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Examiners' Report
June 2024

Int GCSE Single Science 4SS0 1C

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Introduction

Many candidates found this paper difficult and a lot of questions were left unanswered. The different levels of demand within a question and between questions allowed allowed the paper to discrimimate well; some of the more challenging questions on structure and bonding discrimimated between the stronger candidates whereas weaker candidates were able to access some of the marks in questions 1, 2 and 3. There was a good range of marks overall in this paper.

Many candidates understood the basic organic chemistry in question 1 although a number were not able to calculate the M_r for propane in 1(c). There was also some confusion between the molecular formula and the displayed formula of methane in 1(d).

In question 2 most candidates had clearly attempted chromatography, evidenced by the details they put in the method. 2(b) allowed many candidates to perform well by describing a method that would work well.

Question 3 discriminated well. Candidates should be encouraged to read the question carefully in 3(b)(ii) and highlight the number of significant figures required, a lot of answers were given to different numbers of significant figures.

Question 4 showed that a lot of candidates were not familiar with state symbols. It was pleasing to see a good performance in 4(b)(iii) where many candidates had clearly seen this type of graph before and were familiar with this style of question.

Question 5 showed a lot of confusion about bonding and structure. Many candidates had an understanding about covalent bonds but were unsure about simple molecular and giant covalent structures.

Many candidates showed a good understanding of sub-atomic particles in question 6 and could link the reactivity of caesium with its position in the periodic table. Many, however, struggled to describe how caesium atoms form ions and give the correct charges on the ions.

Many canddiates performed very well in the calculation in 7(c). The questions that related to practical work in 7(a) and 7(b) were less well answered.

Question 1 (c)

Candidates must use the periodic table to calculate the M_r of a compound. Many candidates have an answer of 11, which was the number of atoms in a molecule of propane. They needed to use the A_r of carbon as 12 and the A_r of hydrogen as 1 to get to an answer of 44.

Question 1 (d)

Many candidates confused the molecular formula and the displayed formula of methane. Many answers were given as CH_4, which is the molecular formula. The displayed formula of any organic compound must show every bond.

Question 1 (e)

A large number of candidates did not recognise that C_2H_4 is the molecular formula for ethene and the name of the compound formed is therefore poly(ethene). Candidates should write answers as clearly as possible as poly(ethane) did not score.

Question 2 (a)

This question was looking for two distinct comments about the differences between the **melting** points of a mixture and a pure substance e.g. a mixture melts over a range of temperatures and a pure substance has a sharp melting point.

2 (a) The melting point of solid Y is measured.

State how the result of this measurement would show whether Y is a pure substance or a mixture.

(2)

If it's pure it will boil at a fixed point, if not it will have a range of temperatures to boil.

ResultsPlus
Examiner Comments

This question referred to the melting point of solid Y. Any comments about boiling points were therefore ignored.

ResultsPlus
Examiner Tip

Read the question!

Question 2 (b)

This question was well answered. Candidates had clearly had a go at chromarography. Most candidates scored 4 marks for describing how chromatography is set up. Few scored 5 as many failed to say how it can be shown that X contains red and yellow dyes.

(b) A student is given three liquids. One liquid is a sample of a food colouring X, and the other liquids are a yellow dye and a red dye.

Describe a chromatography experiment that the student could do to show that X contains the yellow dye and the red dye.

(5)

- Draw base line at the bottom of the chromatography paper
- Dip the paper into the solvent of choice below the baseline
- When the solvent finishes moving up the paper, draw a line ~~[illegible]~~ it (solvent front)
- Put 3 dots for the 3 liquids on the base line
- Record each inks movement
- Once all 3 liquids stop moving, the movement has finished.
- If all dyes have moved the same distance, it shows that all of them are soluble in the chosen solvent
- Results show dye yellow, red and x moved the same distance
- This could mean food el colouring x contains yellow and red dye. ~~[illegible]~~

ResultsPlus
Examiner Comments

This answer scored 5 marks as the candidate has described how to set up a chromatography experiment **and** how to show that X contains both red and yellow dyes.

ResultsPlus
Examiner Tip

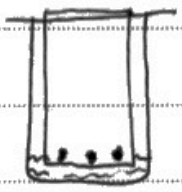
Read the question. Make sure you answer the full question as this candidate has.

(b) A student is given three liquids. One liquid is a sample of a food colouring X, and the other liquids are a yellow dye and a red dye.

Describe a chromatography experiment that the student could do to show that X contains the yellow dye and the red dye.

(5)

pure water at the bottom of a ~~cup~~ beaker and let the bottom is covered with water. fold a piece of paper. ~~and~~ put a stick through it. ~~hang the paper in the cup.~~ put all three dyes on the paper. hang the paper in the ~~cup~~ beaker and let dyes travels up.



ResultsPlus
Examiner Comments

Even though the question does not ask for a diagram, marks can be scored from a diagram, especially if labelled or with accompanying text.

ResultsPlus
Examiner Tip

Once again, read the question. This answer does not score full marks as the description does not include how the results could be used to show that X contains red and yellow dyes.

Question 3 (a)(ii)

A test such as the test for oxygen needs a test **and** a result.

(ii) Give a test for oxygen.

(1)

A glowing splint

ResultsPlus
Examiner Comments

This did not score as the candidate needed to say that the glowing splint **relights**.

Question 3 (b)(i)

This question was leading to a calculation of the percentage of oxygen in the air. The scientist quickly replaced the bung to stop the fumes of phosphorus oxide escaping. It would not matter if any air escaped or if anything entered the tube. Quite often there is a clue hidden in the question; in this case the third bullet point helped.

This is the scientist's method.

- remove the bung and record the initial water level in the glass tube
- use a hot metal rod to ignite the phosphorus and quickly replace the bung
- wait until all the white fumes have disappeared and the water level in the glass tube stops rising
- record the final water level in the glass tube

(i) Give a reason why the scientist quickly replaces the bung.

(1)

to avoid any gases escaping like oxygen

ResultsPlus
Examiner Comments

This did not score as the candidate mentioned oxygen escaping. If they had said to avoid any gas escaping, they would have been given the mark as 'benefit of the doubt'.

ResultsPlus
Examiner Tip

Read the question!.

Question 3 (b)(ii)

If a question is asking to calculate the percentage of a gas in the air, it is a good idea to think about what the answer should be. In this case an answer of 21% with no working did not score. Many candidates calculated the percentage of the air that was not oxygen whereas others lost marks by not giving their answer to 3 significant figures.

~~water~~ into the air outside the glass tube.

(ii) The table shows the scientist's results.

initial water level in arbitrary units	10.0
final water level in arbitrary units	18.3

Use the diagram and the results to calculate the percentage by volume of oxygen in the sample of air.

Give your answer to 3 significant figures.

(4)

$$\frac{18.3 - 10.0}{10} \times 100$$

$= 83\%$

percentage of oxygen = 83 %

ResultsPlus
Examiner Comments

This scored 2 marks. 18.3-10.0 scores and the candidate has shown that they can do a percentage calculation.

ResultsPlus
Examiner Tip

Read the question and **highlight** what's important. This could not score full marks as the answer was given to two significant figures, not three.

(ii) The table shows the scientist's results.

initial water level in arbitrary units	10.0
final water level in arbitrary units	18.3

Use the diagram and the results to calculate the percentage by volume of oxygen in the sample of air.

Give your answer to 3 significant figures.

(4)

18.3 - 10 = 8.3

50 - 10 = 40

$\frac{8.3}{40} \times 100 = 20.75$

percentage of oxygen = 20.8 %

ResultsPlus
Examiner Comments

This scored full marks as the answer was correct and the working was clearly laid out and easy to follow.

Question 3 (c)(i)

Many candidates correctly balanced the equation. Many used the blank space after the question for working which was a good idea.

Question 3 (c)(ii)

This question required the use for universal indicator **and** either correct colours or pH values to show if the solution of phosphoric acid was a strong or a weak acid. Other indicators such as phenolphthalein or methyl orange do not show how strong or weak an acid is and therefore did not score.

(ii) Describe how to show whether the solution is strongly acidic or weakly acidic.

(3)

Test the pH level of the solution with a litmus paper, if the paper turns more of a stronger colour, it is strongly acidic, if the colour isn't as strong, it is weakly acidic.

(Total for Question 3 = 11 marks)

ResultsPlus
Examiner Comments

This answer did not score as litmus is a two colour indicator. The candidate could have scored some credit if correct pH values had been included.

(ii) Describe how to show whether the solution is strongly acidic or weakly acidic.

(3)

Us pH indicator
if solution is strong acidic it
will give you in range of 0-3
if the solution is weak acidic it
will give you range 4-6

(Total for Question 3 = 11 marks)

ResultsPlus
Examiner Comments

This did score 3 marks as pH indicator was read as universal indicator.

ResultsPlus
Examiner Tip

Careful when quoting ranges of pH values or other values such as temperatures. 0-3 would score for a strong acid but 0-4 would not. It's often safer to give one value such as 1 for a strong acid and 5 for a weak acid.

(ii) Describe how to show whether the solution is strongly acidic or weakly acidic.

(3)

Use universal indicator or litmus indicator

Test: universal indicator, Result: Red for strong acidic or yellow/orange for weakly acidic

(Total for Question 3 = 11 marks)

ResultsPlus
Examiner Comments

In this case litmus could have negated the mark scored by universal indicator.

ResultsPlus
Examiner Tip

Careful to only give one answer for each mark.

Question 4 (a)

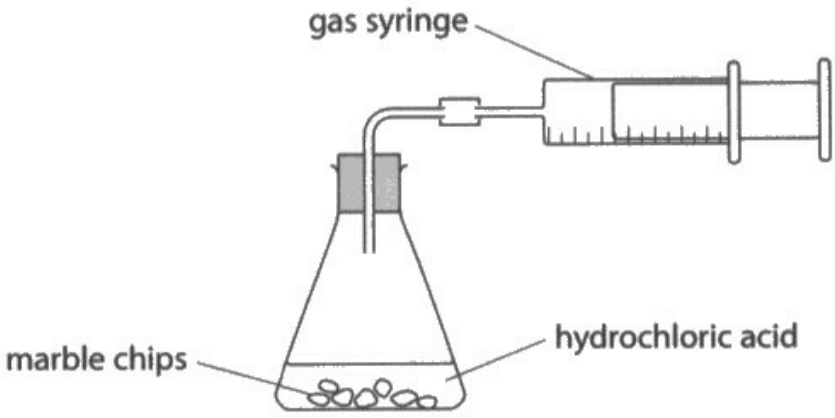
Many candidates scored 1 mark as they identified that the equation wasn't balanced. To score more they had to be specific and say that there needed to be a 2 in front of HCl.

Many candidates didn't seem to know the difference between (aq) for a solution and (l) for a liquid so didn't score the mark for saying that $CaCl_2$ needed to be (aq) not (l).

Question 4 (b)(i)

This question was well answered by most. The majority of candidates correctly concluded that the reaction had stopped because the marble chips were in excess or that the hydrochloric acid was limiting.

(b) The student uses this apparatus to investigate the effect of the concentration of hydrochloric acid on the rate of the reaction with marble chips.



In the first experiment the student records the total volume of carbon dioxide gas in the gas syringe every 30 seconds.

(i) When the reaction has finished, some marble chips remain in the flask.

Give a conclusion the student could make about the reaction.

(1)

All the hydrochloric acid has used up forming carbon dioxide gas. The excess marble chips remain.

ResultsPlus
Examiner Comments

This scored a mark as both statements were correct.

Question 4 (b)(ii)

This question was looking for an observation so the student would know that the reaction had stopped. This could have related to no more effervescence or no more gas being collected in the syringe. Many candidates scored here.

(ii) State how the student would know that the reaction has finished.

(1)

When the marble chip stop reacting

ResultsPlus
Examiner Comments

This was not specific enough to score as the candidate has simply restated what is in the question. If they had added 'so no more bubbles' this answer would have scored.

(ii) State how the student would know that the reaction has finished.

(1)

If it stays constant and if bubbles Stopped showing

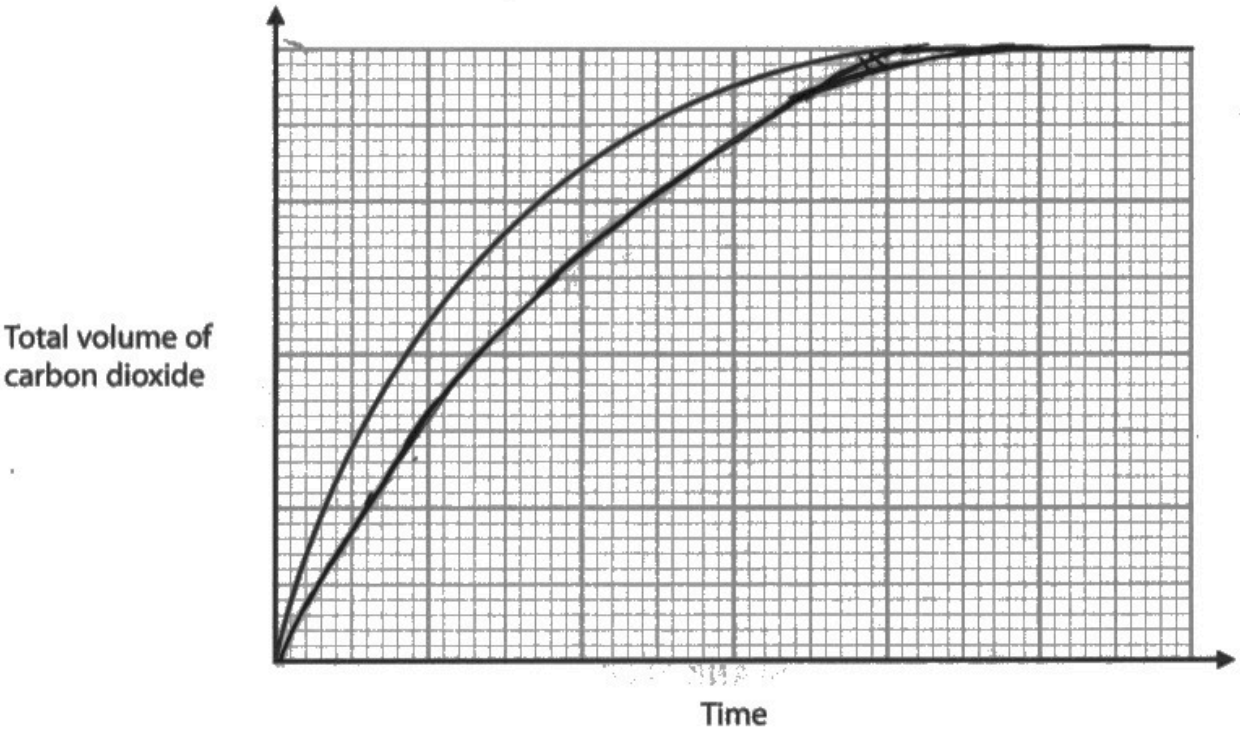
ResultsPlus
Examiner Comments

This answer did score as there is a reference to no more bubbles showing.

Question 4 (b)(iii)

This question was well answered by many who were familiar with this type of graph from practical work or this type of question from previous series of exams. A number thought that as the volume of CO_2 increased, the rate of reaction must increase when in fact it decreases. To score more than 2, candidates had to link the shape of the graph with the rate of reaction.

(iii) The graph shows the student's results.



Explain how the shape of the curve shows how the rate of reaction changes as the time increases.

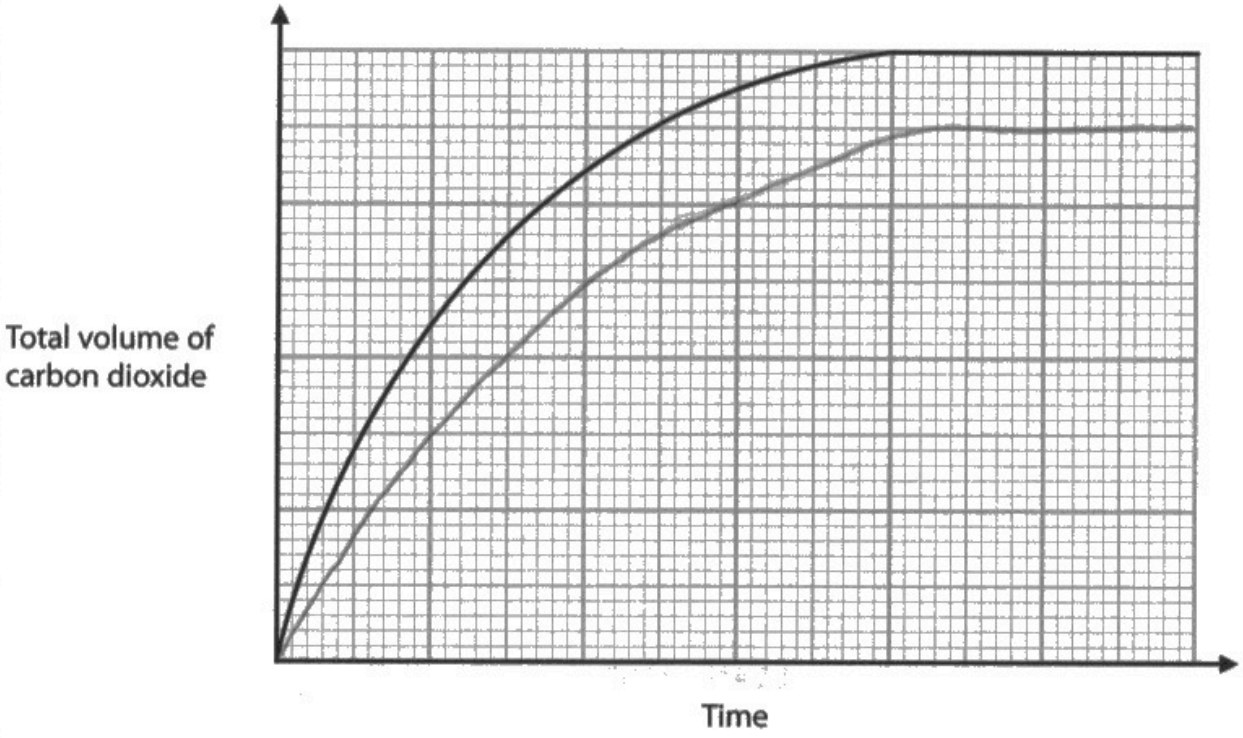
(3)

The rate of reaction gradually increases as time increases, it is not on steep curve since the reaction does not happen instantly, at the end of the reaction the volume of carbon dioxide stays the same as all the reactants have finished

ResultsPlus
Examiner Comments

This scored 2 marks. The first comment about rate increasing is incorrect, marks are scored for recognising the end of the reaction and the volume of CO_2 stays the same.

(iii) The graph shows the student's results.



Explain how the shape of the curve shows how the rate of reaction changes as the time increases.

(3)

The curve has become steeper and it shows that when the ~~that~~ total volume of carbon dioxide increase the rate of reaction will increase. After some time the reaction has come to a stop.

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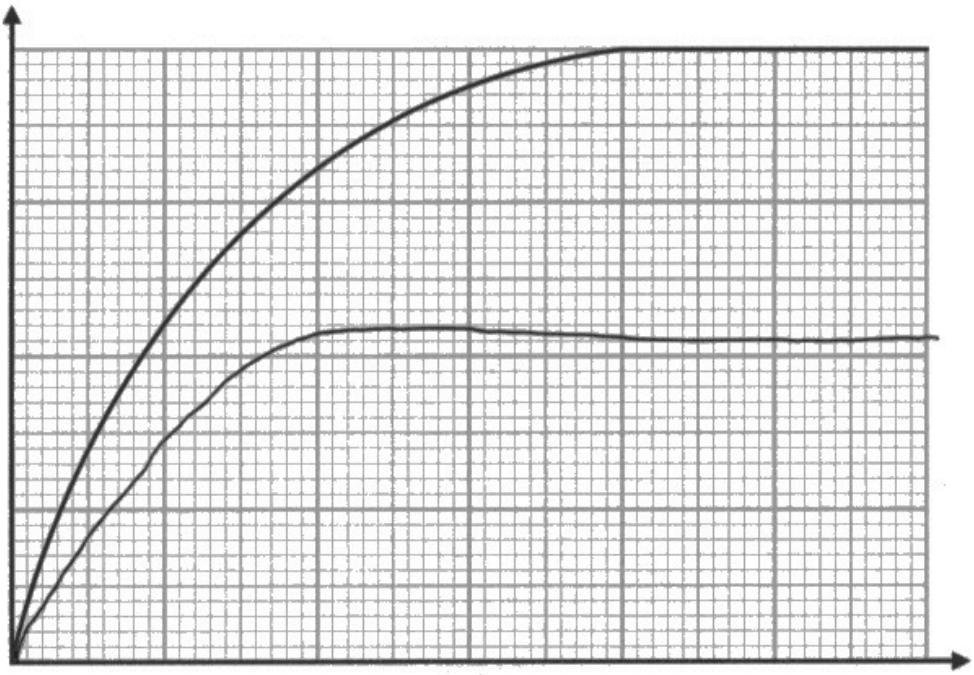
Examiner Comments

This candidate only scored 1 mark for the reaction stopping. There is no link in the last sentence to the shape of the graph.

Question 4 (b)(iv)

Many candidates scored 1 mark for drawing a curve that was below the original. To score 2 marks, the curve had to show half the volume of gas being produced.



Explain how the shape of the curve shows how the rate of reaction changes as the time increases.

(3)

as time increases the rate of reaction gets slower because of the hydrochloric acid losing concentration and giving off a lot of CO_2 until at some point the reaction finishes so the reaction stops giving CO_2.

(iv) The student repeats the experiment using the same mass of marble chips and the same volume of hydrochloric acid. However, the acid is only half as concentrated as the acid used in the first experiment.

On the grid, draw the curve you would expect the student to obtain in the second experiment.

(2)

(Total for Question 4 = 9 marks)

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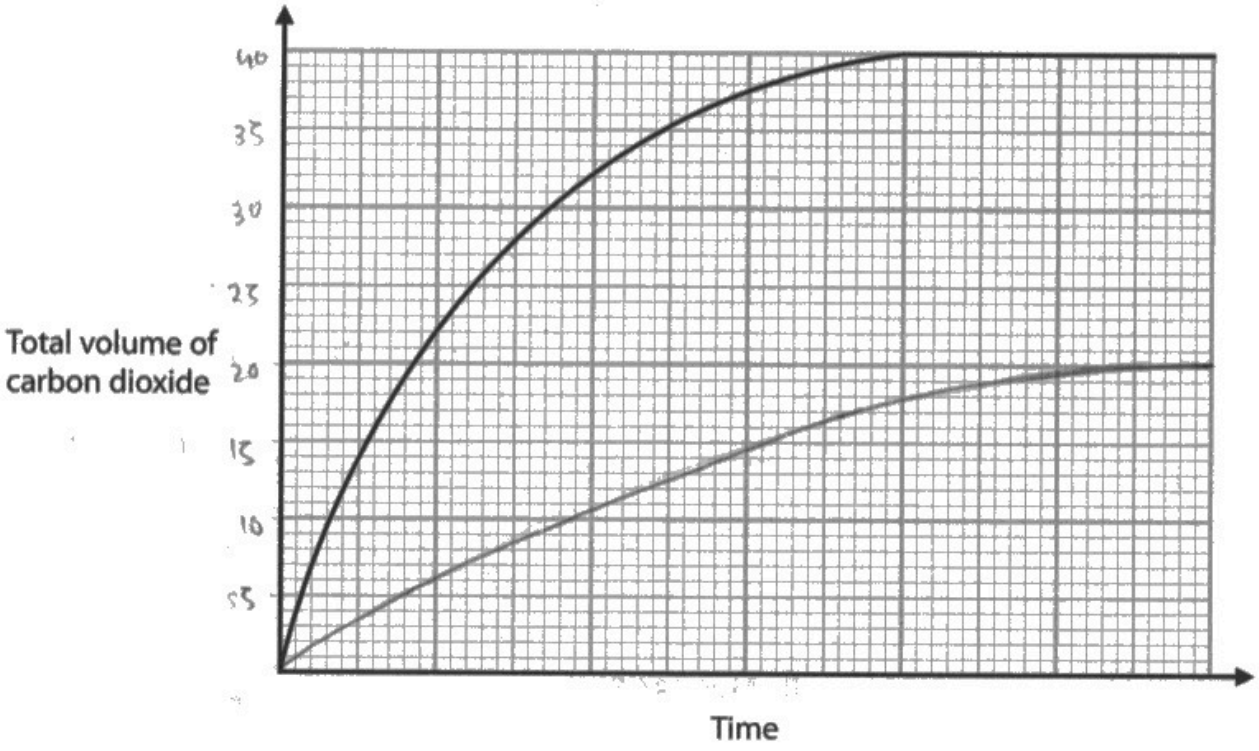
Examiner Comments

This didn't score the second mark as it was felt the line was too high at the end.

ResultsPlus
Examiner Tip

Care with the precision of lines and points in graphs. The tolerance is usually +or – half a square.



Explain how the shape of the curve shows how the rate of reaction changes as the time increases.

(3)

In the beginning, the gradient the rate of reaction is the steepest since at the start more ~~concentration of~~ molecules of marble chips and HCl is present. Therefore, greater and more successful collisions, so rate of reaction is at its highest. As the content gets used up, the gradient decreases so rate of reaction decreases. At the end, a constant volume is seen because all the HCl has been used up, so the reaction is over.

(iv) The student repeats the experiment using the same mass of marble chips and the same volume of hydrochloric acid. However, the acid is only half as concentrated as the acid used in the first experiment.

On the grid, draw the curve you would expect the student to obtain in the second experiment.

(2)

(Total for Question 4 = 9 marks)

ResultsPlus
Examiner Comments

This scored both marks as half the original volume of CO_2 is produced.

Question 5 (a)

Many candidates scored 1 mark for mentioning sharing electron(s). To score both marks they needed to refer to shared **pair(s)** of electrons.

5 Hydrogen sulfide (H_2S) contains covalent bonds between the sulfur atom and the hydrogen atoms.
Hydrogen sulfide has a low melting point and a low boiling point and is a gas at room temperature.

(a) Describe how covalent bonds are formed.

(2)

Covalents bonds are formed when 2 atoms share an electron in their outer shell without gaining or losing any.

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Examiner Comments

This only scored 1 mark as it is not clear that a pair of electrons is shared. If the candidate had said two atoms share an electron each, the second mark would have been awarded.

5 Hydrogen sulfide (H_2S) contains covalent bonds between the sulfur atom and the hydrogen atoms.
Hydrogen sulfide has a low melting point and a low boiling point and is a gas at room temperature.

(a) Describe how covalent bonds are formed.

(2)

Covalent bonds are formed when two non-metal atoms share one or more pairs of electrons from their valence shell.

ResultsPlus
Examiner Comments

This scored both marks as it is clear that pairs of electrons are shared.

Question 5 (b)

This question discriminated well as relatively few candidates scored 3 marks. Candidates need to be clear as to what bond or force is broken or overcome when substances boil. In this case they needed to identify the structure as **simple molecular** and the forces overcome as **weak intermolecular forces** which therefore require **little energy to overcome.**

Many candidates lost marks for stating that weak intermolecular forces occurred between bonds or between atoms. Many candidates failed to score the third mark for stating that the weak intermolecular forces required **less** energy to overcome as it was unclear as to what they were comparing the energy to.

(b) Explain why hydrogen sulfide has a low boiling point.

Refer to structure and forces of attraction in your answer.

(3)

Hydrogen sulfide has a low boiling point due to the weak intermolecular forces of attraction. This means that it does not take much energy to overcome these forces of attraction. Also it has a simple covalent structure ~~this~~ these structures tend to have low melting / boiling points.

ResultsPlus
Examiner Comments

This scored all three marks.

- correct structure
- correct forces
- little energy to overcome

(b) Explain why hydrogen sulfide has a low boiling point.

Refer to structure and forces of attraction in your answer.

(3)

Hydrogen sulfide is a covalent bond with a simple molecular struture. This makes it have weak intermolecular forces of attraction making it reqvire low amount of energy to break its bonds.

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Examiner Comments

This response was limited to 1 mark as the candidate refers to breaking bonds.

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Examiner Tip

Be clear! Identify which force or bond is being broken or overcome.

outershell .

(b) Explain why hydrogen sulfide has a low boiling point.

Refer to structure and forces of attraction in your answer.

(3)

Hydrogen sulfide is a simple molecular structure. There are weak intermolecular ~~for~~ forces between the molecules. So less energy is required to break these forces. Thus it has a low boiling point.

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Examiner Comments

Avoid comparatives unless it is clear what you are comparing. This candidate had probably done a question comparing the boiling point of something with a simple molecular structure with something with a giant covalent structure such as diamond, in which case it would be correct to compare the energy required to overcome the intermolecular forces with the energy required to break the bonds.

Question 5 (c)

Many candidates scored a mark for identifying diamond as a giant or giant covalent structure. References to lattices were ignored.

Question 6 (a)

Most candidates could use the atomic number and mass number of caesium to work out the numbers of protons, neutrons and electrons.

Question 6 (b)(i)

To score, candidates needed to appreciate that the reaction of sodium with water would not produce a flame and that in both cases hydrogen would be produced. Most candidates scored with an answer of effervescence. Other acceptable answers included turning into a ball or moving on the surface of the water.

(b) A small piece of sodium metal is added to a trough of water. A rapid reaction takes place.

A small piece of caesium metal is added to another trough of water.

(i) Predict one observation that could be made in both reactions.

(1)

explosive

ResultsPlus
Examiner Comments

No mark here. Sodium would not explode in water.

(b) A small piece of sodium metal is added to a trough of water. A rapid reaction takes place.

A small piece of caesium metal is added to another trough of water.

(i) Predict one observation that could be made in both reactions.

(1)

~~metal gets ...~~ flame

ResultsPlus
Examiner Comments

No mark here as sodium would not produce a flame in water.

Question 6 (b)(ii)

The majority of candidates scored something in this question as they recognised that caesium is more reactive than sodium. Few scored full marks as they had to say that caesium is below sodium in the group **and** that reactivity increases down the group.

Marks could be scored by giving an answer in terms of how the atomic strucure changes down the group e.g. caesium is more reactive than sodium because its atoms have more shells meaning the outer shell electron is more easily lost.

(ii) Predict how the reaction of caesium with water compares with the reaction of sodium with water.

Refer to the trend in reactivity of Group 1 metals in your answer.

(3)

Caesium will be more reactive than Soeium and could act more vigourosly as reactivity increases down the group and caesium is below Sodium.

ResultsPlus
Examiner Comments

A concise answer that scores all 3 marks.

(ii) Predict how the reaction of caesium with water compares with the reaction of sodium with water.

Refer to the trend in reactivity of Group 1 metals in your answer.

(3)

The reactivity increases the further down the group one element, since sodium is ~~more~~ above ceasium, ~~then~~ it will be less reactive than ceasium which is highly reactive

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Examiner Comments

The reverse argument was also accepted. This candidate also scored 3 marks.

Question 6 (c)(i)

Most candidates realised that chlorine is in the halogens. Any references to groups were ignored in this question.

Question 6 (c)(ii)

Most candidates did not score. Many incorrectly wrote the formula for caesium chloride as $CsCl_2$ rather than CsCl. Others didn't realise that chlorine is diatomic.

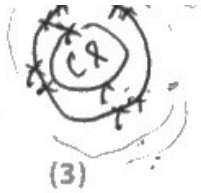
Question 6 (d)(i)

Few candidates scored full marks in this question even though there were 4 marking points and a maximum of 3 marks. There was some confusion about sharing of electrons or the incorrect number of electrons being transferred. Many candidates did not write a specific enough answer and simply stated with ions were positive or negative rather than giving the magnitude of the charge.

Some candidates scored a maximum mark of 2 by referring to chlor**ine** ions or chlor**ide** atoms.

(d) The bonding in caesium chloride is ionic.

(i) Describe how caesium atoms and chlorine atoms form ions, giving the charges on the ions.



(3)

Caseium needs to ~~gain~~ lose one electron to complete it's outer shell whilst Chlorine needs to gain one ~~to~~ two complete it's outer shell thus Cl would have a negative charge whilst Ca would have a positive

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Examiner Comments

Always give the magnitude or the charge on an ion e.g X^{+} or Y^{2-} This candidate clearly knew as they correctly identified one electron being lost and one being gained which left the examiner with a bit of working out to do!

(d) The bonding in caesium chloride is ionic.

(i) Describe how caesium atoms and chlorine atoms form ions, giving the charges on the ions.

(3)

Caesium atoms form positive ions, called cations, and the ionic charge for Caesium is +1, whereas the Chlorine atoms form negative ions, called anions, and has an ionic charge of -1, meaning that the Caesium atom can donate an electron to the chlorine atom. (ions are formed by electrons in the outer shell).

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Examiner Comments

A clear answer that scores all 4 points giving the maximum mark of 3.

Question 6 (d)(ii)

Many candidates scored both marks for correctly identifying the forces of attraction in ionic bonds as electrostatic forces or attraction between oppositely charged ions. There was some confusion with covalent bonding and occasionally metallic bonding.

(ii) Explain what is meant by the term **ionic bonding**.

(2)

Ionic bonding is when atoms give or take an electron from its outermost shell.
This takes place between metals and non-metals.

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Examiner Comments

This answer describes how ions form not what ionic bonding is.

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Examiner Tip

Answer the question!

Question 6 (d)(iii)

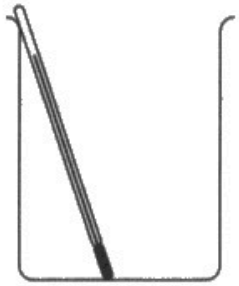
Many candidates realised that caesium chloride has a high melting or high boiling point. Other candidates scored for saying that caesium chloride would conduct electricity when molten or dissolved in water.

Question 7 (a)

Candidates found this question challenging as many had not followed the instruction to refer to Step 4 of the method. A simple answer of 'the reaction is exothermic since the temperature increases' would score 2 marks.

7 When a salt dissolves in water, a heat energy change may occur.

A student uses this apparatus to find the heat energy change that occurs when magnesium sulfate dissolves in water.



This is the student's method.

Step 1 add 50.0 cm^3 of water to the beaker

Step 2 record the initial temperature of the water

Step 3 add 3.0 g of magnesium sulfate and stir carefully using the thermometer

Step 4 record the highest temperature of the solution

(a) Explain how Step 4 shows what type of heat energy change occurs when the magnesium sulfate dissolves.

(2)

~~if the heat rises its exothermic~~

if the temperature rises its exothermic

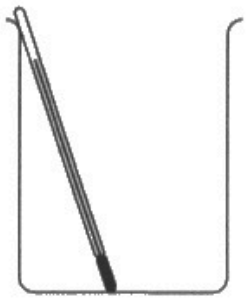
if the temperature ~~down~~ drops then its endothermic

ResultsPlus
Examiner Comments

This answer did not score. The candidate clearly understands what exothermic and endothermic mean but did not refer to the information in step 4.

7 When a salt dissolves in water, a heat energy change may occur.

A student uses this apparatus to find the heat energy change that occurs when magnesium sulfate dissolves in water.



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Step 4 record the highest temperature of the solution

(a) Explain how Step 4 shows what type of heat energy change occurs when the magnesium sulfate dissolves.

(2)

as the ~~en~~ heat energy will go to the Sarroundings

ResultsPlus
Examiner Comments

One mark here for heat energy going to the surroundings but no link with the reaction being exothermic.

Question 7 (b)

Many candidates found this question very challenging. In this question 'explain' meant 'give a change to the apparatus and explain why it works'. The first mark was for some sort of insulation or a better insulator such as a polystyrene cup which would reduce the heat energy lost to the surroundings. A number of candidates didn't score the second mark as they said that using a polystyrene cup would prevent **all** heat energy being lost. Using a polystyrene cup will prevent **some** heat energy being lost to the surroundings. There was some confusion with cotton wool preventing liquids splashing out, presumably from the reaction of marble chips with hydrochloric acid.

(b) Explain one change that could be made to the student's apparatus that would improve the accuracy of the results.

(2)

By using a polystyrene cup instead of a beaker a
the cup is an insulator and will let less heat to
escape to its surroundings therefore giving more
accurate results as less heat is lost to the surroundings

ResultsPlus
Examiner Comments

This would score both marks as the polystyrene cup would prevent some heat escaping.

(b) Explain one change that could be made to the student's apparatus that would improve the accuracy of the results.

(2)

They could use a polysterene
~~cup~~ cup. Its a better insulator and
stops any heat loss to the surround-
ings.

ResultsPlus
Examiner Comments

This only scores the first mark as the polystyrene cup with not prevent all the heat being lost to the surroundings.

Question 7 (c)

The vast majority of candidates scored something in this final question. Many scored 1 mark for the temperature rise of 11.2°C. Others scored 3 marks out of 4 for forgetting to convert to kJ.

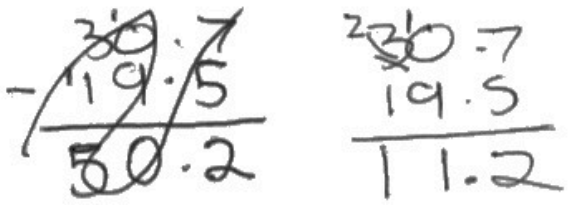
(c) The table shows the student's results.

initial temperature of the water	19.5 °C
highest temperature of the solution	30.7 °C

Calculate the heat energy change (Q), in kJ, that occurs when magnesium sulfate dissolves in water.

[for the solution, mass of 1.00 cm^3 = 1.00 g c = 4.2 J/g/°C]

(4)



Q = ... kJ

(Total for Question 7 = 8 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
Examiner Comments

One mark here for the correct temperature rise.

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

initial temperature of the water	19.5 °C
highest temperature of the solution	30.7 °C

Calculate the heat energy change (Q), in kJ, that occurs when magnesium sulfate dissolves in water.

[for the solution, mass of 1.00 cm^3 = 1.00 g c = 4.2 J/g/°C]

(4)

Q = 0.12894 kJ

(Total for Question 7 = 8 marks)

TOTAL FOR PAPER = 60 MARKS

This could not be given any credit as there was no working and it was unclear how the candidate had arrived at the answer.

Avoid just giving an answer with no working.

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

initial temperature of the water	19.5 °C
highest temperature of the solution	30.7 °C

Calculate the heat energy change (Q), in kJ, that occurs when magnesium sulfate dissolves in water.

[for the solution, mass of 1.00 cm^3 = 1.00 g c = 4.2 J/g/°C]

(4)

$Q = mc\Delta T$

$\Delta T = 30.7°C - 19.5°C$

$Q = 50 \times 4.2 \times 11.2$

$= 11.2°C$

$Q = 2352\,J \div 1000$

~~1000~~

$Q = 2.35\ kJ$

$Q =$ 2.35 kJ

(Total for Question 7 = 8 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
Examiner Comments

A perfect answer with clear working.

Paper Summary

Based on their performance on this paper, candidates should:

- Read the question at least twice before starting the answer.
- Highlight or underline what's important in the question to help make sure you are answering the question or giving a numerical answer to the correct number of significant figures or in the correct units.
- Use bullet points in answers – perhaps one bullet point per mark.
- Make sure you know the difference between describe and explain. Explain questions need a linking word such as 'therefore' or 'because'.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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