume of the Earth's atmosphere today. Q05(b)(i) asked candidates to give the name of the gas in the Earth's atmosphere today that makes up the largest proportion. The vast majority of candidates were able to read the pie chart to recognise that nitrogen makes up the largest proportion.



(b) Figure 6 shows the composition by volume of the Earth's atmosphere **today**.

Figure 6

(i) Give the name of the gas in Earth's atmosphere today that makes up the largest proportion.

(1)

Nitrogen

ResultsPlus
Examiner Comments

This example gained the mark.

(b) Figure 6 shows the composition by volume of the Earth's atmosphere **today**.

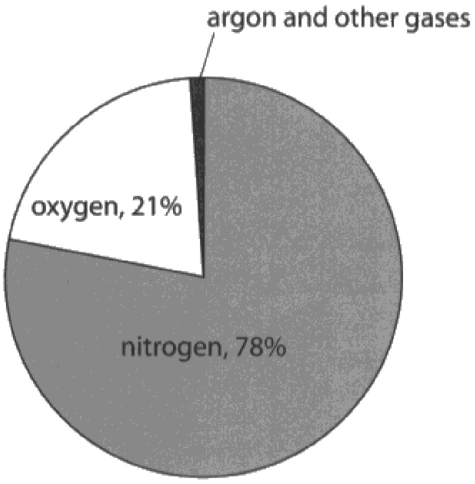


Figure 6

(i) Give the name of the gas in Earth's atmosphere today that makes up the largest proportion.

(1)

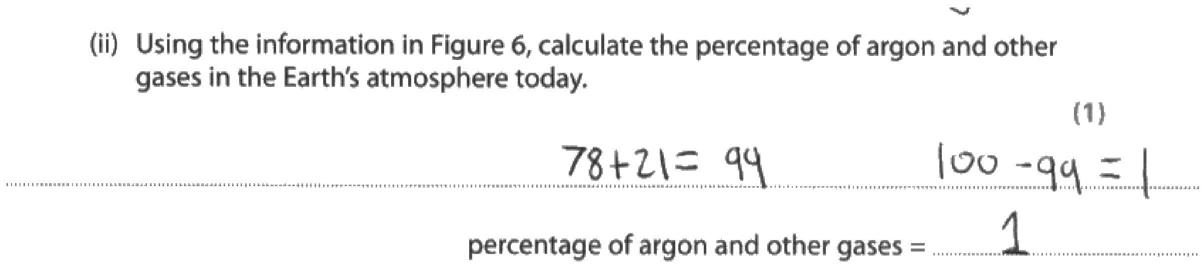
Oxygen

ResultsPlus
Examiner Comments

Where learners did not score, it was often because they have oxygen rather than nitrogen as their answer. This scored no marks.

Question 5(b)(ii)

Candidates were then asked to use the pie chart to calculate the percentage of argon and other gases in the Earth's atmosphere today. A large proportion were able to calculate the percentage as 1 to gain the mark.



(ii) Using the information in Figure 6, calculate the percentage of argon and other gases in the Earth's atmosphere today.

(1)

78+21= 99 100 -99 = 1

percentage of argon and other gases = 1

ResultsPlus
Examiner Comments

This response shows a good answer, which shows the candidates working and gained the mark.

Question 5(c)(i)

Q05(c) showed learners a diagram of some apparatus that can be used to measure the percentage of oxygen in air. They were told that the oxygen in the air reacts with the heated zinc in the apparatus. Q05(c)(i) then asked one change that would be seen during the reaction. Candidates found this very challenging with only the most able scoring both marks for being able to explain one change.

A noticeable proportion of candidates stated that zinc rusts or that zinc melts. When they said that the zinc rusts, this was ignored, if they had stated that zinc corrodes this could have scored.

Where candidates scored one mark, it was often as they stated that there was a colour change, this scored a mark regardless of the colour they stated that the zinc changed to.

(c) The percentage of oxygen in air can be measured using the apparatus shown in Figure 7.

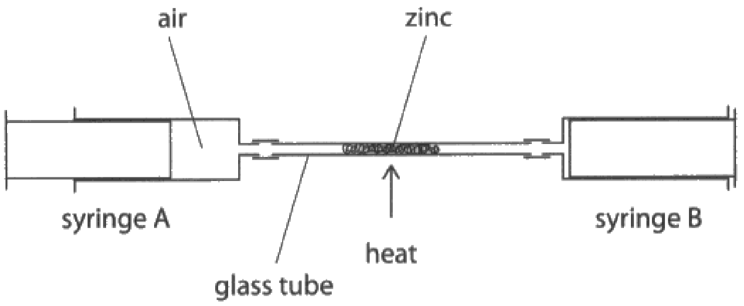


Figure 7

The oxygen in the air reacts with the heated zinc.

(i) Explain **one** change that would be seen during the reaction.

(2)

The zinc would react with the oxygen, therefore there would be less zinc.

ResultsPlus
Examiner Comments

Many candidates stated that zinc reacts with oxygen, this was ignored as this was given in the question.

ResultsPlus
Examiner Tip

Remember to use the information in the stem to inform your answer, but do not simply restate the stem as this will not score.

(c) The percentage of oxygen in air can be measured using the apparatus shown in Figure 7.

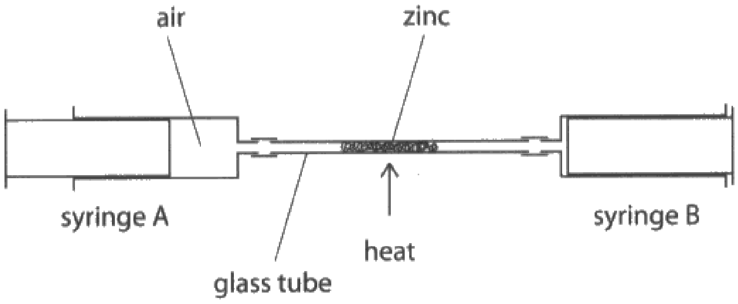


Figure 7

The oxygen in the air reacts with the heated zinc.

(i) Explain **one** change that would be seen during the reaction.

(2)

The syringes would display smaller numbers because there would be less oxygen in the air due to the zinc reacting with it.

ResultsPlus
Examiner Comments

This example gained one mark, they stated that there would be less oxygen in the syringe, there was no mark for explaining that this is because the zinc was reacting with it.

(c) The percentage of oxygen in air can be measured using the apparatus shown in Figure 7.

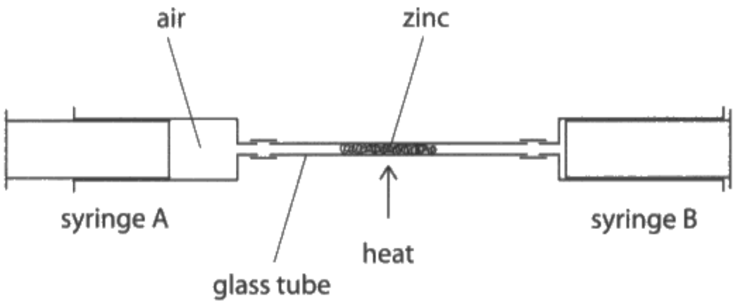


Figure 7

The oxygen in the air reacts with the heated zinc.

(i) Explain **one** change that would be seen during the reaction.

(2)

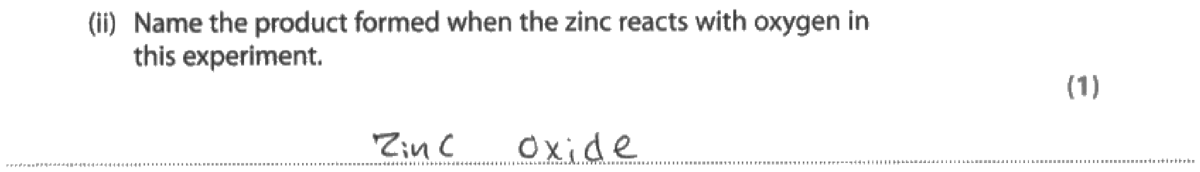
colour change of zinc as it oxidises because when transition metals react they change colour.

ResultsPlus Examiner Comments

This example gained two marks, the candidate states that the zinc changes colour and explains this by saying that zinc oxidises.

Question 5(c)(ii)

Q05(c)(ii) asked candidates to name the product formed when the zinc reacts with oxygen. A good proportion of candidates were able to name zinc oxide as the product to gain the mark.



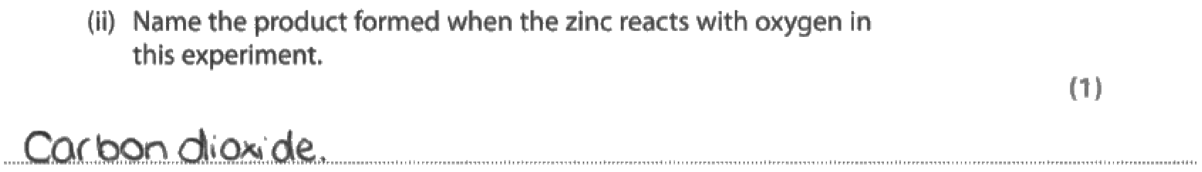
(ii) Name the product formed when the zinc reacts with oxygen in this experiment.

(1)

Zinc oxide

ResultsPlus
Examiner Comments

This example scored the mark.



(ii) Name the product formed when the zinc reacts with oxygen in this experiment.

(1)

Carbon dioxide.

ResultsPlus
Examiner Comments

A common incorrect answer seen was carbon dioxide, this did not score.

Question 5(d)(i)

Q05(d)(i) showed candidates the electronic configuration of an argon atom and asked them to state why argon is unreactive. The majority were able to state that this is because argon has a full outer shell, some stated that argon did not need to lose or gain electrons, and this also scored.

(d) (i) Figure 8 shows the electron configuration of an argon atom.

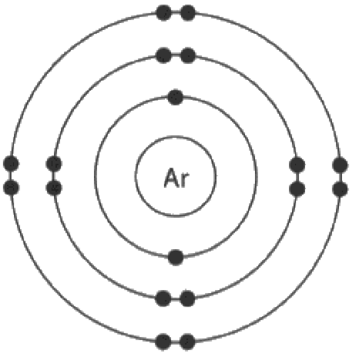


Figure 8

State why argon is unreactive.

(1)

It has a full outer shell & no need to gain or loose electrons

ResultsPlus
Examiner Comments

This example shows a good answer which gained the mark.

(d) (i) Figure 8 shows the electron configuration of an argon atom.

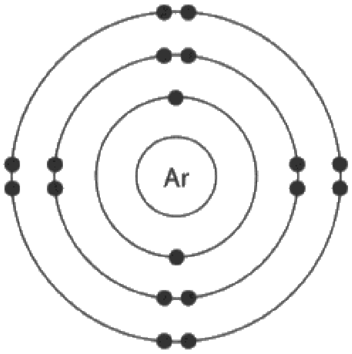


Figure 8

State why argon is unreactive.

(1)

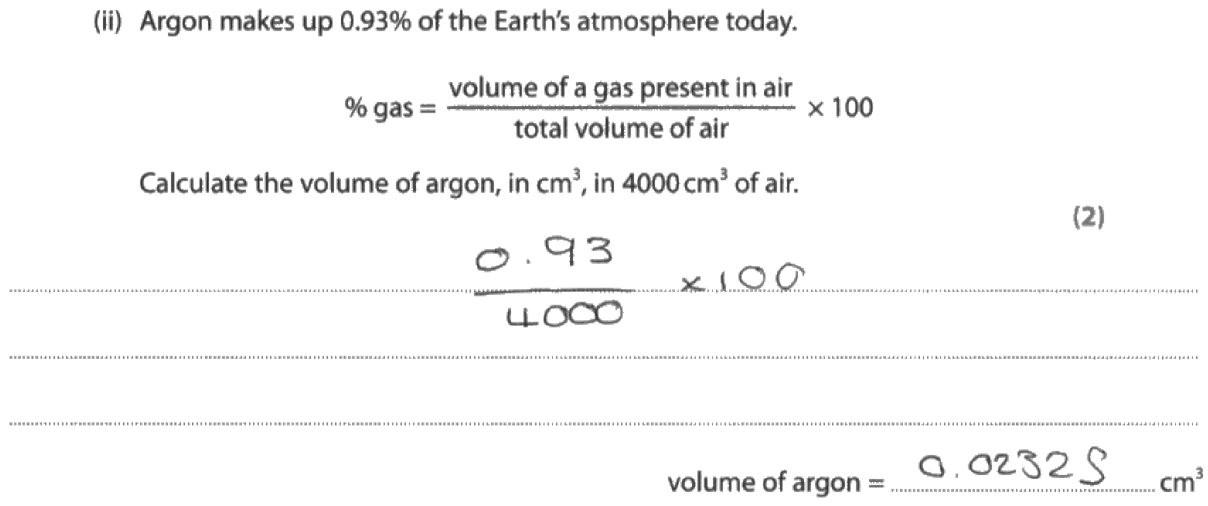
it is in group 0 meaning it is inert

ResultsPlus
Examiner Comments

Where candidates did not score, it was often as they re-stated that argon was inert or unreactive as in this example.

Question 5(d)(ii)

Q05(d)(ii) required candidates to calculate the volume of argon in 4000cm^3 of air, they were given the equation to do that. Candidates found this quite challenging with more candidates not scoring than scoring on the question. Where candidates scored both marks, they often showed their working in a logical way to come to the correct answer.



(ii) Argon makes up 0.93% of the Earth's atmosphere today.

$$\% \text{ gas} = \frac{\text{volume of a gas present in air}}{\text{total volume of air}} \times 100$$

Calculate the volume of argon, in cm^3, in 4000 cm^3 of air.

(2)

$$\frac{0.93}{4000} \times 100$$

volume of argon = 0.02325 cm^3

ResultsPlus
Examiner Comments

This example shows a common incorrect answer where candidates have not read the question carefully and substituted the 0.93% into the volume of gas present rather than the percentage of gas, so this gained no marks.

(ii) Argon makes up 0.93% of the Earth's atmosphere today.

$$\% \text{ gas} = \frac{\text{volume of a gas present in air}}{\text{total volume of air}} \times 100$$

Calculate the volume of argon, in cm^3, in 4000 cm^3 of air.

(2)

~~$\frac{4000}{0.93} \times 100 =$~~

% x total volume of air = volume of gas present

$0.93 \times 4000 = 3720$

volume of argon = 3720 cm^3

ResultsPlus
Examiner Comments

Where candidates scored just one mark, it was often because they did not rearrange the 100 correctly or did not use it at all, such as in this example which scored one mark.

(ii) Argon makes up 0.93% of the Earth's atmosphere today.

$$\% \text{ gas} = \frac{\text{volume of a gas present in air}}{\text{total volume of air}} \times 100$$

Calculate the volume of argon, in cm^3, in 4000 cm^3 of air.

(2)

$$\frac{0.93 \times 4000}{100} = 37.2$$

volume of argon = 37.2 cm^3

ResultsPlus
Examiner Comments

This response shows a good answer, with clear working which gained both marks.

Question 6(a)(i)

Question 6 considered the alkali metal lithium, its reaction with water and the products of that reaction. Q06(a)(i) asked learners to state which group of the periodic table contains the alkali metals. This was well answered by candidates with most being able to score the mark.

6 Lithium is an alkali metal.

(a) (i) State which group of the periodic table contains the alkali metals.

(1)

1

ResultsPlus
Examiner Comments

This example gained the mark.

6 Lithium is an alkali metal.

(a) (i) State which group of the periodic table contains the alkali metals.

(1)

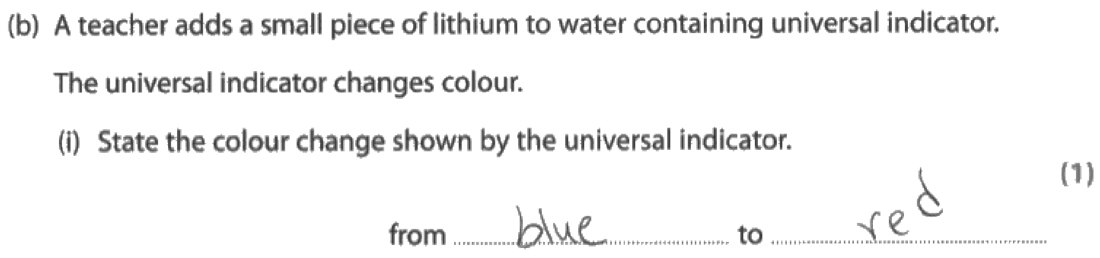
group 7

ResultsPlus
Examiner Comments

The most common incorrect answer was group 7.

Question 6(b)(i)

Q06(b)(i) told candidates that a teacher adds a small piece of lithium to water containing universal indicator, they were then asked what colour change would be shown by the universal indicator. Very few candidates were able to give the correct colour change with many thinking that the colour change was colourless to pink, possibly thinking of phenolphthalein rather than universal indicator.



(b) A teacher adds a small piece of lithium to water containing universal indicator.

The universal indicator changes colour.

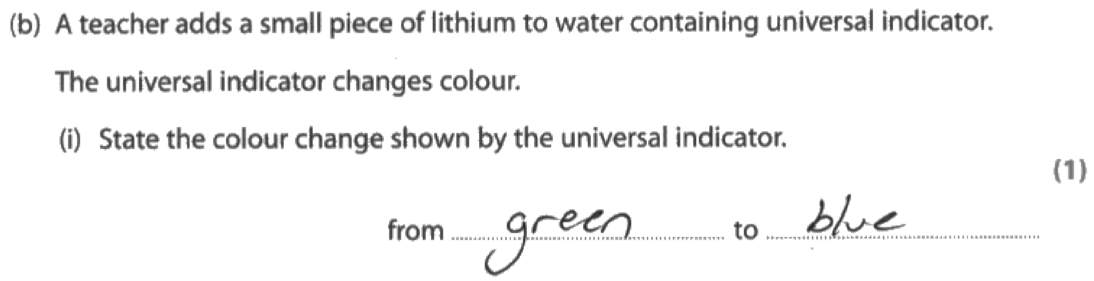
(i) State the colour change shown by the universal indicator.

(1)

from blue to red

ResultsPlus
Examiner Comments

This example shows a common answer which did not score.



(b) A teacher adds a small piece of lithium to water containing universal indicator.

The universal indicator changes colour.

(i) State the colour change shown by the universal indicator.

(1)

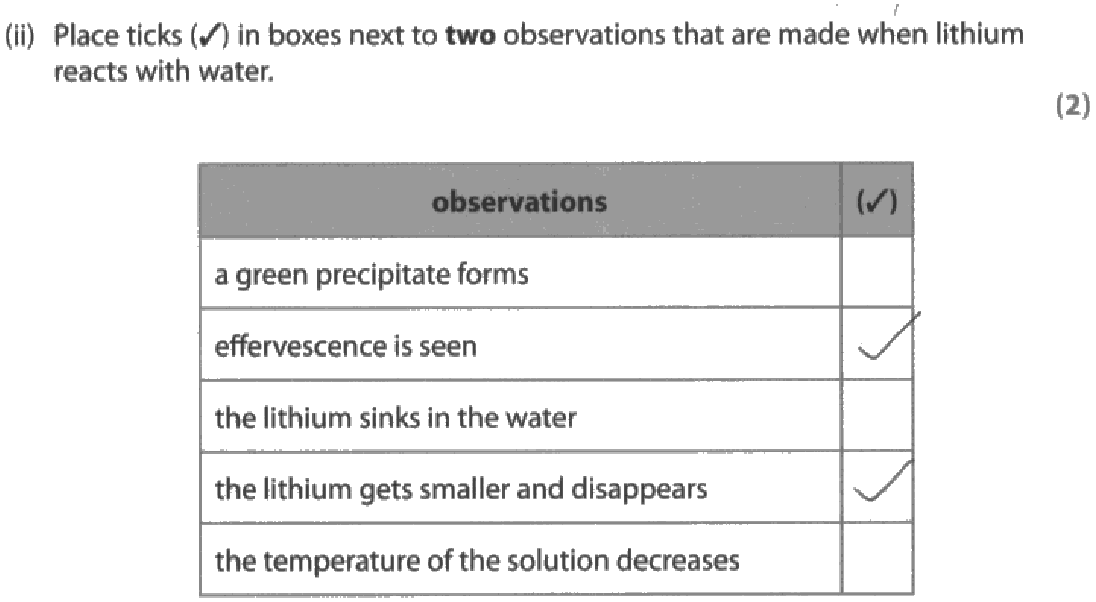
from green to blue

ResultsPlus
Examiner Comments

This example shows a good answer which scored the mark.

Question 6(b)(ii)

Q06(b)(ii) gave learners a table of possible observations and asked candidates to tick two observations that are made when lithium reacts with water. The majority of candidates accessed the question, although more scored one mark than two.



(ii) Place ticks (✓) in boxes next to **two** observations that are made when lithium reacts with water.

(2)

observations	**(✓)**
a green precipitate forms	
effervescence is seen	✓
the lithium sinks in the water	
the lithium gets smaller and disappears	✓
the temperature of the solution decreases	

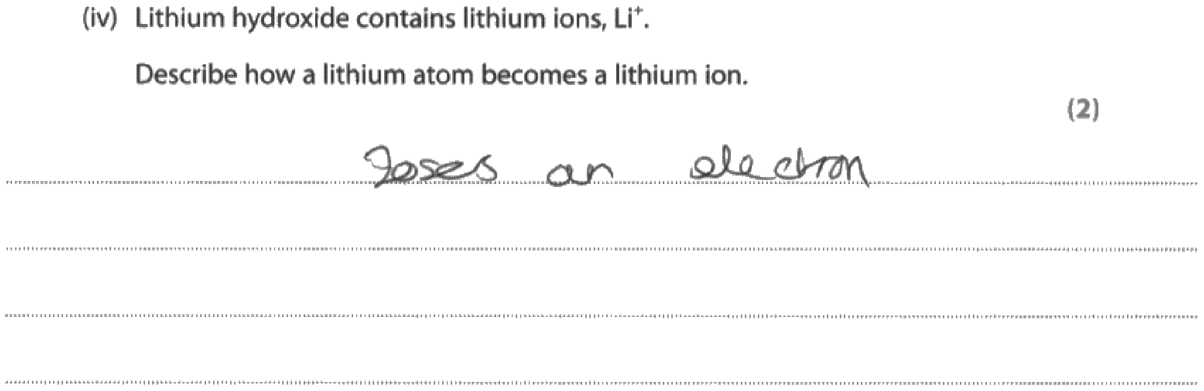
ResultsPlus
Examiner Comments

This example scored both marks.

Question 6(b)(iv)

Q06(b)(iv) asked candidates how a lithium atom becomes a lithium ion. Candidates found this challenging with most scoring no marks. Scientific terminology often let candidates down with words such as atom, ion or proton being used rather than electron.

Those that scored one often did so as they knew that one electron was moved but they thought that one electron was gained rather than lost.



(iv) Lithium hydroxide contains lithium ions, Li^+.

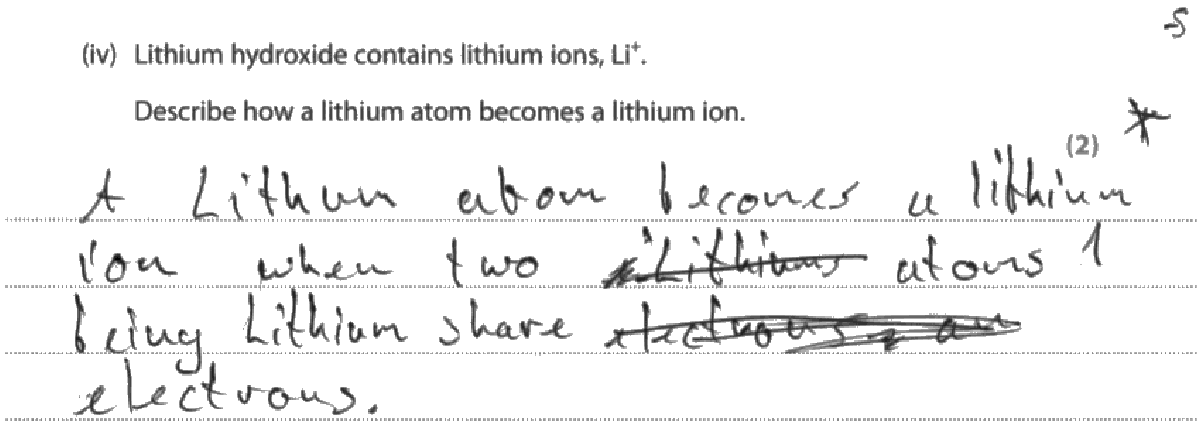
Describe how a lithium atom becomes a lithium ion.

(2)

loses an electron

ResultsPlus
Examiner Comments

This example shows a good response which gained both marks, an electron was accepted for one electron.



-5

(iv) Lithium hydroxide contains lithium ions, Li^+.

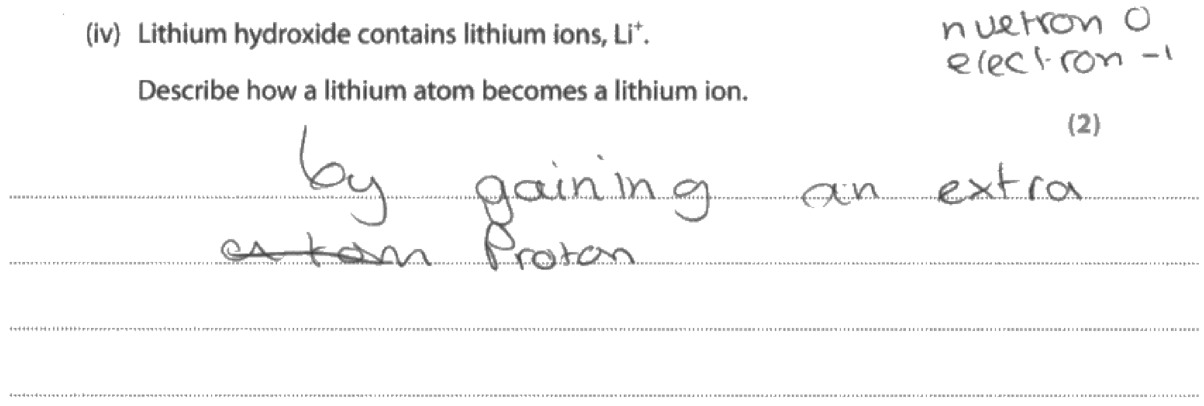
Describe how a lithium atom becomes a lithium ion.

(2)

A Lithum atom becomes a lithium ion when two ~~Lithium~~ atoms 1 being Lithium share ~~electrons an~~ electrons.

ResultsPlus Examiner Comments

This example scored no marks as the candidate has stated that the electrons are shared which was rejected for both marking points.



(iv) Lithium hydroxide contains lithium ions, Li^+.

Describe how a lithium atom becomes a lithium ion.

nuetron 0
electron -1

(2)

by gaining an extra ~~atom~~ Proton

ResultsPlus Examiner Comments

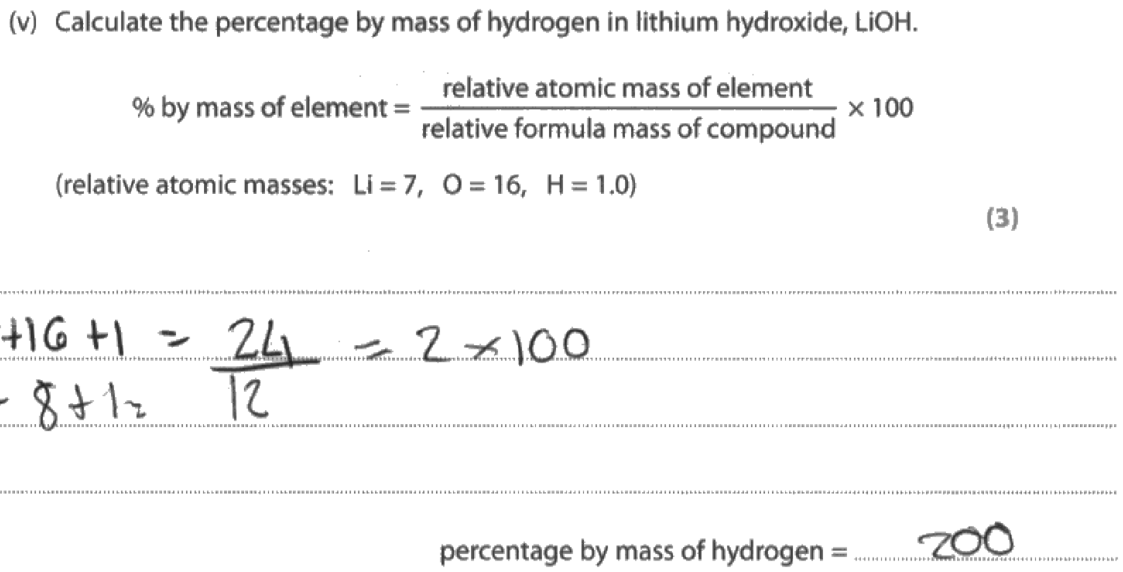
This example scored no marks.

ResultsPlus Examiner Tip

Ensure that you are familiar with key scientific terminology such as ion, electron, proton and neutron and atom and when it is appropriate to use each of the specific terms.

Question 6(b)(v)

Q06(b)(v) asked candidates to calculate the percentage by mass of hydrogen in lithium hydroxide. Candidates accessed the question well with a good spread of marks seen. The majority were able to calculate the relative formula mass of lithium hydroxide to gain at least one mark. Some understood that the mass of hydrogen present in the compound had to be divided by the formula mass of the lithium hydroxide to gain the second, the more able were then able to calculate by 100 and give or round their answer correctly to obtain the percentage by mass of hydrogen in the lithium hydroxide.



(v) Calculate the percentage by mass of hydrogen in lithium hydroxide, LiOH.

$$\% \text{ by mass of element} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

(relative atomic masses: Li = 7, O = 16, H = 1.0)

(3)

7+16 +1 = 24 = 2 ×100

3+ 8+1= 12

percentage by mass of hydrogen = 200

ResultsPlus
Examiner Comments

This example scored one mark for calculating the relative formula mass of lithium hydroxide, there was nothing further creditworthy.

(v) Calculate the percentage by mass of hydrogen in lithium hydroxide, LiOH.

$$\% \text{ by mass of element} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

(relative atomic masses: Li = 7, O = 16, H = 1.0)

(3)

$4.1666 = \frac{1}{24} \times 100$

$7+16+1=24$

percentage by mass of hydrogen = 4.17%

ResultsPlus
Examiner Comments

This example scored three marks as the candidate has correctly rounded their answer of 4.16666 to 4.17.

(v) Calculate the percentage by mass of hydrogen in lithium hydroxide, LiOH.

$$\text{\% by mass of element} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

(relative atomic masses: Li = 7, O = 16, H = 1.0)

(3)

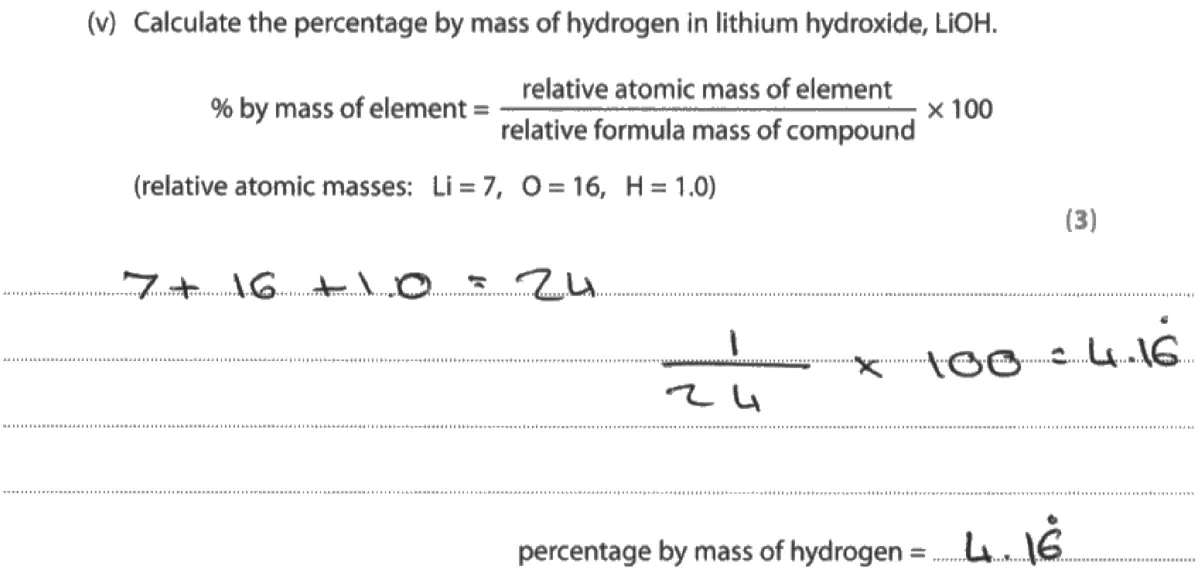
$x = \frac{1}{24} \times 100 = 4,16\%$

$7 + 16 + 1 = 24$

percentage by mass of hydrogen = 4,16%

ResultsPlus
Examiner Comments

This example scored two marks. The candidate has the correct calculation but has rounded to 4.16 which is incorrect and so the last mark was lost.



(v) Calculate the percentage by mass of hydrogen in lithium hydroxide, LiOH.

$$\text{\% by mass of element} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

(relative atomic masses: Li = 7, O = 16, H = 1.0)

(3)

$7 + 16 + 1.0 = 24$

$\frac{1}{24} \times 100 = 4.1\dot{6}$

percentage by mass of hydrogen = $4.1\dot{6}$

ResultsPlus
Examiner Comments

This example scored three marks. The candidate has shown the recurring sign above the 6 of the 4.16 and so full marks could be awarded.

ResultsPlus
Examiner Tip

When carrying out calculation questions that involve a recurring number, ensure that you round the number correctly or show the recurring dot, do not truncate the number.

Question 7(a)(i)

Question 7 gives candidates the practical scenario of a student heating a known volume of water by burning propanol. The student is investigating the mass of propanol needed to increase the temperature of the water by 50ºC. The apparatus that the student uses is shown in the figure.

Candidates were then given 6 steps in the method which were not in the correct order. They were given the first two steps and then asked to place the last four in the correct sequence. Candidates accessed the question well with the majority being able to place the four steps in the correct order.

7 (a) A student heats a known volume of water by burning propanol.

The student investigates the mass of propanol needed to increase the temperature of the water by 50 °C.

Figure 9 shows the apparatus the student uses.

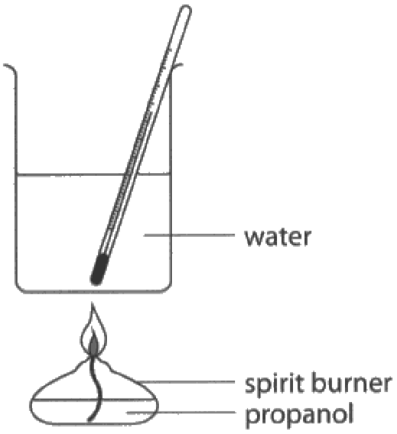


Figure 9

(i) The student carries out the investigation using the following six steps.

The steps are **not** shown in the correct order.

step P find the final mass of the spirit burner containing propanol ⑥

~~**step Q**~~ measure the initial temperature of the water

~~**step R**~~ put 100 cm^3 water into the beaker

step S find the initial mass of the spirit burner containing propanol ③

step T when the temperature of the water has increased by 50 °C extinguish the flame ⑤

step U place the spirit burner under the beaker of water and light the spirit burner ④

Write the steps in the correct order.

The first two steps have been completed for you.

(2)

R	**Q**	S	U	T	P

ResultsPlus
Examiner Comments

This response shows a good answer which scored both marks.

7 (a) A student heats a known volume of water by burning propanol.

The student investigates the mass of propanol needed to increase the temperature of the water by 50 °C.

Figure 9 shows the apparatus the student uses.

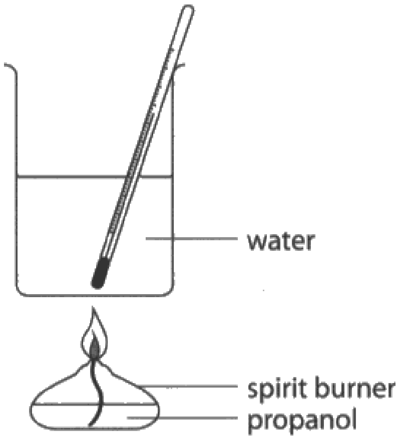


Figure 9

(i) The student carries out the investigation using the following six steps.

The steps are **not** shown in the correct order.

step P find the final mass of the spirit burner containing propanol

step Q measure the initial temperature of the water

step R put 100 cm^3 water into the beaker

step S find the initial mass of the spirit burner containing propanol

step T when the temperature of the water has increased by 50 °C extinguish the flame

step U place the spirit burner under the beaker of water and light the spirit burner

Write the steps in the correct order.

The first two steps have been completed for you.

(2)

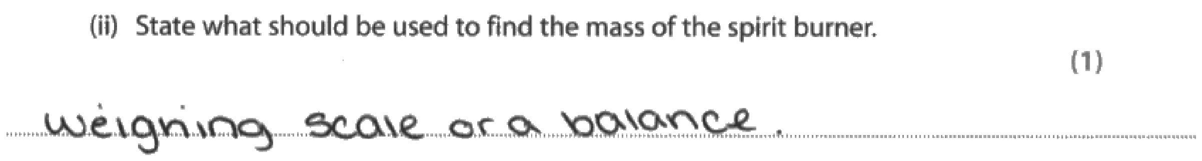
R	**Q**	U	T	S	P

ResultsPlus
Examiner Comments

In a small proportion of cases, candidates scored just one mark as they knew that finding the final mass of the spirit burner was the final step as in this example.

Question 7(a)(ii)

Q07(a)(ii) asked candidates to state what should be used to find the mass of the spirit burner. Around half of the cohort knew that a balance or scales should be used to measure the mass.

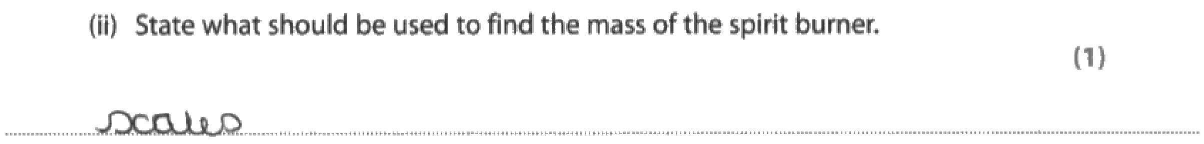

(ii) State what should be used to find the mass of the spirit burner.

(1)

weighing scale or a balance.

ResultsPlus
Examiner Comments

This example gained one mark, both weighing scale and balance were acceptable.

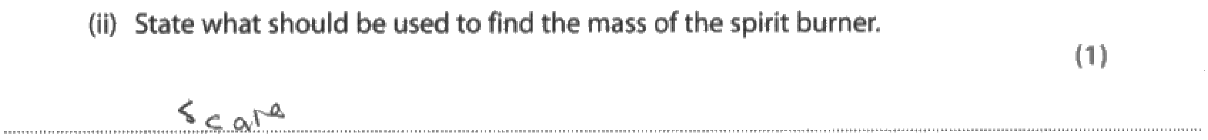

(ii) State what should be used to find the mass of the spirit burner.

(1)

scales

ResultsPlus
Examiner Comments

Scales was an allowable response, and this example scored the mark.


(ii) State what should be used to find the mass of the spirit burner.

(1)

scale

ResultsPlus
Examiner Comments

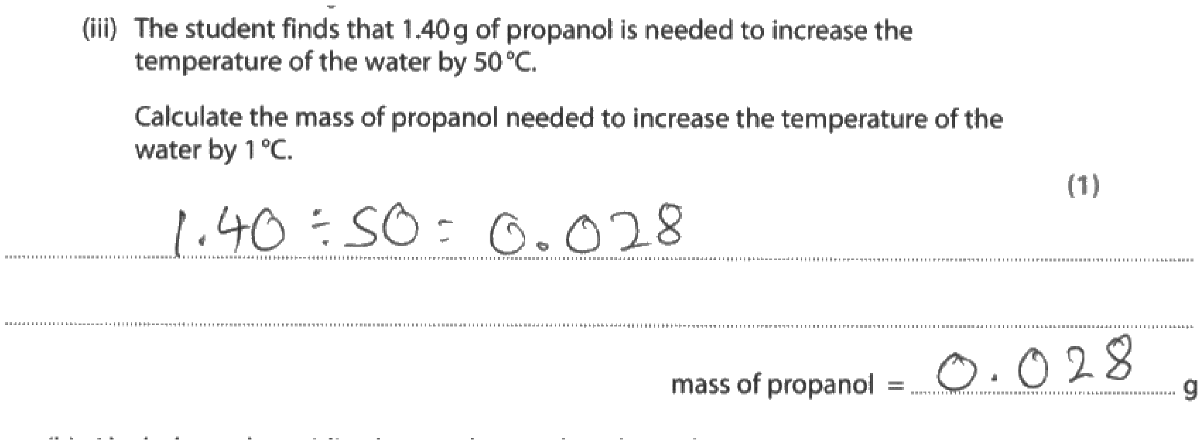
In some cases, candidates stated that a scale should be used rather than a balance or a weighing scale, scale alone was ignored and did not score as in this example.

Question 7(a)(iii)

Q07(a)(iii) told candidates that 1.40g of propanol is needed to increase the temperature of water by 50°C. They were then asked to calculate the mass of propanol needed to increase the temperature of water by 1°C.

A good proportion knew to divide the 1.40g by 50 to get the increase for 1°C.

Where candidates did not score, it was often as they got the fraction around the wrong way and divided 50 by 1.40 to get an answer of 35.7.



(iii) The student finds that 1.40 g of propanol is needed to increase the temperature of the water by 50 °C.

Calculate the mass of propanol needed to increase the temperature of the water by 1 °C.

(1)

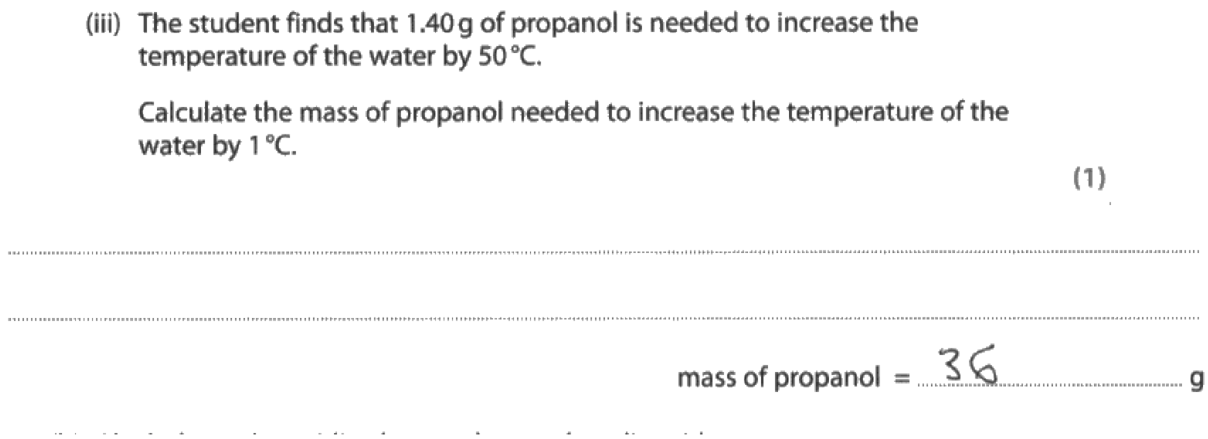
1.40 ÷ 50 = 0.028

mass of propanol = 0.028 g

ResultsPlus

Examiner Comments

This example shows a good answer which scored the mark.



(iii) The student finds that 1.40 g of propanol is needed to increase the temperature of the water by 50 °C.

Calculate the mass of propanol needed to increase the temperature of the water by 1 °C.

(1)

mass of propanol = 36 g

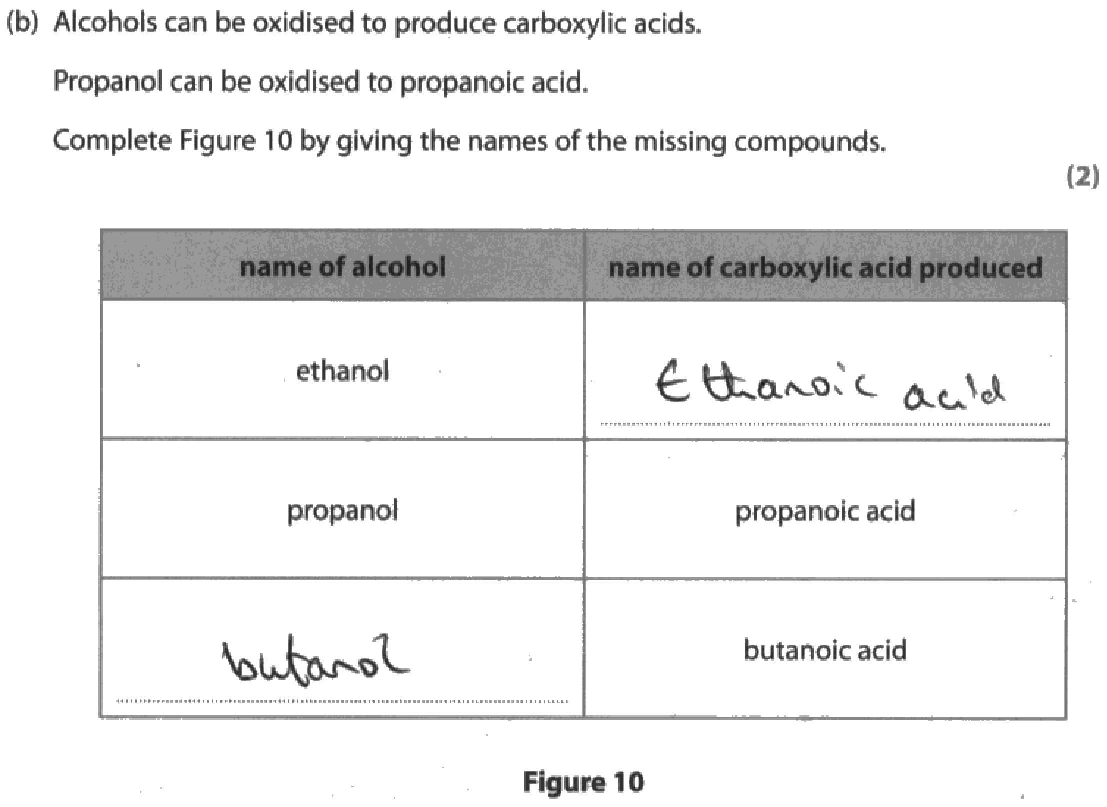
ResultsPlus

Examiner Comments

This example scored no marks.

Question 7(b)

Q07(b) gave candidates a table showing the names of two alcohols and two carboxylic acids, and asked them to complete the names of the missing compounds. A good proportion scored with most scoring two marks. Where candidates only scored one mark it was often as they were not careful with their spellings and gave the name of the carboxylic acid as ethanolic acid, this did not score.



(b) Alcohols can be oxidised to produce carboxylic acids.

Propanol can be oxidised to propanoic acid.

Complete Figure 10 by giving the names of the missing compounds.

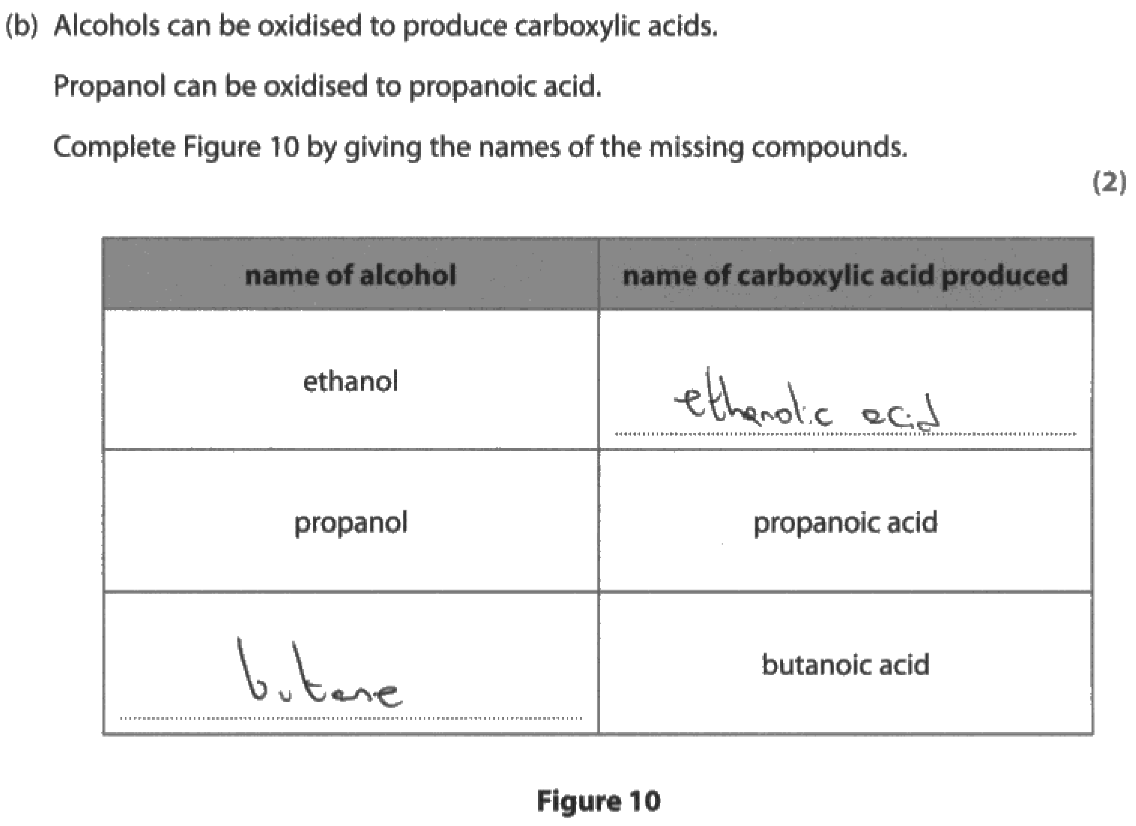
(2)

name of alcohol	name of carboxylic acid produced
ethanol	Ethanoic acid
propanol	propanoic acid
butanol	butanoic acid

Figure 10

ResultsPlus
Examiner Comments

This response shows a good answer that scored both marks.



(b) Alcohols can be oxidised to produce carboxylic acids.

Propanol can be oxidised to propanoic acid.

Complete Figure 10 by giving the names of the missing compounds.

(2)

name of alcohol	name of carboxylic acid produced
ethanol	ethanolic acid
propanol	propanoic acid
butane	butanoic acid

Figure 10

ResultsPlus
Examiner Comments

This example scored no marks, the candidate gives ethanolic acid which was not accepted. It is not clear if the candidate states butane or butene as the name of the missing alcohol, but either would not score.

ResultsPlus
Examiner Tip

When writing the names of organic compounds, ensure that you are careful and clear with spellings and that letters are clear.

Question 7(c)

Q07(c) was the first of the two six-mark levels-based questions. This question gave candidates information about organic compounds J and K. They were then asked to describe the similarities and differences between the atoms, the structure and bonding and the properties of the two substances.

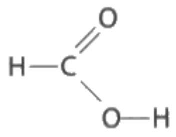
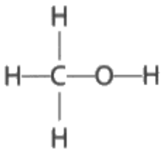
Candidates accessed the question well, with a good spread of marks across the range and only the most able scoring the full six marks. Candidates that performed well in the question, used the information in the stem to inform their answer and brought their own understanding to help describe the similarities and differences, often naming the compounds, describing differences in properties and similarities in atoms and bonding.

Less able candidates repeated information straight from the table without bringing any additional knowledge or understanding.

A common misconception seen, was where candidates stated that J was an alkene due to the double bond and K was an alkane as there was no double bond. A noticeable proportion thought that J was an alkali as it had a pH of 3.

*(c) Compound **J** is a carboxylic acid and compound **K** is an alcohol.

Figure 11 gives some information about compounds **J** and **K**.

compound	**J**	**K**
structure of one molecule		
state at room temperature	liquid	liquid
pH of solution	3	7

carboxylic acid

alcohol

Figure 11

Describe, using Figure 11 and your own knowledge, the similarities and differences between compounds **J** and **K**.

Include information about

- the atoms in each molecule
- the structure and bonding
- the properties of each substance.

(6)

• Alcohol - CO H4 it is a liquid with a ph of 7, meaning that it is neutral. It is used for drinks like wine and beer.

• J has a double bond

ResultsPlus
Examiner Comments

In this example, the candidate has written on the table that J is carboxylic acid and K is an alcohol but this is given in the stem of the question. In the writing they state that the alcohol is neutral, this gains credit in the properties section. They state that one has a double bond, but as they do not say which one this did not gain credit. As the candidate has given one correct fact this scored one mark.

*(c) Compound **J** is a carboxylic acid and compound **K** is an alcohol.

Figure 11 gives some information about compounds **J** and **K**.

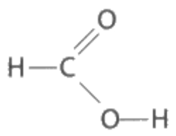
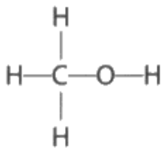
compound	**J**	**K**
structure of one molecule		
state at room temperature	liquid	liquid
pH of solution	3	7

Figure 11

Describe, using Figure 11 and your own knowledge, the similarities and differences between compounds **J** and **K**.

Include information about

- the atoms in each molecule
- the structure and bonding
- the properties of each substance.

(6)

J	K
. has a double bond	. only single bonds
. is acidic	. is neutral
. liquid at room ~~the~~ temp	. ~~no~~ Liquid in room temp
. very acidic, strong acid	

ResultsPlus
Examiner Comments

In this response, the candidate has drawn a table, which is acceptable. They state that J has a double bond, and K only has single bonds, and that J is acidic and K is neutral, they say that both are liquids at room temperature, but this is just copied from the table. As the candidate has given differences in properties and structure and bonding the answer is given a mark in level 2 of three marks.

*(c) Compound **J** is a carboxylic acid and compound **K** is an alcohol.

Figure 11 gives some information about compounds **J** and **K**.

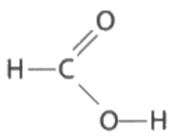
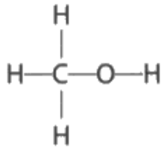
compound	**J**	**K**
structure of one molecule		
state at room temperature	liquid	liquid
pH of solution	3	7

Figure 11

Describe, using Figure 11 and your own knowledge, the similarities and differences between compounds **J** and **K**.

Include information about

- the atoms in each molecule
- the structure and bonding
- the properties of each substance.

(6)

Compound J has the functional group COOH which shows that it is a carboxylic acid. and compound K has the functional group OH showing it's an alcohol.

ResultsPlus
Examiner Comments

This example scored two marks. The candidate has described the differences in functional groups saying that COOH shows that it is a carboxylic acid whereas K has OH which shows that it is an alcohol. As they have only covered one aspect of the question a mark in level 1 was awarded.

*(c) Compound **J** is a carboxylic acid and compound **K** is an alcohol.

Figure 11 gives some information about compounds **J** and **K**.

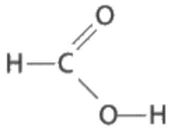
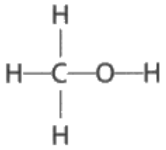
compound	**J**	**K**
structure of one molecule		
state at room temperature	liquid	liquid
pH of solution	3	7

Figure 11

Describe, using Figure 11 and your own knowledge, the similarities and differences between compounds **J** and **K**.

Include information about

- the atoms in each molecule
- the structure and bonding
- the properties of each substance.

(6)

~~[illegible]~~ K is an ~~[illegible]~~ alcohol ~~with~~

function ~~[illegible]~~ group O-H .

high ~~bp~~ boiling point since liquid at room temp also low melting point

its ~~alkali with~~ ~~a~~ neutral with ~~k~~ pH 7

J is a carboxylic acid

Functional group $\mathrm{C}\begin{smallmatrix}=\mathrm{O}\\ \backslash\mathrm{O}-\mathrm{H}\end{smallmatrix}$

high boiling point and low ~~[illegible]~~ melting point

~~[illegible]~~ because it is a liquid at room

temp

acidic liquid

both

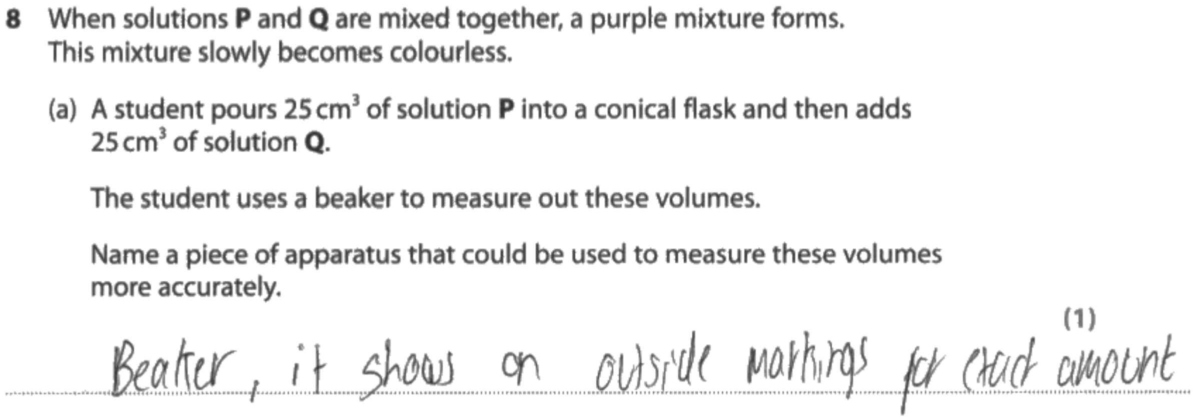
both ~~[illegible]~~ liquid at room temp
both have 1 carbon

ResultsPlus
Examiner Comments

This last example described similarities and differences across all three aspects and was awarded full credit in level 3.

Question 8(a)

Question 8 tested candidates understanding of experiments on rate of reaction. They were given the scenario of two solutions P and Q, which when mixed together, slowly tuned from purple to colourless. Q08(a) of the question asked candidates to name a piece of apparatus that could be used to measure the volume of a solution more accurately than a beaker. Many candidates scored the mark for stating that a measuring cylinder or a burette should be used.



8 When solutions **P** and **Q** are mixed together, a purple mixture forms.
This mixture slowly becomes colourless.

(a) A student pours 25 cm^3 of solution **P** into a conical flask and then adds 25 cm^3 of solution **Q**.

The student uses a beaker to measure out these volumes.

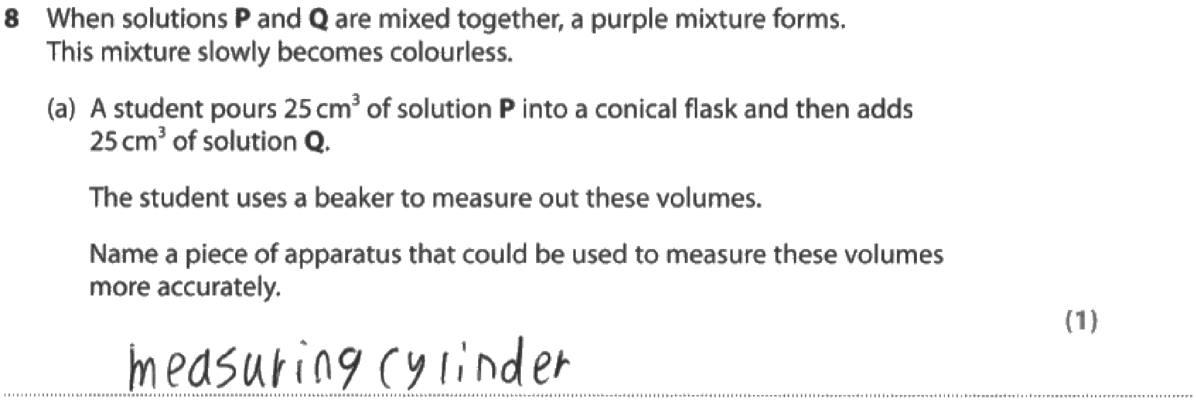
Name a piece of apparatus that could be used to measure these volumes more accurately.

(1)

Beaker, it shows on outside markings for exact amount

ResultsPlus
Examiner Comments

This example scored no marks, the candidate has misread the question and stated why the beaker might be accurate.



8 When solutions **P** and **Q** are mixed together, a purple mixture forms.
This mixture slowly becomes colourless.

(a) A student pours 25 cm^3 of solution **P** into a conical flask and then adds 25 cm^3 of solution **Q**.

The student uses a beaker to measure out these volumes.

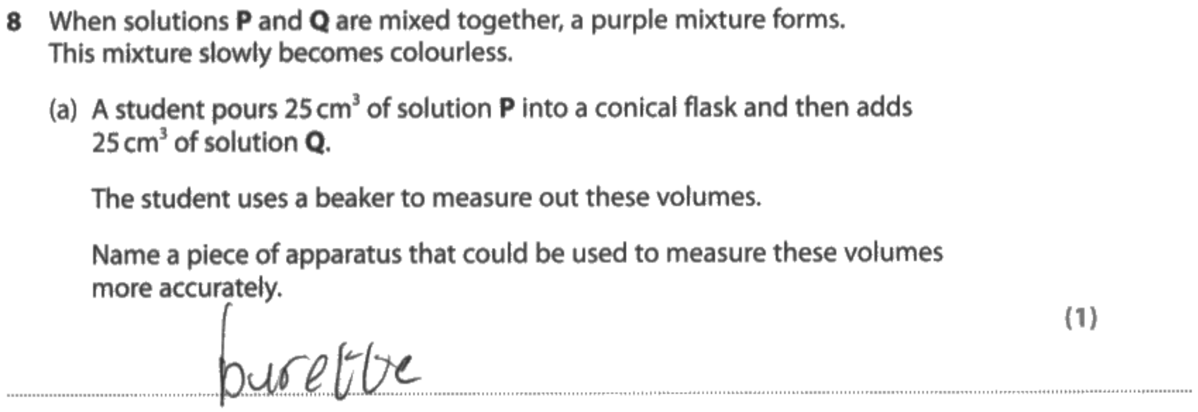
Name a piece of apparatus that could be used to measure these volumes more accurately.

(1)

measuring cylinder

ResultsPlus
Examiner Comments

Measuring cylinder gained the mark.



8 When solutions **P** and **Q** are mixed together, a purple mixture forms.
This mixture slowly becomes colourless.

(a) A student pours 25 cm^3 of solution **P** into a conical flask and then adds 25 cm^3 of solution **Q**.

The student uses a beaker to measure out these volumes.

Name a piece of apparatus that could be used to measure these volumes more accurately.

(1)

burette

ResultsPlus
Examiner Comments

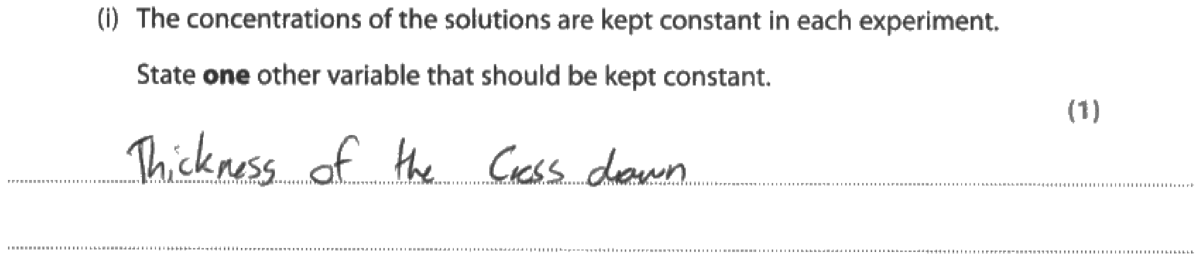
Burette gained the mark.

Question 8(b)(i)

Part (b) gave candidates a result table of the students investigation where the temperature was changed. Candidates were told that the concentration of the solutions were kept constant in each experiment, they were then asked to state one other variable that should be kept constant.

Many candidates scored the mark for stating that the volume of the solution or that the person looking should be the same, others scored for stating that the cross should be the same.

Where candidates did not score it was often as they misunderstood the question and stated that the temperature or the time should be kept constant.



(i) The concentrations of the solutions are kept constant in each experiment.

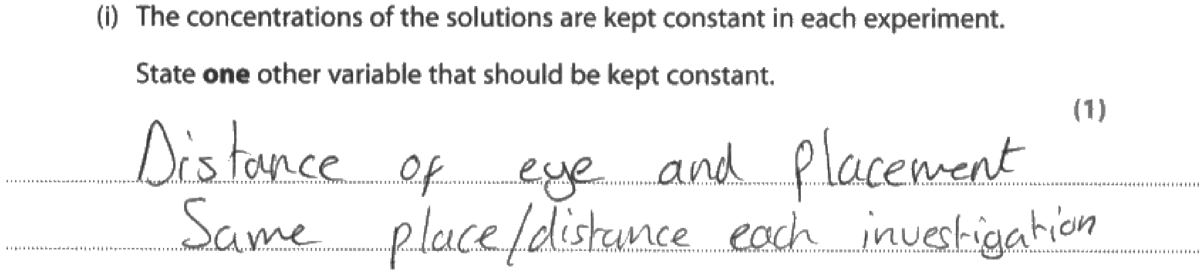
State **one** other variable that should be kept constant.

(1)

Thickness of the Cross drawn

ResultsPlus
Examiner Comments

This example scored one mark.



(i) The concentrations of the solutions are kept constant in each experiment.

State **one** other variable that should be kept constant.

(1)

Distance of eye and placement
Same place/distance each investigation

ResultsPlus
Examiner Comments

Same distance of person looking scored the mark.

(i) The concentrations of the solutions are kept constant in each experiment.

State **one** other variable that should be kept constant.

(1)

The temperature of the solution

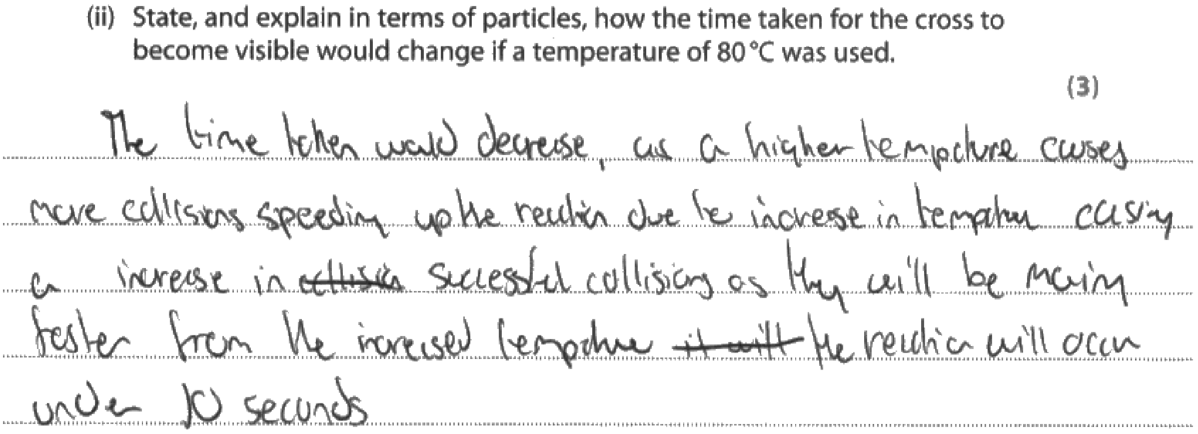
ResultsPlus

Examiner Comments

This response shows a common answer which gained no credit.

Question 8(b)(ii)

In Q08(b)(ii) candidates were asked to state and explain in terms of particles how the time take for the cross to become visible would change if a temperature of 80ºC was used. Many candidates scored on the question with one being the most common mark awarded for stating that the rate of reaction would increase. Some were able to state that this was because the particles had more energy. Only the more able were then able to link this to there more being more frequent collisions, more successful collisions or that more particles have the activation energy. It was felt that where candidates had been taught this well that they gave good clear answers which covered all four marking points and so gained the full three marks easily.



(ii) State, and explain in terms of particles, how the time taken for the cross to become visible would change if a temperature of 80 °C was used.

(3)

The time taken would decrease, as a higher temprature causes more collisions speeding up the reaction due to increase in tempature causing a increase in ~~collision~~ succesful collisions as they will be moving faster from the increased temprature ~~it will~~ the reaction will occur under 10 seconds

ResultsPlus
Examiner Comments

This response gained three marks. The time taken decreases gained the first mark. The candidate states it causes more collisions, alone this did not score as, at this point, there is no reference to more frequent collisions or more collisions per unit time. However, the candidate does go on to state that there is an increase in successful collisions which scored the final marking point and that this is because the particles are moving faster which gained the second marking point.

(ii) State, and explain in terms of particles, how the time taken for the cross to become visible would change if a temperature of 80 °C was used.

(3)

it would take a short amount of time because the particles are ~~close together so~~ far apart so it wont be hard to move them.

ResultsPlus
Examiner Comments

This example scored no marks, taking a short amount of time was not sufficient for the time taken decreases as there is no comparison.

(ii) State, and explain in terms of particles, how the time taken for the cross to become visible would change if a temperature of 80 °C was used.

(3)

The time would ~~be a~~ ~~a lot~~ decrease / be shorter than 60°C because the particles have more energy and move faster at 80°C so react faster.

ResultsPlus
Examiner Comments

This response gained two marks, the candidate states that the time taken decreases because the particles are moving faster, they say that the reaction is faster, but the first mark had already been scored. There is no reference to particle collisions for the either of the last two mark points.

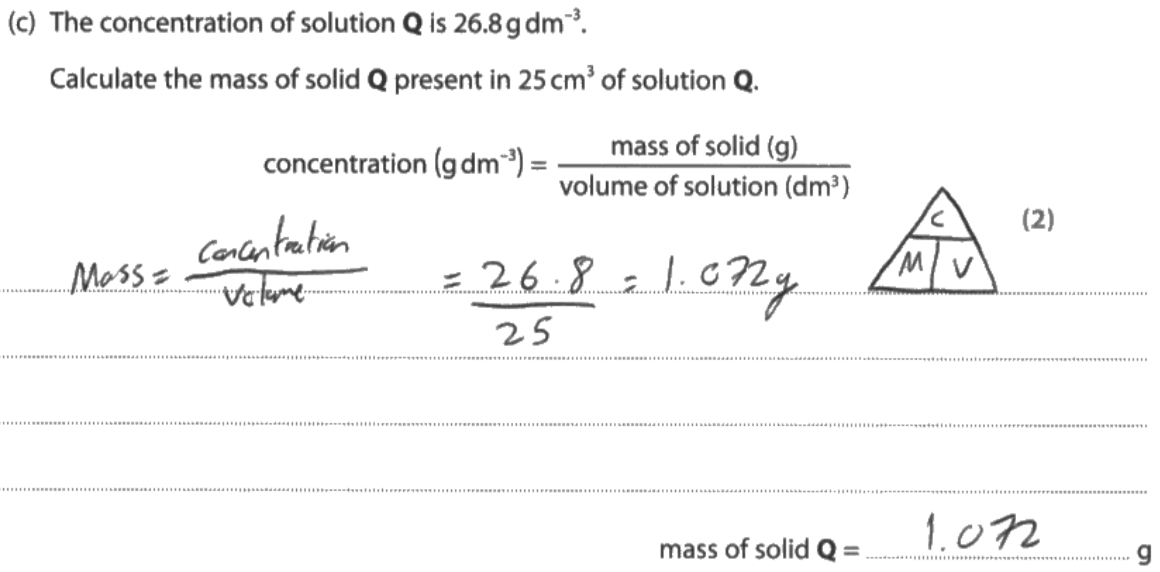
Question 8(c)

Q08(c) told candidates that the concentration of solution Q is 26.8 g dm^{-3}.

They were then asked to calculate the mass of solid Q present in $25cm^3$ of solution Q and given the equation for concentration.

Candidates found converting the volume from cm^3 to dm^3 and rearranging the equation to calculate the mass of solid very challenging with only the most able scoring the full two marks.

A common answer that scored one mark was where candidates knew to rearrange the equation but forgot to convert the volume to dm^3 and so come to an answer of 670 rather than 0.67.



(c) The concentration of solution **Q** is 26.8 g dm^{-3}.

Calculate the mass of solid **Q** present in 25 cm^3 of solution **Q**.

$$\text{concentration } (g\,dm^{-3}) = \frac{\text{mass of solid (g)}}{\text{volume of solution } (dm^3)}$$

$$\text{Mass} = \frac{\text{Concentration}}{\text{Volume}} = \frac{26.8}{25} = 1.072g$$

(2)

mass of solid **Q** = 1.072 g

ResultsPlus
Examiner Comments

This example scored no marks. The candidate has not rearranged the equation and has not converted the volume and so no marks were scored.

(c) The concentration of solution **Q** is 26.8 g dm^{-3}.

Calculate the mass of solid **Q** present in 25 cm^3 of solution **Q**.

$$\text{concentration (g dm}^{-3}\text{)} = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3\text{)}}$$

(2)

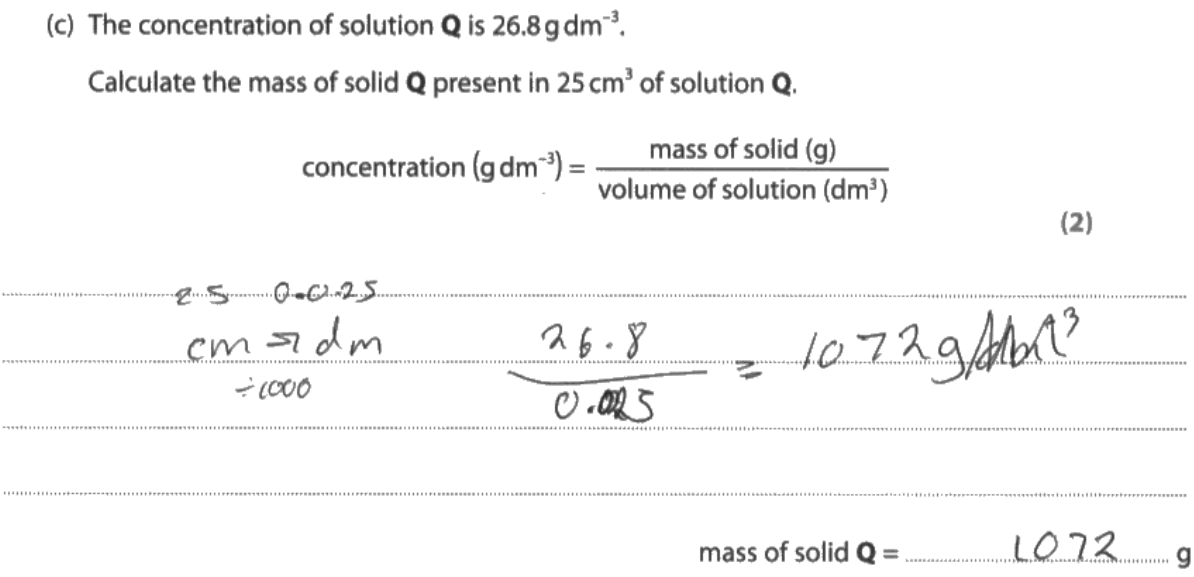
$26{\cdot}8 = \frac{\text{mass of Q}}{0{\cdot}025}$ $26{\cdot}8 \times 0{\cdot}025$

~~$\frac{26{\cdot}8}{0{\cdot}025}$ = mass~~ $= 0{\cdot}67$

mass of solid **Q** = 0·67 g

ResultsPlus
Examiner Comments

This example shows a good answer, with clear working which leads to the correct answer and gained two marks.



(c) The concentration of solution **Q** is 26.8 g dm^{-3}.

Calculate the mass of solid **Q** present in 25 cm^3 of solution **Q**.

$$\text{concentration (g dm}^{-3}) = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3)}$$

(2)

25 0.025

cm → dm $\frac{26.8}{0.025}$ = 1072 g/dm^3

÷1000

mass of solid **Q** = 1072 g

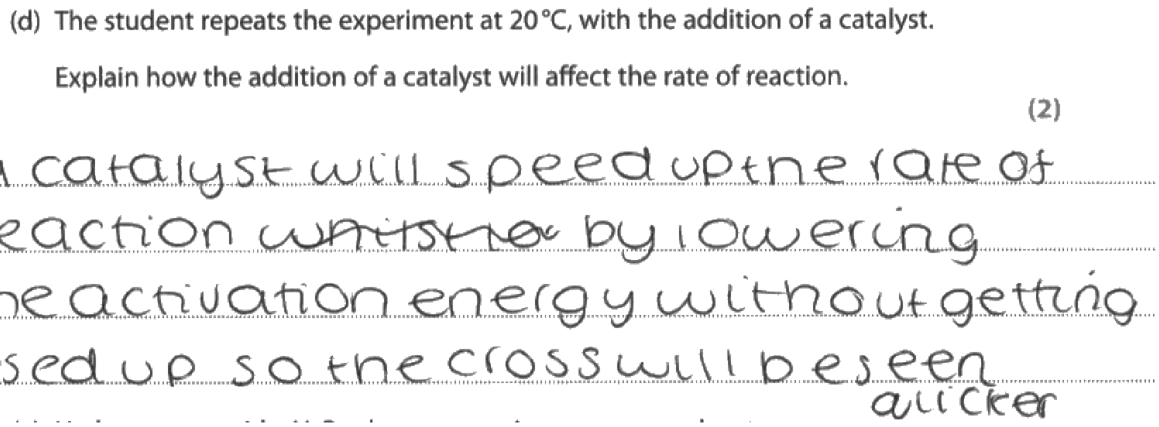
ResultsPlus

Examiner Comments

In some cases, candidates knew to convert the volume but did not rearrange the equation correctly and so came to an answer of 1072, this gained one mark for the conversion of volume as in this example.

Question 8(d)

In Q08(d) candidates were asked to explain how the addition of a catalyst would affect the rate of reaction. Candidates performed well in this question with the majority scoring one mark, however only the more able were able to explain this to score the full two marks. Many gave the generic definition of a catalyst stating that it would increase the rate of reaction without getting used up, rather than explaining why the catalyst increases the rate of reaction. Some candidates tried to explain that catalyst increases the rate of reaction by speeding up the movement of particles or giving the particles more energy, possibly confusing it with an increase of temperature again, as this is the incorrect explanation this was rejected against the second mark point.



(d) The student repeats the experiment at 20 °C, with the addition of a catalyst.

Explain how the addition of a catalyst will affect the rate of reaction.

(2)

a catalyst will speed up the rate of
reaction ~~whilst the~~ by lowering
the activation energy without getting
used up so the cross will be seen
quicker

ResultsPlus
Examiner Comments

This example scored two marks for the understanding that the catalyst would increase the rate of reaction because it lowers the activation energy. The reference to the catalyst not being used up was ignored.

(d) The student repeats the experiment at 20 °C, with the addition of a catalyst.

Explain how the addition of a catalyst will affect the rate of reaction.

(2)

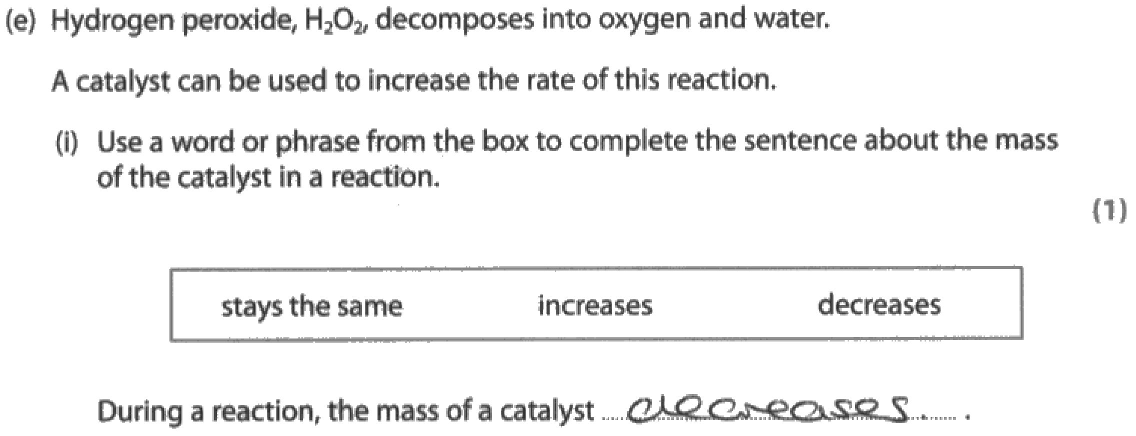
Speeds up movement of particals which increases collisions which increases succesful collisions, Speeding up the reaction.

ResultsPlus
Examiner Comments

This example gained one mark. The candidate states that the rate of reaction speeds up and that this increases successful collisions, however they also state that the movement of particles is increased which is incorrect and was rejected for the second marking point, and so just one mark was awarded.

Question 8(e)(i)

Q08(e) gave candidates a different reaction to consider, the decomposition of hydrogen peroxide into oxygen and water, and Q08(e)(i) asked to complete a sentence using a word or phrase from the box about the mass of the catalyst in the reaction.



(e) Hydrogen peroxide, H_2O_2, decomposes into oxygen and water.

A catalyst can be used to increase the rate of this reaction.

(i) Use a word or phrase from the box to complete the sentence about the mass of the catalyst in a reaction.

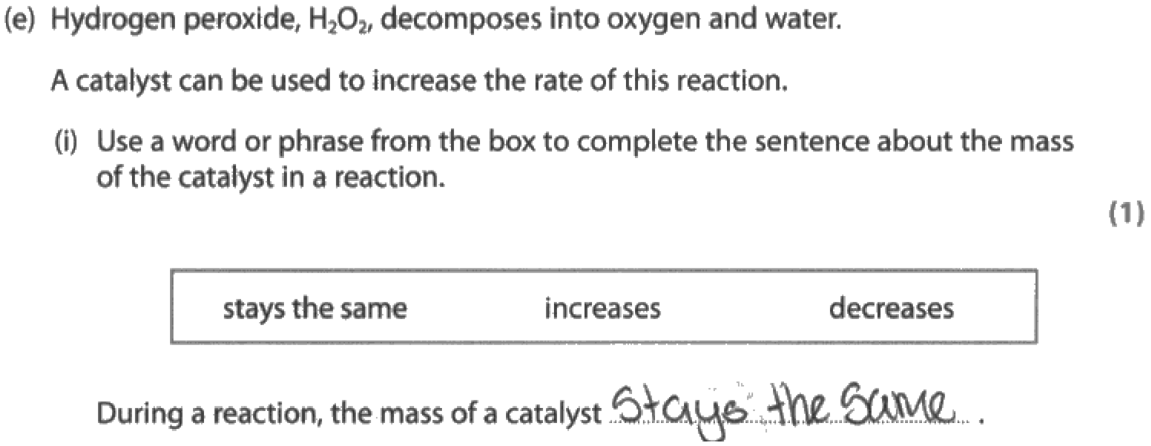
(1)

stays the same	increases	decreases

During a reaction, the mass of a catalyst decreases .

ResultsPlus
Examiner Comments

A large proportion of candidates thought that the mass of catalyst would decrease and so did not score, as in this example.



(e) Hydrogen peroxide, H_2O_2, decomposes into oxygen and water.

A catalyst can be used to increase the rate of this reaction.

(i) Use a word or phrase from the box to complete the sentence about the mass of the catalyst in a reaction.

(1)

stays the same	increases	decreases

During a reaction, the mass of a catalyst Stays the Same .

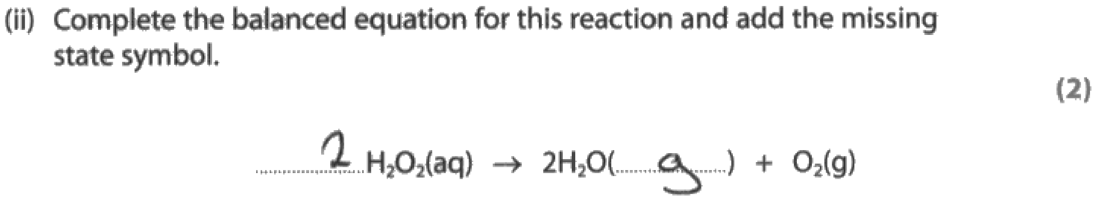
ResultsPlus
Examiner Comments

This example shows a good response which gained the mark.

Question 8(e)(ii)

Q08(e)(ii) required candidates to complete the balanced equation for the reaction and add the missing state symbol.

The most common score was one on the question with many being able to balance the equation and only the more able being to add the state symbol for water as well.



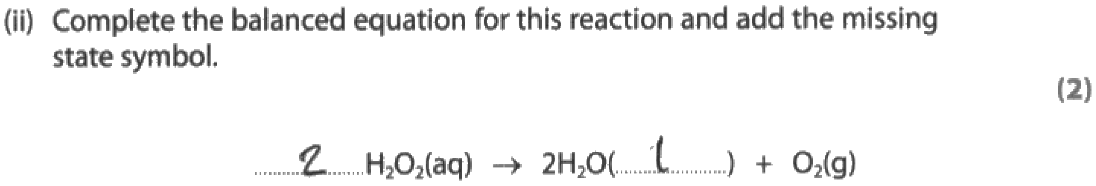
(ii) Complete the balanced equation for this reaction and add the missing state symbol.

(2)

$$2\,H_2O_2(aq) \rightarrow 2H_2O(g) + O_2(g)$$

ResultsPlus
Examiner Comments

A common error was to give the state symbol for water as (g) rather than (l), this example scored one mark.



(ii) Complete the balanced equation for this reaction and add the missing state symbol.

(2)

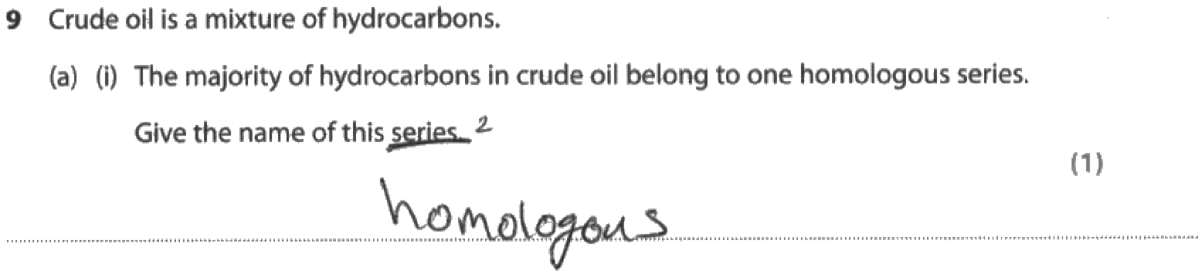
$$2\,H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$

ResultsPlus
Examiner Comments

This example shows a good response which gained both marks.

Question 9(a)(i)

Question 9 looked at crude oil. Q09(a)(i) asked candidates to give the name of the homologous series that the majority of hydrocarbons in crude oil belong to. This was poorly understood and only the more able knew that the alkanes were the homologous series and the majority not scoring.



9 Crude oil is a mixture of hydrocarbons.

(a) (i) The majority of hydrocarbons in crude oil belong to one homologous series.

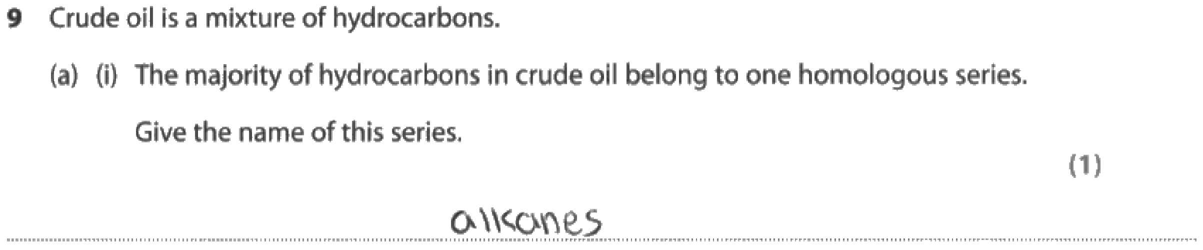
Give the name of this series. 2

(1)

homologous

ResultsPlus
Examiner Comments

Some repeated the stem of the question as in this example which scored no marks.



9 Crude oil is a mixture of hydrocarbons.

(a) (i) The majority of hydrocarbons in crude oil belong to one homologous series.

Give the name of this series.

(1)

alkanes

ResultsPlus
Examiner Comments

This example scored the mark.

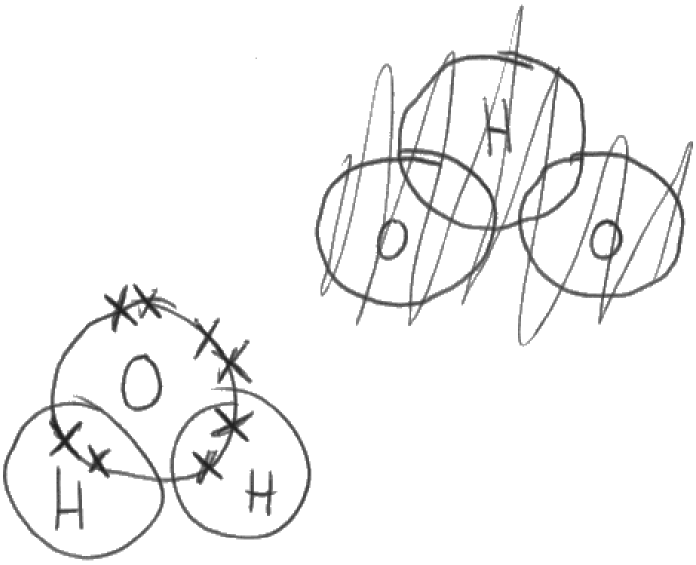
Question 9(b)

Q09(b) asked candidates to draw a dot and cross diagram for a molecule of water. Candidates found this very challenging with the majority scoring no marks and only the more able scoring both marks.

(b) When hydrocarbons undergo combustion, water is produced.

Draw a dot and cross diagram of a molecule of water.

(2)



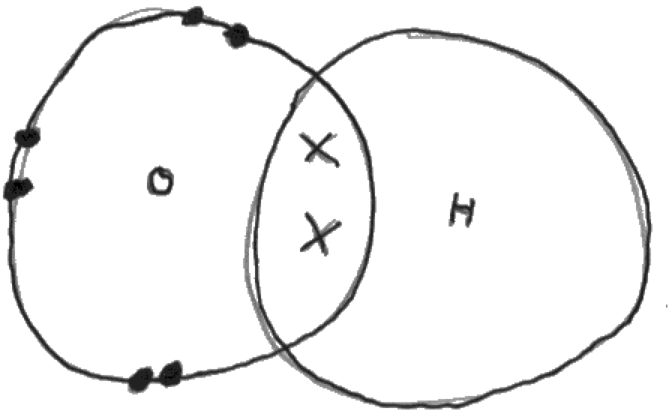
ResultsPlus
Examiner Comments

This example shows a good answer that scored both marks, all crosses all dots or mixture of both were allowed.

(b) When hydrocarbons undergo combustion, water is produced.

Draw a dot and cross diagram of a molecule of water.

(2)



ResultsPlus
Examiner Comments

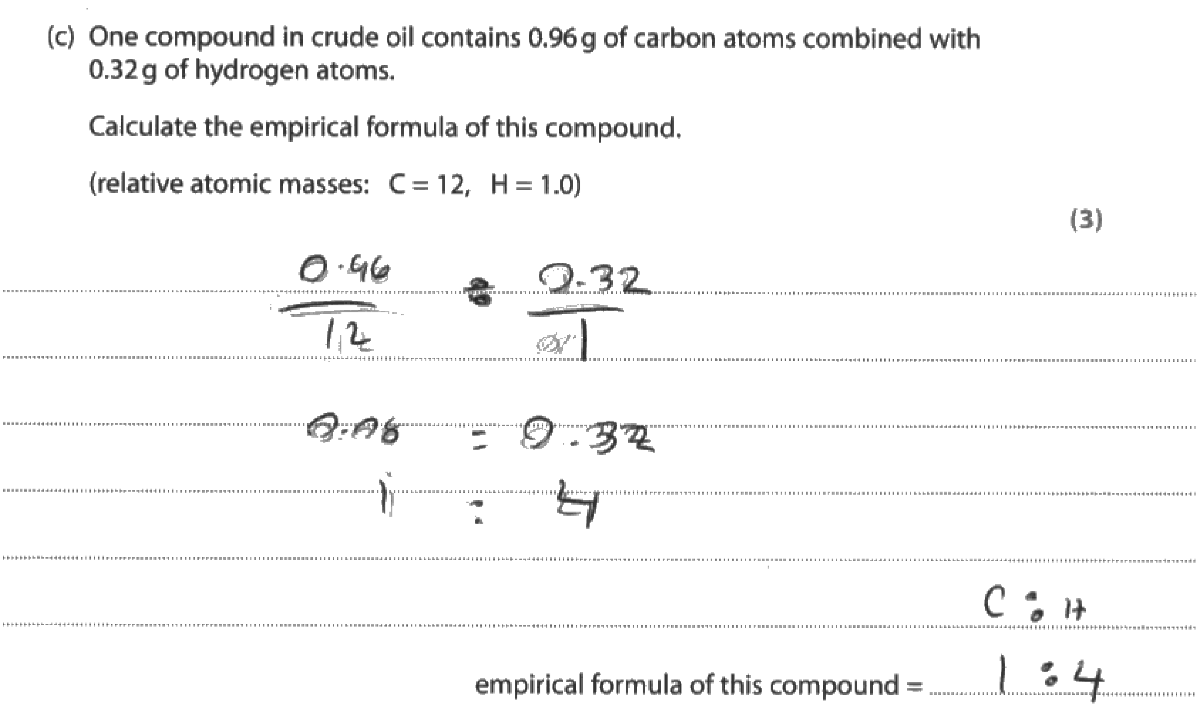
This example scored one mark. Although the candidate has only drawn one hydrogen and one oxygen, one mark is scored for the understanding that the type of bonding is covalent and so electrons should be shared.

Question 9(c)

Q09(c) asked candidates to calculate the empirical formula of a compound that contains 0.96g or carbon and 0.32g of hydrogen.

Candidates found this challenging with the vast majority scoring no marks. Candidates that did well set their working out in a logical way, often using table methods to get them to the correct answer.

A noticeable number of candidates tried a different calculation, possibly trying to calculate the relative atomic mass and gave an answer of 11.84.



(c) One compound in crude oil contains 0.96 g of carbon atoms combined with 0.32 g of hydrogen atoms.

Calculate the empirical formula of this compound.

(relative atomic masses: C = 12, H = 1.0)

(3)

$$\frac{0.96}{12} = \frac{0.32}{1}$$

$$0.08 = 0.32$$

$$1 : 4$$

C : H

empirical formula of this compound = 1 : 4

ResultsPlus
Examiner Comments

This example scored two marks. The candidate gained the first mark for giving the correct fraction for both H and O, they gained the second mark for giving this to the correct whole number ratio of 1:4. Unfortunately they did not score the last mark as they did not convert this ratio to the empirical formula.

(c) One compound in crude oil contains 0.96 g of carbon atoms combined with 0.32 g of hydrogen atoms.

Calculate the empirical formula of this compound.

(relative atomic masses: C = 12, H = 1.0)

(3)

C	H
$\frac{12}{0.96}$	$\frac{1.0}{0.32}$
$= \frac{12.5}{3.125}$	$= \frac{3.125}{3.125}$
$= 4$	$= 1$

$= C_4H_1$

empirical formula of this compound = C_4H_1

ResultsPlus
Examiner Comments

This response also gained two marks. The candidate has the initial fractions inverted and so did not score the first marking point. However as they have shown their working error carried forward was allowed and, as the ratios are correct for the fractions, the second mark is awarded, and the correct conversion of this ratio to the formula and so the third mark is awarded.

ResultsPlus
Examiner Tip

This example shows the importance of showing your working, the answer on the answer line alone would not have scored, but as working has been shown it can been seen where the error has occurred and error carried forward could be awarded.

(c) One compound in crude oil contains 0.96 g of carbon atoms combined with 0.32 g of hydrogen atoms.

Calculate the empirical formula of this compound.

(relative atomic masses: C = 12, H = 1.0)

(3)

	C		H
	0.96		0.32
÷	12	÷	1
÷	$\frac{0.08}{0.08}$	÷	$\frac{0.32}{0.08}$
	1	:	4

empirical formula of this compound = CH_4

ResultsPlus
Examiner Comments

This example shows a good response with clear working that scored all three marks. It should be noted that if the answer on the answer line was the only thing written no marks would have been awarded, working had to be shown to gain the marks.

Question 9(d)

Q09(d) was the second of the six-mark extended open response questions. The question asked candidates about the fractional distillation of crude oil, they were shown the positions of kerosene and fuel oil in a fractional distillation column and asked to describe the properties and uses of kerosene and fuel oil, they were asked to include the difference in boiling point, viscosity, ease of ignition, the uses of both and how fuel oil can be converted into kerosene.

As with the first extended open response question, candidates accessed the question well, with a good spread of marks across the range and only the most able scoring the full six marks, although more left this blank and so scored no marks than in 7(c).

A good proportion of candidates knew that kerosene was used as aircraft fuel, however fewer knew the use of fuel oil with many thinking that it is used in cars. A good proportion were able to give the differences in properties, although some had the properties the wrong way round thinking that because kerosene is higher up the column it would have a higher boiling point and viscosity.

*(d) Crude oil is separated into useful products called fractions using fractional distillation.

Figure 14 shows a fractional distillation column and the fractions kerosene and fuel oil.

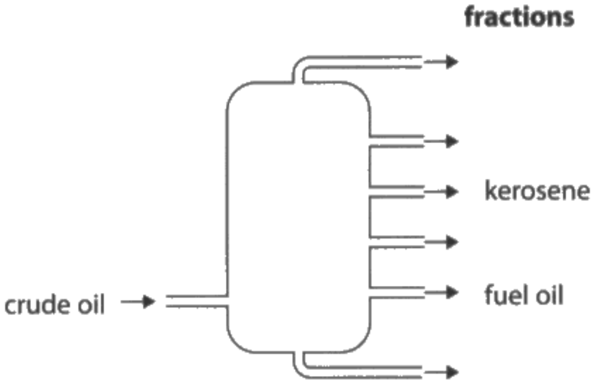


Figure 14

Kerosene and fuel oil have different uses depending on their properties.

Describe the properties and uses of kerosene and fuel oil.
Include in your answer

- the difference in boiling point
- the difference in viscosity
- the difference in ease of ignition
- their uses and how fuel oil can be converted into kerosene.

(6)

- Kerosene is used as a fuel for airplanes.

- fuel oil is used for cars

~~fuel oil has a~~

~~- fuel ooil is easy toignig~~ io

- fuel oil is easy to ignite.

- kerosene struggles to ignite.

- kerosene has more viscosity than fuel oil as it has to have enough energy to fuel big planes.

- fuel oil can be converted into kerosene by mass amounts of chemicals and other fractioning oils.

ResultsPlus
Examiner Comments

In this example, the candidate states that kerosene can be used as a fuel in airplanes, but they have not given a use for fuel oil. The candidate has the properties the wrong way around and states that fuel oil is easy to ignite, and kerosene is not, they state that kerosene is more viscous than fuel oil. They give a way to convert fuel oil to kerosene, but it is incorrect and so ignored. Therefore, one mark was awarded for one correct fact about kerosene.

*(d) Crude oil is separated into useful products called fractions using fractional distillation.

Figure 14 shows a fractional distillation column and the fractions kerosene and fuel oil.

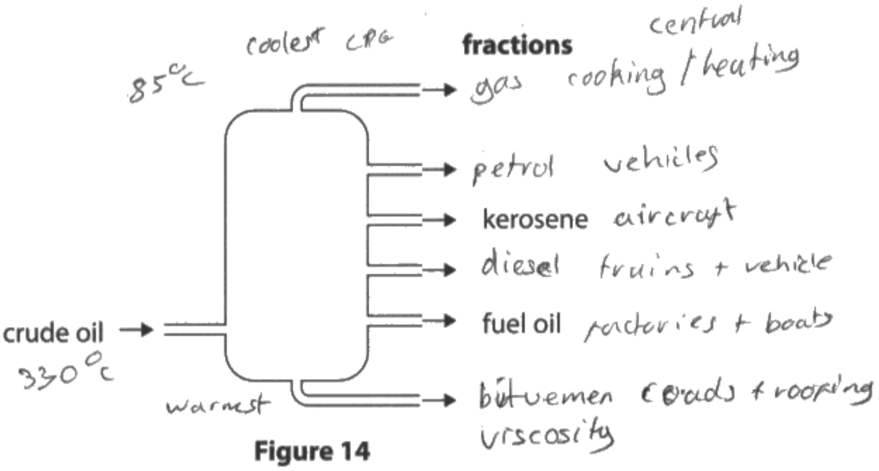


Figure 14

Kerosene and fuel oil have different uses depending on their properties.

Describe the properties and uses of kerosene and fuel oil.
Include in your answer

- the difference in boiling point
- the difference in viscosity thickness
- the difference in ease of ignition
- their uses and how fuel oil can be converted into kerosene.

(6)

Crude oil uses fractional distillation to seperate their different fractions.

- Gas - This is the coolest section of the container, and it is where gas is produced. The gas is used for things like LPG cans, or central heating and cooking in homes and workplaces. It has no viscosity.
- Petrol - This is close to the cooler side of the container, where petrol is made. ~~They~~ It is ~~are~~ used for things like vehicles and old boats, and is probably one of the cheapest fractions in the container. It's viscosity is very gloopy.

- Kerosene - This is right in the middle of the fractions, it is at a temperature of cool and warm, and it's viscosity is a thick gloopy liquid. It is used for aircraft and tanks, making it an expensive fraction.
- Diesel - This is near to the warm section of the columns, and it's viscosity is similliar to petrols in that it is gloopy and sticky but liquiedy and watery too. It's used for trains and certain vehicles.
- Fuel oil In One of the warmest columns of the container, and it's viscosity is very thick as it needs to burnt in big vehicles and powerstations + boats. It might be tied with expense in Kerosene.
- Bitumen - This is the hottest section of the columns. Straight from the 330°c crude oil this is where it is made. It's viscosity is extremely thick, with little to none water prescence in the substance. It's also extremely sticky. Bitumen is used in uses like roads, and roofing. It's useful to construction and road workers who also operate with tars + etc.

ResultsPlus
Examiner Comments

Many candidates did not read the question carefully and therefore spent a lot of time talking about the uses and properties of all the fractions rather than just kerosene and fuel oil as in this example. Only the information on kerosene and fuel oil was marked, the response gained three marks.

ResultsPlus
Examiner Tip

It is important that you read the question carefully and ensure that you focus your answer on the question in hand.

*(d) Crude oil is separated into useful products called fractions using fractional distillation.

Figure 14 shows a fractional distillation column and the fractions kerosene and fuel oil.

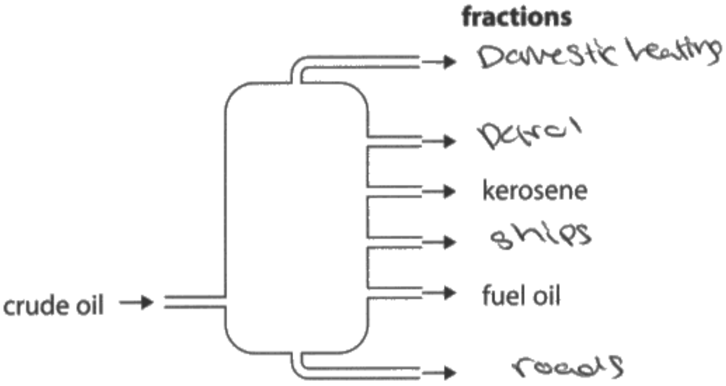


Figure 14

Kerosene and fuel oil have different uses depending on their properties.

Describe the properties and uses of kerosene and fuel oil.
Include in your answer

- the difference in boiling point
- the difference in viscosity
- the difference in ease of ignition
- their uses and how fuel oil can be converted into kerosene.

(6)

Kerosene is used to power aircraft.
fuel oil has a higher viscosity then kerosene.
fuel oil has a lower boiling point then kerosene
fuel oil is used to power ships.

Fuel oil:
- has a higher viscosity then kerosene
- has a higher boiling point
- has a lower flamability then kerosene due to high viscosity.

- used for ships

Kerosene:

- has a lower boiling point then fuel oil
- has less viscosity then fuel oil
- ~~has higher boiling point then fuel oil~~
- has higher flemability then fuel oil.
- used for aircraft in aviation.

- Fuel oil can be converted into ~~ea~~ kerosene through cracking - breaking down the double bonds.

ResultsPlus

Examiner Comments

In this example, the candidate has given the correct uses for both fuels. The candidate has given some correct properties and some incorrect, even with the errors, the correct ideas can be credited as the errors do not contradict them. They state that the fuel oil can be converted into kerosene by cracking, there is no further detail about the cracking. A mark of five was awarded.

*(d) Crude oil is separated into useful products called fractions using fractional distillation.

Figure 14 shows a fractional distillation column and the fractions kerosene and fuel oil.

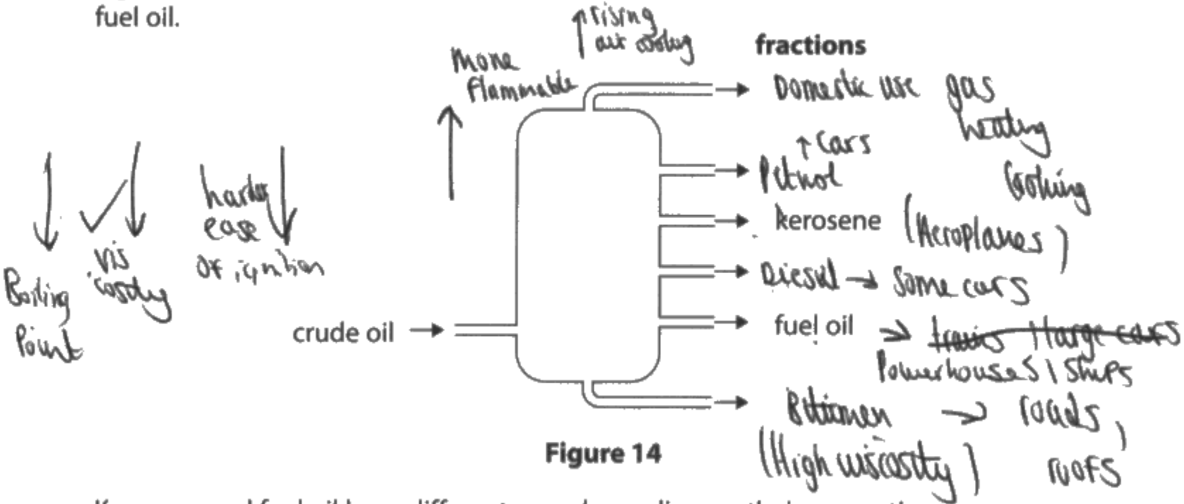


Figure 14

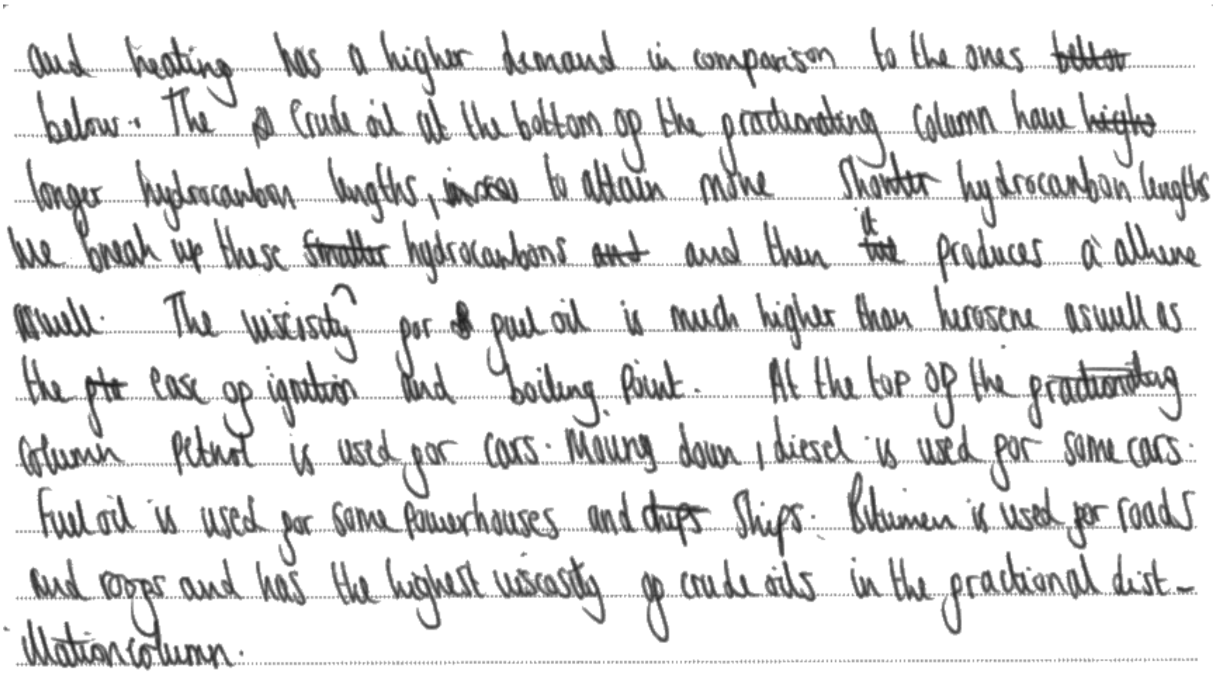
Kerosene and fuel oil have different uses depending on their properties.

Describe the properties and uses of kerosene and fuel oil.
Include in your answer

- the difference in boiling point
- the difference in viscosity
- the difference in ease of ignition
- their uses and how fuel oil can be converted into kerosene.

(6)

Crude oil is heated up, at the bottom of the ~~fractionatt~~ fractionating column. ~~the~~ it is the hottest. At the bottom of the fractionating column, Bitumen has the highest viscosity (thickness), as you move down the fractional distillation ~~column~~ Column the boiling Point also increases, at the top of the column the crude oils are the most useful. As ~~the~~ you move further up the Column the flammability increases. Rising air is why the top of the fractionating Column is cool. Kerosene is used for fuels for aeroplanes, but because of the high ~~viscosity~~ flammability, you need to earth aeroplanes beforehand. Whereas fuel oil is used for power houses ~~, Ships, tr~~ and large Ships, as ~~the~~ at the ~~co~~ top Crude oils Such as Petrol and the use of gas for domestic use



and heating has a higher demand in comparison to the ones ~~bottom~~ below. The Crude oil at the bottom op the practionating column have ~~highs~~ longer hydrocarbon lengths, ~~inorder~~ to attain more Shorter hydrocarbon lengths we break up these ~~smaller~~ hydrocarbons ~~and~~ and then ~~the~~ it produces a alkene aswell. The viscosity por puel oil is much higher than kerosene aswell as the ~~ptt~~ ease op ignition and boiling point. At the top op the ~~practionating~~ column petrol is used por cars. Moving down, diesel is used por some cars. Fuel oil is used por some powerhouses and ~~chips~~ Ships. Bitumen is used por roads and roofs and has the highest viscosity op crude oils in the practional distillation column.

ResultsPlus
Examiner Comments

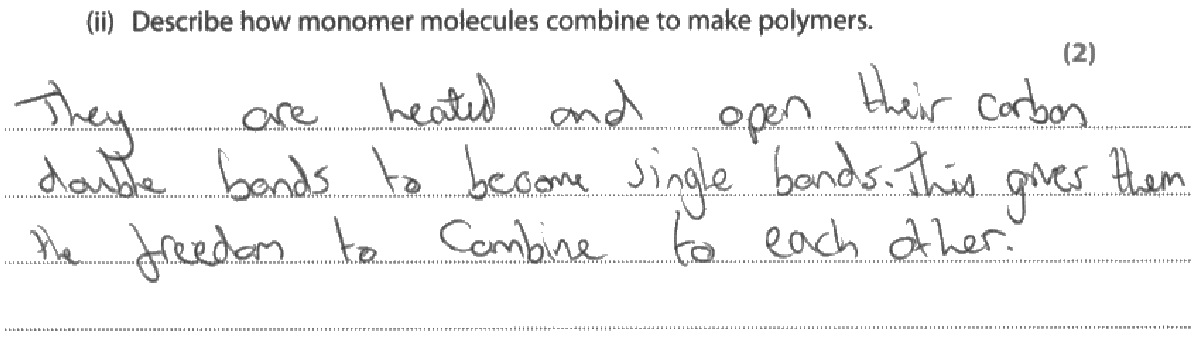
This example shows a good answer which scored the full six marks.

Question 10(a)(ii)

The last question on the paper asked candidates about the materials used to make crisp packets. Q10(a)(ii) asked candidates to describe how monomer molecules combine to make polymers.

Candidates found this challenging with only the most able scoring both marks for showing an understanding that the double bond of the monomer breaks and then links to form a long chain.

Many candidates did not score the second mark as they restated the stem saying that monomer molecules combine to make polymers.



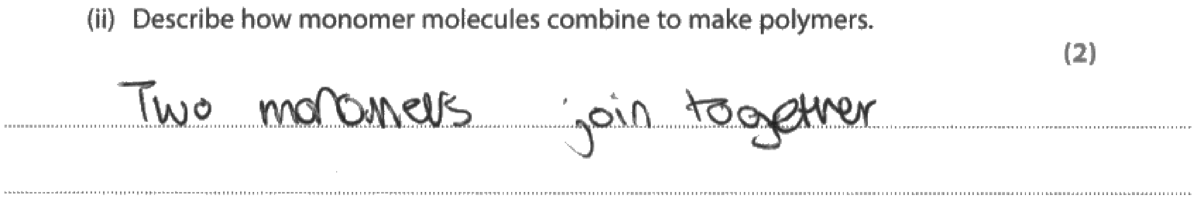
(ii) Describe how monomer molecules combine to make polymers.

(2)

They are heated and open their carbon double bonds to become single bonds. This gives them the freedom to Combine to each other.

ResultsPlus
Examiner Comments

This example scored one mark for stating that the double bonds open. The idea of the monomers combining did not score as this was given in the stem of the question.



(ii) Describe how monomer molecules combine to make polymers.

(2)

Two monomers join together

ResultsPlus
Examiner Comments

In this example there is no reference to the double bond breaking for the first marking point, but they do state that the monomers join together which gained the second mark.

(ii) Describe how monomer molecules combine to make polymers.

(2)

The C=C double bond breaks open so that the monomers can join to make polymers

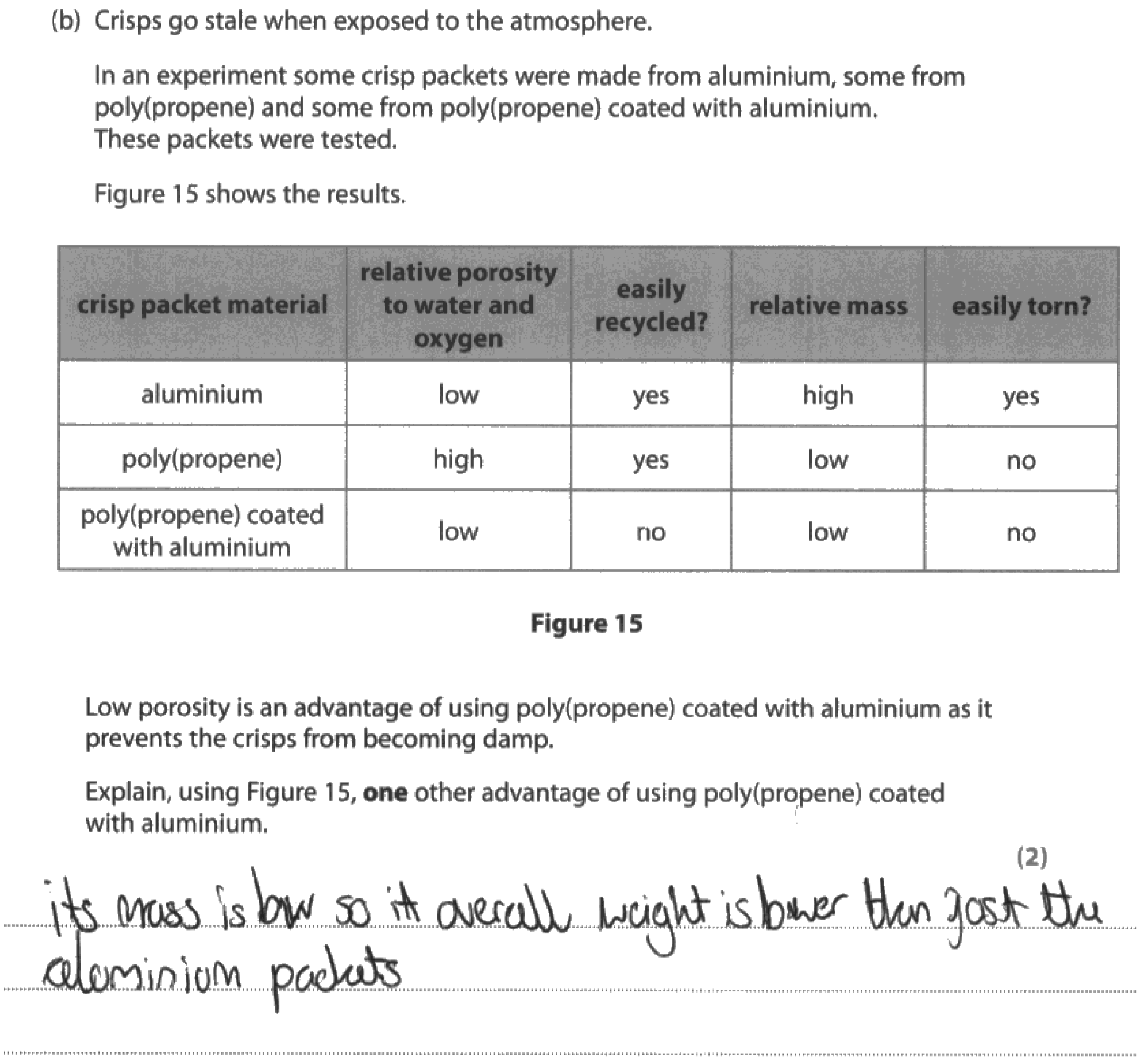
Results Plus
Examiner Comments

This example shows a good answer which scored both marks.

Question 10(b)

Q10(b) gave candidates a table showing the results of an experiment using different crisp packet materials. They were then asked to give an advantage of using poly(propene) coated with aluminium. The most common mark awarded was one, this was generally scored for the understanding that the crisp packet would not tear, the more able then explained that this meant that the crisps would not go stale, some stated that this meant that the crisps would not spill out which also scored.

Fewer stated that an advantage would be that it had a low mass, where this was given as an advantage, candidates found it hard to explain why this would be advantage.



(b) Crisps go stale when exposed to the atmosphere.

In an experiment some crisp packets were made from aluminium, some from poly(propene) and some from poly(propene) coated with aluminium.
These packets were tested.

Figure 15 shows the results.

crisp packet material	relative porosity to water and oxygen	easily recycled?	relative mass	easily torn?
aluminium	low	yes	high	yes
poly(propene)	high	yes	low	no
poly(propene) coated with aluminium	low	no	low	no

Figure 15

Low porosity is an advantage of using poly(propene) coated with aluminium as it prevents the crisps from becoming damp.

Explain, using Figure 15, **one** other advantage of using poly(propene) coated with aluminium.

(2)

its mass is low so it overall weight is lower than jost the aluminiom packets

ResultsPlus
Examiner Comments

This example scored one mark for stating that the mass is low scores, there is no reference to it being cheaper to transport to gain a second mark.

(b) Crisps go stale when exposed to the atmosphere.

In an experiment some crisp packets were made from aluminium, some from poly(propene) and some from poly(propene) coated with aluminium.
These packets were tested.

Figure 15 shows the results.

crisp packet material	relative porosity to water and oxygen	easily recycled?	relative mass	easily torn?
aluminium	low	yes	high	yes
poly(propene)	high	yes	low	no
poly(propene) coated with aluminium	low	no	low	no

Figure 15

Low porosity is an advantage of using poly(propene) coated with aluminium as it prevents the crisps from becoming damp.

Explain, using Figure 15, **one** other advantage of using poly(propene) coated with aluminium.

(2)

It is not easily torn meaning it won't get ripped open during transport so the crips won't go stale when exposed to atmosphere.

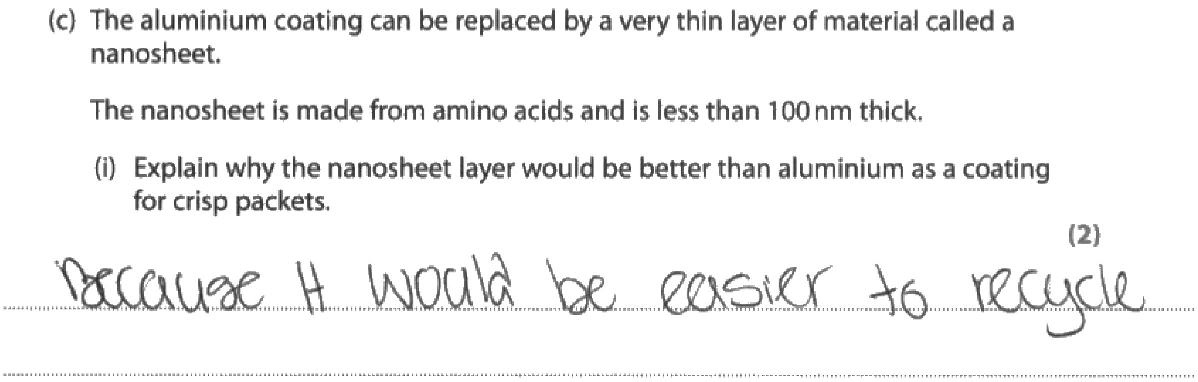
ResultsPlus
Examiner Comments

This response shows a good answer that scored both marks.

Question 10(c)(i)

Q10(c) told candidates that the aluminium coating of the crisp packet could be replaced by a very thin layer of material called a nanosheet. They were then asked to explain why the nanosheet layer would be better than aluminium as a coating for crisp packets. Candidates found this challenging with only the more able scoring and the most able scoring the full two marks for showing an understanding that less material would be used and so resources would be conserved or that it would cost less.

Some candidates stated that this would mean that it would be easier to recycle, this was ignored.



(c) The aluminium coating can be replaced by a very thin layer of material called a nanosheet.

The nanosheet is made from amino acids and is less than 100 nm thick.

(i) Explain why the nanosheet layer would be better than aluminium as a coating for crisp packets.

(2)

Because it would be easier to recycle

ResultsPlus
Examiner Comments

This example scored no marks as ideas about recycling were ignored.

(c) The aluminium coating can be replaced by a very thin layer of material called a nanosheet.

The nanosheet is made from amino acids and is less than 100 nm thick.

(i) Explain why the nanosheet layer would be better than aluminium as a coating for crisp packets.

walkers

(2)

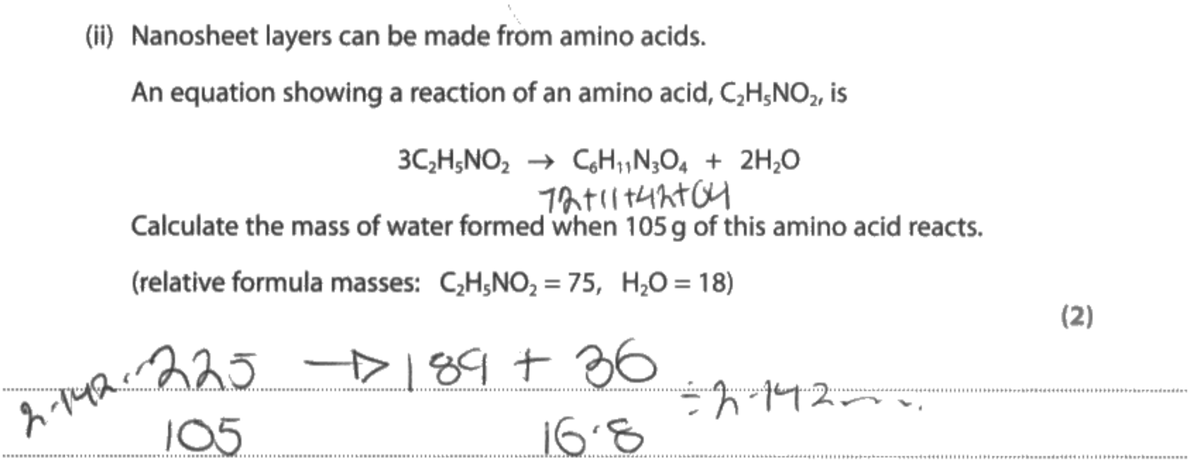
~~Costs~~ It would cost less and less would be used allowing money to be saved instead of using aluminium which is a valuble metal

ResultsPlus
Examiner Comments

This response shows a good answer which scored both marks.

Question 10(c)(ii)

Q10(c)(ii) told candidates that nanosheet layers can be made from amino acids and gave candidates the equation for the reaction of an amino acid. They were then asked to calculate the mass of water formed when 105g of the amino acid reacts. Again, candidates found this challenging with few knowing how to calculate the mass to score the full two marks and only the more able scoring one. Where one mark it was often for multiplying the mass of the amino acid by three and the mass of water by two.



(ii) Nanosheet layers can be made from amino acids.

An equation showing a reaction of an amino acid, $C_2H_5NO_2$, is

$$3C_2H_5NO_2 \rightarrow C_6H_{11}N_3O_4 + 2H_2O$$

72+11+42+64

Calculate the mass of water formed when 105 g of this amino acid reacts.

(relative formula masses: $C_2H_5NO_2 = 75$, $H_2O = 18$)

(2)

2.142 225 —▷ 189 + 36 ÷2.142...

105 16.8

This example scored both marks for calculating the mass of water as 16.8g.

(ii) Nanosheet layers can be made from amino acids.

An equation showing a reaction of an amino acid, $C_2H_5NO_2$, is

$$3C_2H_5NO_2 \rightarrow C_6H_{11}N_3O_4 + 2H_2O$$

Calculate the mass of water formed when 105 g of this amino acid reacts.

(relative formula masses: $C_2H_5NO_2 = 75$, $H_2O = 18$)

(2)

75 x 3 = 225

18 x 2 = 36

ResultsPlus Examiner Comments

This response gained one mark, the candidate has worked out the correct ratio but has not taken this further to gain the second mark.

Question 10(d)(i)

Q10(d)(i) showed candidates the structure of a molecule of malic acid. They were told that malic acid contains two type of functional group. In Q10(d)(i), they were told that the first type was -COOH and asked to give the name of this functional group. Only the more able were able to recognise that this was carboxyl group or carboxylic acid group.

(d) Some crisps contain malic acid.

The structure of one molecule of malic acid is shown in Figure 16.

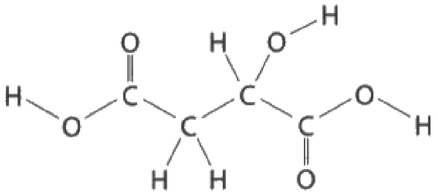


Figure 16

(i) Malic acid has two types of functional group.

One type is the –COOH functional group.

Give the name of this functional group.

(1)

Carboxylic acid.

ResultsPlus
Examiner Comments

This example scored the mark.

(d) Some crisps contain malic acid.

The structure of one molecule of malic acid is shown in Figure 16.

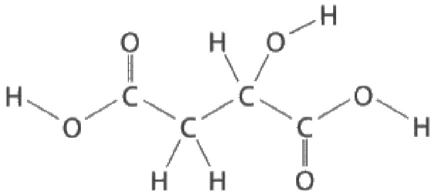


Figure 16

(i) Malic acid has two types of functional group.

One type is the –COOH functional group.

Give the name of this functional group.

(1)

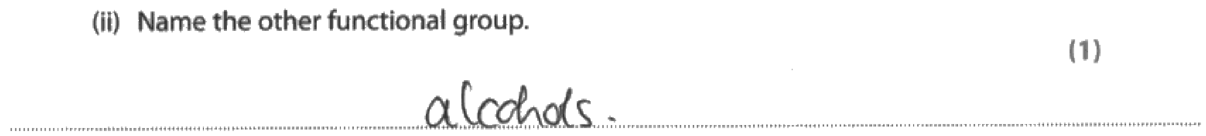
COOH

ResultsPlus
Examiner Comments

Some candidates repeated the stem of the question, this did not score.

Question 10(d)(ii)

Q10(d)(ii) asked candidates to name the other functional group. Again only the more able were able to name the other functional group to gain the mark.



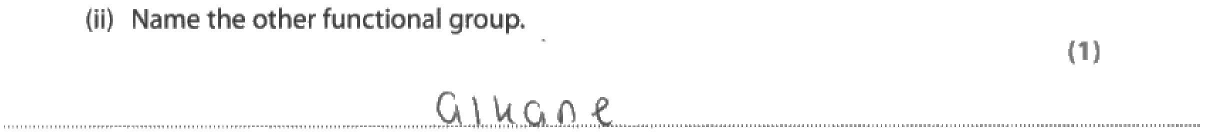
(ii) Name the other functional group.

(1)

alcohols.

ResultsPlus Examiner Comments

This example scored the mark.



(ii) Name the other functional group.

(1)

Alkane

ResultsPlus Examiner Comments

Some candidates stated alkane, this did not score.

Paper Summary

Based on their performance on this paper, candidates should:

- Practise common calculations from the specification, for example empirical formula, concentration, reacting masses and percentage by mass calculations, always showing any working.
- Learn how to convert units, eg cm^3 to dm^3.
- Ensure that when carrying out experiments in class, that they are aware of the names and purpose of the apparatus used and are able to explain what is happening and why in terms of the chemistry.
- Ensure that they are clear on key terms from the specification and when to use them.
- Learn keys tests from the specification, for example tests for ions, chlorine and for saturation in organic substances.
- Practise past papers, ensuring that you understand what is required from different command words such as explain and describe and remembering not to repeat the stem of the question as your answer.
- Practise drawing dot and cross diagrams of familiar and unfamiliar compounds.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link: https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

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