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Examiners' Report
June 2025

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 the paper to discriminate well; some of the more challenging questions on structure and bonding discriminated 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 atomic structure of an element and its position in the periodic table. The knowledge of the subatomic particles within an atom is also evidenced, as seen in question 1.

Question 2 showed a lot of candidates were familiar with the particle model for the three states of matter, in terms of the movement and arrangement of particles.

Candidates answered well with the observations in question 3, but many struggled to explain the final colour of the universal indicator and to complete the equation for the reaction of lithium with water.

Many candidates found question 4 challenging, many struggled to describe the results shown on a chromatograph and to calculate an R_f value. QO4(c) discriminated well. It was pleasing to see that a good number of candidates were able to give a detailed description of a method to obtain pure crystals of sodium chloride from a mixture.

Question 5 showed that a lot of candidates were not familiar with state symbols. Many candidates did less well in QO5(b)(ii) where they struggled to provide a suitable improvement to the experiment in the question.

Many candidates understood the basic organic chemistry in question 6, although a number of candidates were less familiar with part Q06(c)(i) regarding the practical work. Many candidates knew the chemical test for water.

Question 7 showed that a lot of candidates were familiar with the problems with the disposal of polymers. Many candidates did less well in the calculation in Q07(a)(ii). Many candidates struggled to find out the value of n, which is the number of chloroethene molecules in a molecule of poly(chloroethene) with a given M_r. However, the heat energy change was better attempted.

Question 8 showed a lot of confusion about bonding and structure. Many candidates had an understanding of covalent bonds but were unsure about simple molecular structure and how they are linked to the melting point.

Question 1(a)

Many candidates correctly identified the nucleus.

Question 1(d)

Many candidates answered well. The most common incorrect answer was Rubidium.

Question 2(a)(i)

Most candidates scored here. Where they lost mark was to state melting and boiling together.

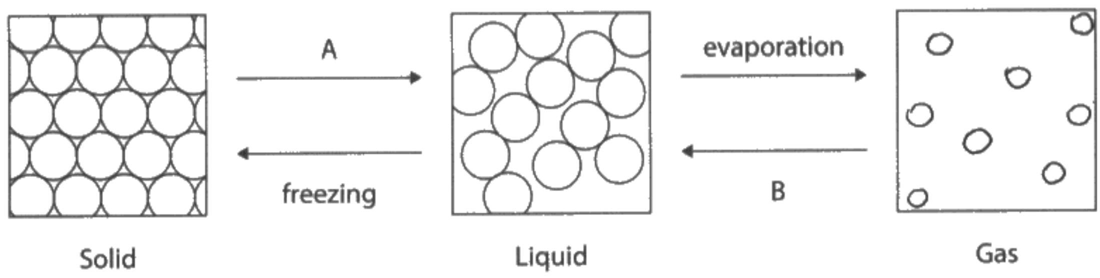
Question 2(a)(ii)

Most candidates correctly stated condensing or condensation. The most common mistake seen here was sublimation.

Question 2(b)

Most candidates got two marks here. Some candidates discussed intermolecular forces while others discussed loose packing of particles, which were not creditworthy. A small minority of candidates stated 'no fixed shape', which is a property rather than the arrangement of particles.

2 The diagram shows how particles are arranged in a solid and a liquid, and some changes of state.



(a) (i) Name the change of state labelled A.

(1)

melting

(ii) Name the change of state labelled B.

(1)

condensing

(b) Describe the movement and arrangement of particles in a gas.

(2)

the molecules in gas are spreadout without any order with lots of space. the molecules will not be touching each other

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Examiner Comments

Read the question carefully. This response scored one mark for the arrangement of particles in a gas. The same mark was scored in the diagram drawn. However, the candidate had not described the movement of the particles.

Question 3(a)

Most candidates scored a mark for 'alkali metals' in this question, where the most common mistake was the omission of the word 'metals'.

Question 3(b)(ii)

Most candidates scored the first marking point for the correct identification of the final colour of the universal indicator. Many candidates referred to lithium being an alkali rather than the solution itself. Others gave generic answers, for instance, red in acid, blue in alkali, without specifying which colour would be observed in this reaction. A few candidates referred to the high pH of the solution which could still be credited.

This response here scored two marks for the correct identification of the final colour of the universal indicator, either blue or purple would have scored, and an explanation for the final colour.

(ii) After the reaction stops, the teacher adds a few drops of universal indicator to the solution in the trough.

Explain the final colour of the universal indicator.

(2)

The universal indicator solution turns blueish purple since the solution is alkaline.

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Examiner Comments

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Examiner Tip

Use a definite colour. NB blue or purple!

Question 3(b)(iii)

A lot of candidates struggled to complete the equation correctly. There was a range of incorrect answers seen, including LiO, LiH_2O, LiO_2 and H. If the formulae are incorrect, then there will be no balancing mark.

Question 4(a)

Most candidates scored a mark here. The most common mistake is choosing 'crystallisation' over 'simple distillation' as the best method for separating water from sodium chloride. The other mistake often seen was ticking more than one method for the separation.

Question 4(b)(i)

A good proportion of candidates scored two marks. There are, however, many answers focused on solubility rather than composition, stating that Y contained the most soluble dyes.

Dyes were described as colours or colourings, or spots which did not score.

(i) Describe what the results show about the composition of food colouring Y.

(2)

The Food colouring Y contains dye B, dye D and an unknown colour dye.

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Examiner Comments

This is a concise answer that scored two marks.

(i) Describe what the results show about the composition of food colouring Y.

(2)

The ~~solution~~ composition of Y is very soluble and it has 3 spots. ~~and~~

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Examiner Comments

This response scored no marks because the description did not include what those 3 spots on the chromatograph showed, ie which dyes the food colouring Y was made up of.

(i) Describe what the results show about the composition of food colouring Y.

(2)

Food colouring Y has more dye colours than any other dye in the chromatography paper. This is because solvent has reacted strongly with the dye.

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Examiner Comments

This response did not address what the question was asking, namely the composition of food colouring Y, therefore no marks were awarded here.

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Examiner Tip

Read the question twice!

Question 4(b)(ii)

Most candidates knew how to calculate an R_f value. Although the baseline was not labelled in the question, many answers had 8.2 cm for the distance travelled by solvent, which was correct. The distance travelled by dye recorded by the majority of candidates was within 1.5 to 1.8 cm. The most common error was to have the division the wrong way around.

(ii) Calculate the R_f value of dye B.

(2)

$$\frac{\text{distance moved by spot}}{\text{distance travelled of solvent}} = \frac{1.8}{8.2} = 0.22 \text{ //}$$

R_f value = 0.22

ResultsPlus
Examiner Comments

This response scored two marks. Both the distance travelled by dye and the distance travelled by solvent were correctly measured, and the R_f value was correctly evaluated.

(ii) Calculate the R_f value of dye B.

(2)

$8.2 \div 1.7 = 4.82353$

distance between start line and solvent front - 8.2 cm

distance of dye B from the start line - 1.7

R_f value = 4.82353

ResultsPlus
Examiner Comments

This response scored one mark. Both the distance travelled by dye B and the distance travelled by the solvent were correct. However, the division was inverted, so the second marking point was not awarded.

Question 4(c)

Many candidates recognised the need to use filtration and/or crystallisation, but forgot to add water beforehand. Some suggested using a mortar and pestle to grind the samples before adding the solvent, while others suggested picking out the large pieces first with gloves/bare hands. Some candidates suggested melting the mixture, and that will separate them based on their melting points. The methods given largely lacked the understanding that the question is asking for a scientific method, not one that involves picking out the pieces of glass, or "sieving" them.

(c) A student accidentally breaks a glass test tube containing crystals of sodium chloride.

Describe a method to obtain pure crystals of sodium chloride from the mixture of sodium chloride crystals and broken glass.

(3)

scoop the sodium chloride and glass remains then add it to a test tube with water. filter the mixture with filtration paper and a funnel to remove any glass. heat the mixture until water is evapolated and sodium chloride crystals remain

ResultsPlus
Examiner Comments

This response scored three marks as the candidate described the method in the correct order and stated the correct methods to separate pure sodium chloride crystals from the broken glass.

(c) A student accidentally breaks a glass test tube containing crystals of sodium chloride.

Describe a method to obtain pure crystals of sodium chloride from the mixture of sodium chloride crystals and broken glass.

(3)

- Crystallisation
- Filtration
- Fractional distillation.

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Examiner Comments

This scored no marks. The candidate had simply listed three methods but had not described how the separation could be achieved.

ResultsPlus
Examiner Tip

Answering in the form of a list can risk negating any correct part of the response.

(c) A student accidentally breaks a glass test tube containing crystals of sodium chloride.

Describe a method to obtain pure crystals of sodium chloride from the mixture of sodium chloride crystals and broken glass.

(3)

Firstly, add water to the mixture and filter it to obtain a residue of broken glass. then, evaporate the water from the mixture of water and sodium chloride. this leaves just the crystals behind.

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Examiner Comments

This is a concise and well-expressed answer that scored three marks.

Question 5(a)

Many candidates scored one mark for CO_2 (g) and H_20 (l). There were some other configurations of gaining one mark but candidates who scored two were few and far between. Many had $Ca(OH)_2$ as (l) and $CaCO_3$ as (aq) which were incorrect responses. Solid as a symbol was rarely used.

Question 5(b)(i)

A lot of candidates were confused about how the experiment worked to remove CO_2 from syringe A. This is evidenced by not subtracting the two readings to find the volume change.

A significant proportion of answers were given to two decimal places rather than two significant figures. 56% was the most common incorrectly calculated answer.

(b) These are the student's results.

volume of gas in syringe A at the start = 80 cm^3

volume of gas in syringe B at the start = 0 cm^3

volume of gas in syringe B at the end = 45 cm^3

(i) Using these results, calculate the percentage of carbon dioxide removed in the experiment.

Give your answer to 2 significant figures.

(3)

$80 - 45 = 35\ cm^3$ of CO_2 remaining

$\frac{45}{80} = 0.5625 \times 100 = 56.25\%$

percentage of carbon dioxide removed = 56.25 %

ResultsPlus
Examiner Comments

This response scored one mark for the correction volume of CO_2 removed. However, the percentage calculation was incorrect, error carried forward would have been allowed for third marking point if the answer had been rounded to 2 significant figures, ie 56%.

(b) These are the student's results.

volume of gas in syringe A at the start = 80 cm^3

volume of gas in syringe B at the start = 0 cm^3

volume of gas in syringe B at the end = 45 cm^3

(i) Using these results, calculate the percentage of carbon dioxide removed in the experiment.

Give your answer to 2 significant figures.

(3)

$$\frac{45}{80} \times 100 = 56.25\% - 100$$

percentage of carbon dioxide removed = ~~56.25~~ 43.75 %

ResultsPlus
Examiner Comments

This response scored two marks. The candidate had used an alternative working to arrive at the percentage CO_2 removed by subtracting the percentage of Helium left (in syringe B) from 100 which is 43.76%. The final mark was lost as the answer was not given to 2 significant figures.

Question 5(b)(ii)

Most candidates found this question challenging. A good proportion of candidates were able to gain one mark, mainly by stating the use of more limewater as an improvement to the experiment. Some candidates suggested to seal the equipment in some way to prevent CO_2 from the air interfering with the result. Others suggested "repeat it", or "conduct a limewater test" – without saying this is to be done as an additional step in the method given so it read not as an improvement but just a chemical test for CO_2.

Second marking point was rarely scored. Often when first marking point was scored, a qualitative statement about limewater turning cloudy was given rather than linking to a measurement of volume.

(ii) **Explain an improvement to the experiment to make sure that all the carbon dioxide has been removed from the mixture of gases.**

(2)

Swap syringe A and B and ~~do the~~ repeat the experiment until the ~~[illegible]~~ volume of gas stays the same in the syringe

ResultsPlus
Examiner Comments

This response scored full marks, showing a clear understanding of how this experiment works and a realistic improvement to the experiment to make sure all the CO_2 can be removed from the mixture of gases.

(ii) Explain an improvement to the experiment to make sure that all the carbon dioxide has been removed from the mixture of gases.

(2)

To keep passing the gas through the limewater ~~to~~ to ensure all of it has reacted.

ResultsPlus
Examiner Comments

This response scored one mark as the idea of how to remove the CO_2 by limewater was evidenced, although it did not go on to explain how to ascertain that **all** CO_2 had been removed.

(ii) Explain an improvement to the experiment to make sure that all the carbon dioxide has been removed from the mixture of gases.

(2)

shaking the lime water so that all of the carbon dioxide is mixed with the lime water. ~~and the~~

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Examiner Comments

This response scored no marks. The suggested improvement would not work using the existing apparatus.

ResultsPlus
Examiner Tip

Study the diagram in the question more carefully and suggest small modifications made to the apparatus to improve the experiment.

Question 6(a)

Most candidates knew the general formula of alkanes, hence were able to work out the formula for $C_{34}H_{70}$.

Question 6(b)

The majority of answers were comparative, some by giving statements about both fractions. Those that did not score marking point 1 or 2 tended to have the trends reversed. Another common mistake was giving the incorrect colours for either gasoline or fuel oil. A small minority of answers interchanged melting and boiling points for marking point 2.

It was apparent that many candidates were unclear of the meaning of viscosity, giving contradictory answers eg thicker so less viscous.

(b) State the differences between the fuel oil and gasoline fractions, in terms of colour, boiling point and viscosity.

(3)

colour

Fuel oil is more yellow than gasoline Fraction.

boiling point

Fuel oil have a ~~boiling point~~ less boiling point that gasoline Fractions

viscosity

~~Crude oil~~ ~~a~~ gasoine less ~~more~~ viscosity ~~that~~ than Fuel oil.

ResultsPlus
Examiner Comments

This response scored the first marking point for the correct comparison of colours between fuel oil and gasoline. The comparison of the boiling point was the wrong way around. ‘Less viscosity’ is not credited, the candidate must use the correct terminology or comparative terms for this type of question.

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Examiner Tip

If in doubt, avoid guessing colours for any of the fractions, but simply state darker or lighter when comparing colours.

(b) State the differences between the fuel oil and gasoline fractions, in terms of colour, boiling point and viscosity.

(3)

colour

The color of gasoline is more of a brown-yellow. Meanwhile the fuel oil is yellow.

boiling point

The boiling point of fuel oil is 100° meanwhile the gasoline is 80°

viscosity

The gasoline viscosity is stronger than fuel oil

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Examiner Comments

This response scored one mark for the correct comparison between fuel oil and gasoline in terms of their boiling points, although the exact values of the boiling points were not taken into consideration. It was the idea of fuel oil having a higher boiling point than that of gasoline that mattered.

Question 6(c)(i)

Many candidates scored one mark here. A significant proportion of candidates were aware of the need to cool the vapour, but did not necessarily suggest an appropriate improvement. For example, adding a condenser, a cooler or cooling jacket, and using a longer tube.

Others focused on the production or collection of more water vapour into the U-tube in order to increase the volume of water collected, suggesting alterations to the candle, funnel size and position, and vacuum pump.

(i) Explain a modification to the apparatus to allow more water to collect in the U-tube.

(2)

add a way to cool the water vapor by adding ice For example

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Examiner Comments

This was just sufficient to score a mark as the candidate has suggested to add ice to cool the water vapour. However, the candidate did not specifically stated that the water vapour condenses so the second marking point was not gained.

(i) Explain a modification to the apparatus to allow more water to collect in the U-tube.

(2)

by adding a cover around the candle So that no water vapour can leak out the funnel or escape

ResultsPlus
Examiner Comments

This response scored no marks as the suggested modification would not allow more water vapour condensing.

Question 6(c)(ii)

A good number of candidates knew the products of incomplete combustion, but many identified the black solid as carbon monoxide. Others gave good explanations, but then described the process as complete combustion. One common incorrect answer included some sort of reaction with the plastic funnel.

(ii) Explain the formation of the black solid inside the funnel.

(2)

The combustion of the candle burn is incomplete, so carbon is produce and stick to the funnel

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Examiner Comments

This response showed a good understanding of incomplete combustion and provided a concise answer to the question, which scored full marks.

(ii) Explain the formation of the black solid inside the funnel.

(2)

The black solid formed is carbon monoxide or carbon soot, formed by the incomplete combustion of the alkane

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Examiner Comments

This response would have scored two marks. The first marking point was not awarded as the candidate has identified the black solid as either carbon monoxide or carbon or soot. The second marking point however, could still be gained.

(ii) Explain the formation of the black solid inside the funnel.

(2)

The black solid forms by the wax burned from the candel, so it gets in the funnel.

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Examiner Comments

The response scored no marks as the candidate did not fully understand the (in)combustion reaction and what the products might be.

Question 6(c)(iii)

This question asked for a chemical test to show that the liquid in the U-tube contains water, and yet many candidates suggested heating the liquid to check if it boils at 100°C, which would indicate that it is pure water. Other incorrect answers included checking the pH or using universal indicator to test the liquid. There were, however, a very small number of candidates who could describe the use of anhydrous cobalt chloride paper as their test, instead of the most common answer of anhydrous copper sulfate. Some candidates would answer with the correct colour change, namely, white powder turns blue, but no chemical name or incorrect chemical substance used, which scored zero marks.

(iii) Describe a chemical test to show that the liquid in the U-tube contains water.

(2)

Anhydrous Copper(III) sulfate is a dehydrated white substance that lacks water of crystallization. When water is added to the substance, it turns blue.

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This response scored two marks. Either anhydrous or white copper sulfate scores the first marking point. The candidate made a small error in stating copper (III) sulfate instead of copper (II) sulfate, which was ignored. The colour change was correct, therefore the second marking point was awarded.

(iii) Describe a chemical test to show that the liquid in the U-tube contains water.

(2)

Use ph paper and see if the colour is yellow or compare the colour to the ph scale it shows at 7

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Examiner Comments

This response scored no marks. A common answer that had prevented many candidates from scoring. Some candidates found this a difficult test to recall and were describing other incorrect chemical tests.

Question 7(a)(i)

This question asked for two problems associated with polymer disposal, although not explicitly stated in the question, one answer should be linked to landfill and the other incineration. It was pleasing to see that many candidates were able to achieve two marks. Those who did not score two marks tended to give vague responses, eg harmful gases produced, contaminate the environment, hurt the habitat of wildlife, contribute to pollution, pollute soil or oceans, and polymers are toxic, rather than products of combustion are toxic.

A good number of candidates suggested increased CO_2 released when burned, and some included the environmental impact of CO_2.

A small number of candidates misunderstood what the questions were asking, referred to the diagrams of the monomer and polymer and referenced the number of bonds, the "n" and the way they had been drawn.

7 This question is about alkenes.

(a) This is the equation for the polymerisation of chloroethene to form poly(chloroethene).

chloroethene poly(chloroethene)

The number of chloroethene molecules used to form one molecule of poly(chloroethene) is represented by n.

(i) Give two problems with the disposal of polymers.

(2)

1 Polymers are hard to break down, as they have more bonds ~~and a tag~~

2 Polymers can add waste to the earth due to it being hard to break down

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Only first marking point scored. The candidate understood the idea that polymers were hard to break down, however, the second answer was too vague to score.

7 This question is about alkenes.

(a) This is the equation for the polymerisation of chloroethene to form poly(chloroethene).

chloroethene poly(chloroethene)

The number of chloroethene molecules used to form one molecule of poly(chloroethene) is represented by n.

(i) Give two problems with the disposal of polymers.

(2)

1 They are not biodegradable is it can't be broken down.

2 If it is ~~burnt~~ burned it will form a toxic gas.

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Examiner Comments

This response answered the question well, and scored two marks. The candidate gave two problems associated with the different methods of disposing of polymers: one for the landfill and the other for burning or incineration.

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Examiner Tip

It is advisable to qualify the production of waste, eg toxic gases or greenhouse gases as a result of burning polymers.

7 This question is about alkenes.

(a) This is the equation for the polymerisation of chloroethene to form poly(chloroethene).

chloroethene poly(chloroethene)

The number of chloroethene molecules used to form one molecule of poly(chloroethene) is represented by n.

(i) Give two problems with the disposal of polymers.

(2)

1 It does not have enough hydrogen molecules

2 It is alkane

![ResultsPlus Examiner Comments]

This response scored no marks. The candidate misunderstood what the question was asking and referred to the diagrams of the monomer and polymer in the question.

Question 7(a)(ii)

Many candidates found this question very challenging. In this question, 'show' meant that the candidate needed to demonstrate how the value of n is approximately 4700. The most common mistake involved calculations dividing 295750 by 4700. While this approach did not score, it was not clear that the candidates were able to interpret the value they gave. However, those with the correct approach were able to compare their answer with the approximate value given, and many did so.

This response scored no marks and exemplified a common mistake. The candidate did not know the significance of the calculation shown and therefore had not addressed what the question asked.

(ii) A molecule of poly(chloroethene) has an M_r of 295 750

Show that the value of n is approximately 4700

(3)

~~4228~~ 295 750 ÷ 4700 = 69.92

(ii) A molecule of poly(chloroethene) has an M_r of 295 750

Show that the value of n is approximately 4700

C = 12
H = 1
Cl = 35.5

(3)

C_2H_4
C_2H_3Cl

C_2H_3Cl

2(12) + 3(1) + 35.5

24 + 3 + 35.5

→ 62.5 × 4700 = 293750 which is really close to 295750 showing that n is approximately 4700

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Examiner Comments

This response scored one mark. The candidate worked out first the M_r of chloroethene. However, instead of dividing the M_r of poly(chloroethene) by the M_r of chloroethene, the candidate multiplied the M_r of chloroethene by 4700, which meant that the subsequent marks were not scored.

(ii) A molecule of poly(chloroethene) has an M_r of 295 750

Show that the value of n is approximately 4700

(3)

Mr of 1 mol of poly(chloroethene)

$= (12 \times 2) + 3 + 35.5 = 62.5$

$n = \frac{295,750}{62.5} = 4,732 \rightarrow 2\text{ s.f} = 4,700$

$n = 4,700$

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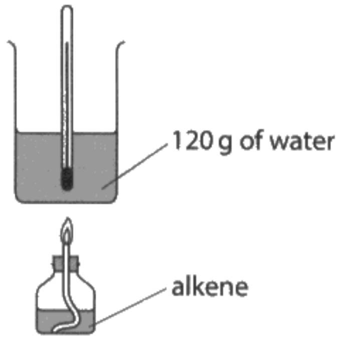
This response scored full marks. The candidate laid out the work clearly and easily to follow. This also demonstrated a secure understanding of the approach taken to address what the question asked.

Question 7(b)(i)

The vast majority of candidates scored something in this question. Marking points 1 and 2 frequently scored. Common errors included incorrect temperature readings, multiplying only by c and not using $Q = mc\Delta T$, calculating percentages and dividing the value by 1000 at the final stage, converting J in to KJ, which was unnecessary. Of the answers not awarded full marks, many missed a valuable mark by not giving the steps in their calculation.

(b) A scientist uses this apparatus to find the heat energy change when a liquid alkene is burned.



The diagram shows the reading on the thermometer before and after the experiment.

Before **After**

(i) Calculate the heat energy change in J.

[for water, $c = 4.2\ J/g/°C$]

(4)

4.2x 120x 20

40-20 = 20

heat energy change = 10080 J

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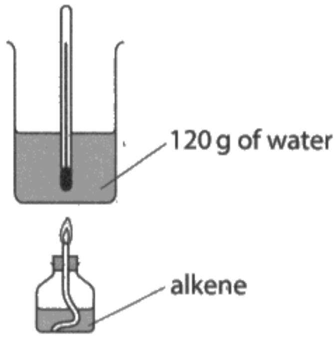
This response scored three marks. The candidate misread the temperature readings, so lost a mark here. The mark for ΔT was still awarded as an error carried forward, and the rest of the calculation was done correctly so credited accordingly.

(b) A scientist uses this apparatus to find the heat energy change when a liquid alkene is burned.



The diagram shows the reading on the thermometer before and after the experiment.

(i) Calculate the heat energy change in J.

[for water, $c = 4.2$ J/g/°C]

(4)

41 − 19 = 22

heat energy change = 22 J

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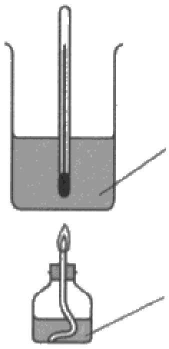
Examiner Comments

Despite the incorrect temperature readings, one mark was awarded here for the ΔT as an error carried forward.

(b) A scientist uses this apparatus to find the heat energy change when a liquid alkene is burned.



The diagram shows the reading on the thermometer before and after the experiment.

(i) Calculate the heat energy change in J.

[for water, $c = 4.2\,J/g/°C$]

(4)

Q = 4.2 × 120 × ~~4T~~

4.2 × 120 × 41 J

19 + 22. J = 41. J

heat energy change = 20916 J

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Examiner Comments

In this response, the candidate misread the temperature readings and gave incorrect ΔT, by adding two readings. However, $Q = mc\Delta T$ was used in the calculation and correctly evaluated so two marks were awarded here.

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Examiner Tip

Show your steps in the calculation!

Question 7(b)(ii)

Many candidates lost a mark here, either by stating an incorrect answer or leaving the question unanswered. Common mistakes included repeating, calculating means, and incorrectly reading the thermometer.

(ii) Give one reason why the calculated value for the heat energy change using this apparatus is not accurate.

(1)

It may be lesser because heat could have escaped to the surroundings and from evaporation

ResultsPlus
Examiner Comments

This response scored one mark for correctly stating heat escaping to the surroundings, implying heat loss. It is important to be specific about the terminology used here, either heat or **thermal** energy loss scores but not just 'energy loss'.

(ii) Give one reason why the calculated value for the heat energy change using this apparatus is not accurate.

(1)

Because the apparatus is open, which may release the heat.

ResultsPlus
Examiner Comments

This also scores one mark, as the candidate expressed the idea of heat loss to the surroundings.

(ii) Give one reason why the calculated value for the heat energy change using this apparatus is not accurate.

(1)

Because when the heat increase the tepreture increase

ResultsPlus
Examiner Comments

Whilst the candidate mentioned the word heat, there is an absence of an idea of heat loss to the surroundings, so no mark could be gained. Alternatively, the candidate could gain a mark by suggesting a specific deficiency of the apparatus eg. no lid on the beaker or poor insulation.

Question 8(a)

Majority of candidates scored one mark for NaCl. The most common incorrect answer was the formula for $Al_2(SO_4)_3$. Many candidates missed the brackets or had Al_2SO_{12}.

8 This question is about compounds with ionic bonds, and compounds with covalent bonds.

(a) Table 1 shows the charges on some ions and the formulae of some ionic compounds.

Complete the table by giving the missing formulae.

$Mg^{2}N^{3}$ $_{3}\quad_{2}$

(3)

	Na^+	Mg^{2+}	Al^{3+}
Cl^-	NaCl	$MgCl_2$	$AlCl_3$
SO_4^{2-}	Na_2SO_4	$MgSO_4$	$Al_2(SO_4)_3$
N^{3-}	Na_3N	Mg_3N_2	AlN

Table 1

$Al^{3}_{2}\ SO_4{}_{3}$

ResultsPlus
Examiner Comments

This response scores full marks. The candidate did the working on the script, which was pleasing to note.

ResultsPlus
Examiner Tip

Avoid putting charges in the final formulae!

Question 8(b)

Many candidates knew how to test for sodium ions in solution. Many gave a detailed description of the technique of the flame test using a nichrome or platinum wire, whilst others were too vague here saying to burn the solution. Common incorrect answers included using the pH or indicator paper, or adding the sodium to water, and it would fizz. Some candidates stated the need to crystallise the solution before the flame test, which was unnecessary. Some responses stated to do a flame test, but incorrectly attributed the yellow colour to the solution instead of the flame.

(b) Sodium chloride and magnesium chloride form colourless solutions when dissolved in water.

Describe a test to show that a colourless solution contains sodium ions.

(2)

+ Do a flame test
+ If the colour turn yellow it means the solution contain sodium ions.

ResultsPlus
Examiner Comments

This response scored two marks. It was correct with regards to doing a flame test and the expected result of the test.

(b) Sodium chloride and magnesium chloride form colourless solutions when dissolved in water.

Mg

Describe a test to show that a colourless solution contains sodium ions.

Na

(2)

Burn it. if we can see yellow flame, then it contains sodium ions.

ResultsPlus
Examiner Comments

This response only scored the second marking point for the correct colour of the flame. 'Burning it' was too vague a description for the flame test, therefore, no mark for the first marking point.

Question 8(c)

This question was poorly answered. A lot of answers simply restated the information already given in the table. There were also a lot of incorrect references, such as weak covalent bonds, intermolecular forces between bonds, and sodium chloride having strong intermolecular forces between oppositely charged ions. Temperature, force, and movement of particles were also referred to when attempting to explain the difference in melting point. Whilst bonding was used mainly to explain the difference in melting point, very few candidates expanded on the structures, what they meant, or how they were maintained within $SiCl_4$ and NaCl.

A clearly expressed response that gained full marks. The candidate restated the structures but went on to explain correctly the bonding or forces of attraction within $SiCl_4$ and NaCl, indicating the strength of the bonds and forces. Subsequently, the candidate compared the energy required to overcome the intermolecular forces with the energy required to break ionic bonds.

(c) Table 2 gives some information about silicon chloride and sodium chloride.

	Melting point in °C	Bonding	Structure
Silicon chloride	−70	covalent	simple molecular
Sodium chloride	800	ionic	giant lattice

Table 2

Explain the difference between the melting points of silicon chloride and sodium chloride.

Refer to bonding and structure in your answer.

(5)

Silicon chloride has simple molecular structure,
the intermolecular forces between molecules are weak,
little energy is needed to overcome the forces;
Sodium chloride has giant ionic ~~structure~~ structure,
many strong ionic bonds, electrostatic attraction between
oppositely charged ions,
large amount of energy is needed to break the bonds.

(c) Table 2 gives some information about silicon chloride and sodium chloride.

	Melting point in °C	Bonding	Structure
Silicon chloride	–70	covalent	simple molecular
Sodium chloride	800	ionic	giant lattice

Table 2

Explain the difference between the melting points of silicon chloride and sodium chloride.

Refer to bonding and structure in your answer.

(5)

Silicon chloride has a melting point of −70 because the Intermdecclor forces between molecles are weak so it does not take ~~enoug~~ a lot of energy to overcome these forces. However In sodium Chloride, ~~[illegible]~~ ~~the electr~~ the ~~[illegible]~~ atoms between negative and positive charged ions are held together In a very strong giant lattice structure, So the Intermdecular forces between mdecles are very strong which is why it has a very high melting point. The atoms are arranged in a tightly packed 3D configuration.

ResultsPlus
Examiner Comments

The candidate correctly stated the weak intermolecular forces for $SiCl_4$ to score two marks here. However, in NaCl, the candidate fell short of mentioning the 'electrostatic force of attraction' between the oppositely charged ions. There was no comparison of the energy needed to break bonds / forces between $SiCl_4$ and NaCl, therefore, no further credit could be given.

ResultsPlus
Examiner Tip

Using the information in the table, candidates must show the understanding of how the bonding type and structure dictates the melting point of silicon chloride and sodium chloride. A comparison between the energy needed to break the respective bonds / forces within the structure.

(c) Table 2 gives some information about silicon chloride and sodium chloride.

	Melting point in °C	Bonding	Structure
Silicon chloride	−70	covalent	simple molecular
Sodium chloride	800	ionic	giant lattice

Table 2

Explain the difference between the melting points of silicon chloride and sodium chloride.

Refer to bonding and structure in your answer.

(5)

silicon chloride has a relatively lower melting point than sodium chloride. As the structure of silicon chloride is a simple molecular structure, it ~~than~~ needs ~~more~~ less energy to break its intermolecular forces of attraction, and as it is formed through covalent bonding, it doesn't require much energy to break its intermolecular forces of attraction. Due to this it requires a very low melting point of −70°C to break its forces. while in Sodium Chloride, it is formed through ionic bonding by giving & recieving electrons, It also has a giant lattice structure, indicating how tight together & big the atoms are tranged. Due to this in order to break the intermolecular forces of attraction between these particles in the giant lattice & to break its bonds they will require more energy, thus requires a higher melting point such as 800°C.

ResultsPlus
Examiner Comments

This response showed correct identification of the intermolecular forces within $SiCl_4$, so this gained one mark. The mention of covalent bonding was correct in the context of what the candidate meant. There was, however, no mention of whether the intermolecular forces were weak or strong. The second mark was gained for stating in a comparative term the energy needed to break the intermolecular forces. The description of the bonding found in NaCl was incorrect, so no further mark was awarded here.

(c) Table 2 gives some information about silicon chloride and sodium chloride.

	Melting point in °C	Bonding	Structure
Silicon chloride	−70	covalent	simple molecular
Sodium chloride	800	ionic	giant lattice

Table 2

Explain the difference between the melting points of silicon chloride and sodium chloride.

Refer to bonding and structure in your answer.

(5)

Sodium chloride has a strong structure (giant lattice) meaning it will be able to endure high temperatures without breaking down. furthermore Silicon chloride has a ~~covalent~~ simple molecular structure which breaks down very easily.

Sodium chloride has a ionic bond which is a strong type of bond with the tension being high and the bond are weak on the silicon chloride since the bonds are easily broken.

~~Also~~ The melting point of silicon chloride is −70°c while Sodium chloride's is 800°c which clearly show that Sodium chloride is much mor stronger an endurable to high temperatures

(Total for Question 8 = 10 marks)

ResultsPlus
Examiner Comments

This response scored no marks. The candidate restated the information from the table, and related the structure and bonding to temperatures. There was an incorrect reference to breaking bonds in $SiCl_4$ instead of intermolecular forces.

Paper Summary

Based on their performance on this paper, candidates should:

- Read the question carefully before starting the answer.
- Ensure the answer addresses the points in the question.
- Show working clearly in calculations to gain valuable marks even when there is an earlier arithmetic error.
- Give a numerical answer to the correct number of significant figures or in the correct units.
- Plan answers to demanding or longer answer questions.
- Familiarise themselves with the command words, eg explain and describe.

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