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Examiners' Report
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International GCSE Science (Single Award) 4SS0 1C

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Introduction

Many candidates found this paper difficult as they did not have enough knowledge to tackle some of the questions. Nevertheless the paper discriminated well and gave a good range of marks overall.

Formulae and equations proved to be very difficult for the majority of candidates and observations based on practical situations were not well known. In general question 2 on chromatography was answered well by many candidates. Question 6 on rates of reaction proved the most difficult for the majority of candidates. Candidates, on the whole, did better than was expected when tackling the calculations that were included in the question paper and these questions gave a good range of marks on the four mark calculations. Some candidates had a good knowledge of organic chemistry but others lacked knowledge and understanding of organic chemistry. The extended writing question in question 3 discriminated well, with some answers that demonstrated a good understanding of why ionic compounds have high melting points.

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Question 1 (a)(i)

Most candidates gave sulfur as the answer but the minority wrote oxygen, confusing the atomic number with the relative atomic mass.

Question 1 (a)(ii)

The majority of candidates thought that aluminium was in Group 3 and Period 2, with only the minority giving boron as the correct answer.

Question 1 (a)(iii)

A common error was to think iodine was a liquid at room temperature but other candidates gave either bromine or mercury as the correct answer.

Question 1 (b)(ii)

Only the minority of candidates could give a correct formula for a sulfide ion. Common errors involved giving the sulfate ion and very often candidates gave a random formula or name with no charge on the ion at all.

Question 1 (b)(iii)

Only a few candidates gave the correct formula for magnesium fluoride. Common errors included MgF, Mg_2F, MgFl and $MgFl_2$. Some candidates attempted to write an equation even though a formula was asked for rather than an equation.

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Question 2 (a)(i)

Most candidates realised that V was insoluble, but some thought that it stayed on the start line as it only contained one dye.

Question 2 (a)(ii)

Most candidates correctly identified X and Z as containing a dye that is the most soluble in the solvent.

Some candidates however did not clearly explain why they made the correct choice, so they only scored 1 mark.

(ii) Explain which two inks contain a dye that is likely to be the most soluble in the solvent.

(2)

Inks X and Z contain a dye that is likely to be soluble. This is because the two inks have dyes closest to the solvent front.

ResultsPlus
Examiner Comments

This example clearly explains why they chose X and Z so both marks were awarded.

ResultsPlus
Examiner Tip

When a question asks for an explanation, make sure you clearly explain why you have made the choice.

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(ii) Explain which two inks contain a dye that is likely to be the most soluble in the solvent.

(2)

X and Z, they are most soluble in the solvent as they have high ~~dyes~~ dyes ~~there are~~ present in them.

ResultsPlus
Examiner Comments

This candidate identified X and Z correctly but the explanation was not clear enough to gain the second mark.

ResultsPlus
Examiner Tip

The candidate needs to make it clear that the dye has either moved the furthest from the start line or is closest to the solvent front. Note that the word 'furthest' or 'closest' needs to be mentioned, not just 'far', high' or 'close' as this is not a comparison with the other dyes.

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Question 2 (b)

Most candidates could make accurate measurements but many did not know how to calculate R_f values.

A well set out answer.

(b) Calculate the R_f value for the dye in ink W.

(3)

Rf value = Distance travelled by the dye = / Distance travelled by the solvent

Which is nothing but $\frac{x}{y}$

distance travelled by the dye = 1·8

$\frac{1·8}{5·6} = 0·32$

distance travelled by the solvent = 5·6 cm

Rf value = 0·32

R_f value = 0·32

ResultsPlus Examiner Comments

This candidate has clearly shown which measurements they have made and have calculated the R_f value correctly.

ResultsPlus Examiner Tip

It is important to show clear working when doing calculations. As the measurements have been made to two significant figures it is appropriate to also give the answer to two significant figures.

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A somewhat confused answer, but 2 marks can be awarded for correct measurements.

(b) Calculate the R_f value for the dye in ink W.

(3)

$$R_f = \frac{\text{D moved by solute}}{\text{D moved by solvent}}$$

$$R_f = \frac{5.5}{2}$$

$$= 2.75$$

R_f value = 2.75

ResultsPlus
Examiner Comments

The candidate has given the correct equation to calculate the R_f value but unfortunately, they have put the values in the wrong way round.

ResultsPlus
Examiner Tip

Candidates need to realise that R_f values have to be less than 1. Values should be given to 2 or more significant figures, 2 being the preferred value as one significant figure is not accurate enough to score the third mark. Candidates must also take care when rounding answers as they can also lose the third mark for incorrect rounding.

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Question 3 (b)(ii)

The question needs to state why a large piece of potassium was not used.

The question needs to give a reason why adding a large piece is not safe.

(ii) Give a reason why the scientist does not use a large piece of potassium.

(1)

because it can be explosive

ResultsPlus Examiner Comments

Saying that it can be explosive shows that the candidate has indicated that the reaction is unsafe so the mark can be awarded.

ResultsPlus Examiner Tip

The reason must show how that the reaction could be hazardous in some way.

This answer does not score the mark.

(ii) Give a reason why the scientist does not use a large piece of potassium.

(1)

using a larger piece causes a larger reaction

ResultsPlus Examiner Comments

Saying that there will be a larger reaction does not indicate that the reaction is unsafe.

ResultsPlus Examiner Tip

General comments about the reaction being more reactive is not enough for the mark, as this does not necessarily cause a hazard.

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Question 3 (b)(iii)

This question was poorly answered. A common error was to give K^+ as the ion rather than OH^-. Many candidates did not give the formula of an ion at all and just wrote alkali or hydroxide.

Question 3 (b)(iv)

This question was very poorly answered. Most candidates scored zero as they did not have the correct products. Some had potassium oxide instead of potassium hydroxide and others just gave the same products as the reactants. Those candidates that did give the correct products usually balanced the equation correctly and scored both marks.

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Question 3 (c)

This question needs to explain why the ionic compound sodium oxide has a high melting point. The question discriminated well and gave a range of marks.

This is a clear and concise answer that scores all 4 marks.

(c) Sodium reacts with oxygen to form the ionic compound sodium oxide, Na_2O

Explain, in terms of structure and bonding, why sodium oxide has a high melting point.

(4)

Sodium oxide is an ionic compound with electrostatic forces of attraction between the oppositely charged ion. Sodium oxide has a giant ionic lattice and it is held together by strong ionic bonds. In order to melt sodium oxide these strong ionic bonds must be broken and they require lots of heat and energy to break. This results in a high melting point.

ResultsPlus
Examiner Comments

The candidate has explained the type of structure and bonding in sodium oxide and clearly explained why it has a high melting point.

ResultsPlus
Examiner Tip

Read the question carefully and if you are asked to refer to structure and bonding make sure you include these points in your explanation.

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This question is limited to 2 marks.

(c) Sodium reacts with oxygen to form the ionic compound sodium oxide, Na_2O

Explain, in terms of structure and bonding, why sodium oxide has a high melting point.

(4)

Sodium oxide has a giant ionic structure. Which means the intermolecular forces between the particles are very strong. It ∴ A lot of ~~energy~~ heat/thermal energy is needed to break apart the bonds. Which is why the melting point sodium oxide is high.

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Examiner Comments

The answer refers to the giant ionic structure and states that a lot of energy is needed to break the bonds. Unfortunately, the mention of intermolecular forces means marking points 2 and 3 cannot be awarded.

ResultsPlus
Examiner Tip

Ionic structures do not have intermolecular forces, so mention of molecules, intermolecular forces or covalent or metallic bonding will always cause a loss of marks, especially when you are told in the question that sodium oxide is ionic.

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This is a 2 mark answer.

(c) Sodium reacts with oxygen to form the ionic compound sodium oxide, Na_2O

Explain, in terms of structure and bonding, why sodium oxide has a high melting point.

(4)

Sodium oxide is an ionic compound which has electrostatic forces of attraction between oppositely charged ions. there ions are held strong and they have strong electrostatic forces of attraction. to overcome the electrostatic forces of attraction ~~ionic~~ sodium oxide has a high melting point. So when it has a high melting point then the ions could be broken down easily that is why sodium oxide has a high melting point.

ResultsPlus
Examiner Comments

This candidate has clearly described ionic bonding and has said that the attractions are strong. They have therefore been awarded the second and third marking point. However there is no mention of structure and no reference to a lot of energy needed to melt the sodium oxide. They have also stated that the ions can be broken down easily which would mean the melting point would be low rather than high.

ResultsPlus
Examiner Tip

Make sure you read the question carefully and refer to structure as well as bonding in your answer otherwise you will lose unnecessary marks. An explanation also needs to be given as to why the melting point is high, so energy needs to be mentioned to score the fourth marking point.

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Question 4 (a)(i)

Many candidates were unable to name propane, even though they were expected to be able to name the first four alkanes. The incorrect answer of carbon hydroxide was seen quite often.

Question 4 (a)(ii)

Many candidates could draw a correctly displayed formula for propane. Common errors included failing to draw bonds between the carbon atoms and sometimes adding one or more double bonds between the carbon atoms. Candidates need to be reminded that there are 4 bonds to each carbon atom and just one bond to each hydrogen atom.

Question 4 (b)(i)

Many candidates knew that covalent bonding involved sharing electrons but often failed to mention the shared pair and so failed to score the mark. Candidates need to learn the definition of a covalent bond.

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Question 4 (b)(ii)

Many candidates scored the first mark on this question but only a small minority scored 2 or 3 marks, as reference to breaking covalent bonds limited them to only scoring the first marking point.

This is a good answer that scores all 3 marks.

(ii) Explain why C_4H_{10} has a higher boiling point than C_2H_6

(3)

The are more carbon and hydrogen atoms ~~presen~~ present and bonded together with stronger intermolecular forces of attraction in C_4H_{10} than in C_2H_6. Therefore more energy neeeds to be supplied to overcome these intermolecular forces of attraction as a result the boiling point is higher. Whereas in C_2H_6 it has weak intermolecular forces of attraction therefore less energy is needed and its boiling point remains low.

ResultsPlus
Examiner Comments

The candidate has stated that there are more carbon and hydrogen atoms in C_4H_{10} which gains the first mark and they have clearly stated that there are stronger intermolecular forces in C_4H_{10} and therefore more energy is needed to overcome the forces. So marking points 2 and 3 can be awarded.

ResultsPlus
Examiner Tip

When comparing molecules, comparative words such as 'stronger' and 'more' need to be used to gain the marks.

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This answer scores the first marking point.

(ii) Explain why C_4H_{10} has a higher boiling point than C_2H_6 ~~order~~ in order to obtain a full ~~shell of~~ outer shell of electrons. (3)

C_4H_{10}, which is butane has stronger covalent bonds than C_2H_6 - which is ethane. Butane also has more bonds as it is a longer chain with 4 carbon atoms in contrast to ethanes 2. Because ~~butane~~ C_4H_{10} (butane) has ~~more~~ a longer chain and is larger and stronger with more covalent bonds, it ~~has~~ requires more heat energy to overcome these bonds. C_2H_6 (ethane) requires less that is why C_4H_{10} (butane) has a higher boiling point

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Examiner Comments

The first mark is scored for stating that butane has a longer chain than ethane and it could have also scored for stating that there are 4 carbon atoms in butane and 2 in ethane. No more marks can be awarded as the candidate refers to the breaking of covalent bonds which is incorrect.

ResultsPlus
Examiner Tip

Candidates need to realise that when a molecular substance boils only the intermolecular forces are broken and not the covalent bonds. When you boil water it turns into steam and not into hydrogen and oxygen atoms, which would happen if the covalent bonds were broken.

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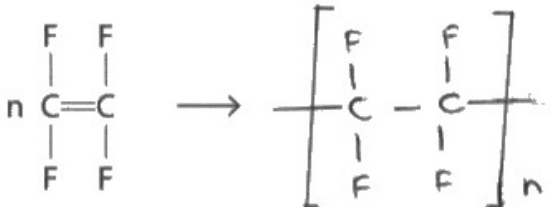
Question 4 (c)(i)

This equation proved difficult for many candidates.

(c) The organic compound tetrafluoroethene (C_2F_4) can be polymerised to form poly(tetrafluoroethene).

(i) Complete the equation for this polymerisation reaction.

(2)



ResultsPlus
Examiner Comments

A clear mark scheme answer.

ResultsPlus
Examiner Tip

Change the double bond to a single bond keeping the atoms in the same places and don't forget to add brackets, extension bond and n on the bottom right.

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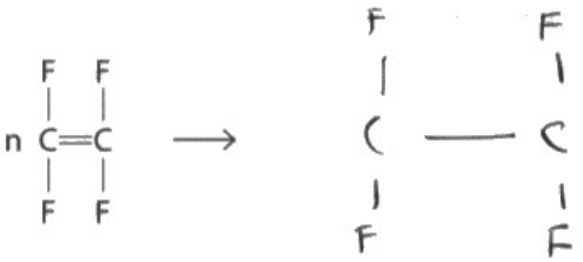
(c) The organic compound tetrafluoroethene (C_2F_4) can be polymerised to form poly(tetrafluoroethene).

(i) Complete the equation for this polymerisation reaction.

(2)



ResultsPlus
Examiner Comments

This candidate has given the correct repeat unit which scores the first marking point, but this is not a balanced equation without the brackets and n.

ResultsPlus
Examiner Tip

If you are asked to complete an equation make sure it is balanced. Remember always to change the double bond to a single bond as if there is a double bond present in the polymer no marks can be awarded.

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Question 4 (c)(ii)

Many candidates scored the mark here with the most popular answer being high melting point.

(ii) Poly(tetrafluoroethene) is used as a coating on non-stick frying pans.

The C—F covalent bonds in poly(tetrafluoroethene) are very strong.

Suggest a reason why poly(tetrafluoroethene) is suitable as a coating on non-stick frying pans.

(1)

Because it is not reactive with food therefore it is not toxic.

ResultsPlus
Examiner Comments

Stating that it is not reactive with food and not toxic is enough to score the mark.

ResultsPlus
Examiner Tip

When a question asks you to suggest a reason, any sensible answer will gain credit as long as you have not just repeated the information given in the question.

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(ii) Poly(tetrafluoroethene) is used as a coating on non-stick frying pans.

The C—F covalent bonds in poly(tetrafluoroethene) are very strong.

Suggest a reason why poly(tetrafluoroethene) is suitable as a coating on non-stick frying pans.

(1)

It is because it is less reactive and has a very high boiling point since it has very strong C-F Covalent bo bonds.

ResultsPlus
Examiner Comments

Less reactive is not enough to score the mark and neither is high boiling point. Stating that covalent bonds are very strong is just repeating what is given in the question so is not creditworthy.

ResultsPlus
Examiner Tip

Stating that something is less reactive is meaningless unless you are comparing it with some other substance. Only use a comparison when there is something to compare it with. Just stating that it is unreactive or inert would have been enough to score the mark.

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Question 5 (a)(i)

Many candidates knew that a bright white light or flame was produced and scored the mark. Only a few candidates mentioned a white powder or ash being formed. Incorrect answers included just mentioning the product or saying that fizzing occurred. Note that a white precipitate would not have been an acceptable answer as precipitates are only present in liquids or solutions and in this case, there was no liquid or solution involved.

Question 5 (a)(ii)

Only a small number of candidates gained the mark for this equation. A few gave the correct formulae but then lost the mark as they failed to balance the equation. Common errors included writing O instead of O_2 – not recognising that oxygen is diatomic, giving the formula of magnesium oxide as MgO_2 and giving a word equation instead of a chemical equation.

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Question 5 (b)

This question discriminated well and gave a range of marks.

This is a very good answer with working clearly shown. All 4 marks were awarded.

Calculate the percentage by volume of oxygen in the sample of air.

Give your answer to two significant figures.

(4)

total volume of gas = 275 + 100 = 375 cm^3 ✓

volume of O_2 used = 100 − 28 = 72 cm^3 ✓

% of O_2 = $\frac{72}{375} \times 100$

= 19.2 % ✗

= 19 %

percentage of oxygen = 19 ✓ %

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Examiner Comments

The candidate has found the volume of oxygen, the total volume of air and gone on to find the percentage of oxygen. They have given the answer to two significant figures as was asked for in the question.

ResultsPlus
Examiner Tip

Make sure you read the question carefully and show your working in a logical sequence because if you make a mistake at some stage, you can be awarded error carried forward marks.

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This candidate has been awarded 2 marks, one of which is an error carried forward mark.

Calculate the percentage by volume of oxygen in the sample of air.

Give your answer to two significant figures.

(4)

• 100 - 28 = 72

$= \frac{72}{275} = 0.262 \times 100$

$= 26.2\%$

$= \frac{72}{100} \times 275$

percentage of oxygen = 26.2 %

ResultsPlus
Examiner Comments

The candidate has gained the first marking point for finding the volume of oxygen. They have then forgotten to add the volume in the syringe to the volume in the flask and connecting tube, so have lost the second marking point. However the third marking point can be awarded as an error carried forward, but they have lost the fourth marking point as the answer has not been given to two significant figures.

ResultsPlus
Examiner Tip

Make sure you read the question carefully and follow the instructions given. Many candidates lose marks for not giving the answer to the correct number of significant figures.

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Question 5 (c)(i)

Many candidates knew the test for carbon dioxide but a fair number of candidates gave the test for hydrogen or oxygen.

(c) Carbon dioxide is another gas in the atmosphere.

(i) Describe a test for carbon dioxide.

(2)

Carbon dioxide can be bubbled through lime water.
When this happens the lime water turn cloudy/chalky.

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Examiner Comments

This candidate has described the test correctly and has gained both marks.

ResultsPlus
Examiner Tip

When describing a test you need to state how you perform the test and then give the result of the test.

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(c) Carbon dioxide is another gas in the atmosphere.

(i) Describe a test for carbon dioxide.

(2)

Limewater test, if carbon dioxide is present, the limewater will go milky / cloudy.

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Examiner Comments

This candidate knows that limewater is used and has given the result of the test but has only scored the second marking point as they have not described how to perform the test.

ResultsPlus
Examiner Tip

Just stating limewater test is not sufficient. The candidate must describe some way of adding or bubbling the gas into limewater to score the first marking point.

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Question 5 (c)(ii)

Most candidates were able to score at least one mark for this question, most often the second marking point, with the most popular answer being some mention of climate change, global warming or its effects.

The question requires an explanation as to why carbon dioxide causes an environmental problem.

(ii) Explain why an increase in the percentage of carbon dioxide in the atmosphere may cause an environmental problem.

(2)

Carbon dioxide is a greenbouse gas thereby an increase in this gas may farther increase the green house effect occuring. As a result may lead to global warming and climate changes like polar ice caps melting and sea levels rising.

(Total for Question 5 = 10 marks)

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Examiner Comments

The candidate has explained that carbon dioxide is a greenhouse gas and this leads to global warming. This is enough for both marks but the candidate has gone on to mention climate change and their effects.

ResultsPlus
Examiner Tip

Make sure you explain why carbon dioxide may cause an environmental problem. Do not refer to the ozone layer or acid rain as carbon dioxide does not affect the ozone layer and does not cause acid rain and incorrect statements may cause you to lose marks.

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(ii) Explain why an increase in the percentage of carbon dioxide in the atmosphere may cause an environmental problem.

(2)

If an increase of carbon dioxide happens, there won't be much oxygen.

ResultsPlus
Examiner Comments

An increase in carbon dioxide will not significantly affect the percentage of oxygen in the atmosphere. There is no explanation of an environmental problem so no marks can be awarded.

ResultsPlus
Examiner Tip

Make sure you discuss the problem caused by the increase in carbon dioxide, as other gases in the atmosphere will not be affected by the increase in carbon dioxide.

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Question 6 (a)(i)

Only a small number of candidates managed to get all the state symbols correct. A common error was to think that hydrochloric acid was a liquid even though it was mentioned that the acid was dilute therefore it should have been classed as aqueous, likewise calcium chloride is a soluble salt so that too was aqueous and not a solid.

Question 6 (a)(ii)

This question was not particularly well answered. A common incorrect answer was to say that the mass decreased because the marble chips were reacting with the hydrochloric acid and becoming smaller.

(ii) State why the mass of the contents of the flask decreases during the reaction.

(1)

CO_2 can escape through the wool.

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Examiner Comments

A clear answer that states that carbon dioxide can escape through the cotton wool.

ResultsPlus
Examiner Tip

Cotton wool is not airtight so gases can easily pass through and the mass decreases as the gas has mass.

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(ii) State why the mass of the contents of the flask decreases during the reaction.

(1)

the acid eats away at the marble chips

ResultsPlus
Examiner Comments

It is true that the acid reacts with the marble chips but the only product that leaves the flask is the carbon dioxide and the total mass of all the other reactants and products stays the same, so this is not a reason for the mass decreasing so the mark cannot be awarded.

ResultsPlus
Examiner Tip

Mass loss in a reaction only occurs when gases escape from the reaction mixture.

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Question 6 (a)(iii)

Only a small minority of candidates answered this question correctly. Many candidates thought the cotton wool was there to either stop gas escaping or to stop air entering the flask.

(iii) State the purpose of the cotton wool.

(1)

To stop ~~any~~ ~~hydroch~~ hydrochloric acid from splashing out.

ResultsPlus Examiner Comments

A clear mark scheme answer.

ResultsPlus Examiner Tip

Cotton wool is there to let gas out but to stop the acid leaving the flask which could cause a hazard and would also make the results inaccurate.

(iii) State the purpose of the cotton wool.

(1)

To prevent loss of CO_2

ResultsPlus Examiner Comments

One purpose of the cotton wool is to let the gas out so the mass loss can be recorded.

ResultsPlus Examiner Tip

Look back at the experiments you have done or seen as there will always be several questions based on standard practicals.

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Question 6 (b)(i–ii)

This question proved very difficult for most candidates. In Q6(b)(i) only a small number of candidates attempted to explain the shape of the graph and most just gave a description of how the mass loss varied over time, which was not creditworthy. Many candidates did not attempt to draw the curve on the grid in Q6(b)(ii) and those that did often drew a curve under the original curve and levelled off lower down, which was not creditworthy. Other candidates did draw a steeper curve which meant they gained 1 mark, but the curve often levelled off higher than the original curve which meant they did not score the second mark.

This was an excellent answer which scored full marks in both parts of the question.

In the investigation the marble chips are in excess.

(i) Explain the shape of the graph.

(4)

We see that at the beginning of the experiment, the gradient is steeper which means the rate of reaction is higher as more of the HCl is there to react with the marble chips. However as time goes by, the gradient decreases, which is noticeable from 4-8 minutes which shows us that the reaction is slowing down as the HCl is on the verge of getting used up. After 10 mins onwards, we see no change in the mass of marble chips as the HCl, which was a reactant has fully been used up so the reaction does not take place anymore which means the mass won't change; hence the straight line after 10 mins.

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Examiner Comments

The candidate discussed the steepness of the curve and linked it to the rate of the reaction. They realised that as the marble chips were in excess, the hydrochloric acid was eventually used up and so the line became straight.

The curve drawn on the grid was steeper than the original curve and levelled off at the same level as the original curve so both marks were awarded.

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Examiner Tip

Read the question carefully and make sure that you explain the shape of the graph. Note that the marble chips are in excess and be specific about the fact that the acid will run out. Just stating that the reactants will run out is not sufficient for the mark as the marble chips are still present.

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This candidate did not explain the shape of the graph and so gained no marks in Q6(b)(i) but drew the correct curve in Q6(b)(ii).

In the investigation the marble chips are in excess.

(i) Explain the shape of the graph.

(4)

The graph shows that there is decrease in mass, after the reaction begins, due to the gas produced. However, after a few minutes, there is no more decreased mass, as the reaction steps due to all the reactants being used up.

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Examiner Comments

Saying that the graph shows there is a decrease in mass does not explain the shape of the graph, so this statement is not creditworthy. Saying that all the reactants being used up is incorrect so no mark can be given for this statement either.

The candidate does understand that using the same mass of smaller marble chips increases the surface area and therefore the curve becomes steeper and levels off at the same place as the same volume and concentration of acid is used.

ResultsPlus
Examiner Tip

In a four mark question, four clear points must be made explaining the shape of the graph with reference to the steepness of the curve, the rate of reaction and the concentration of the acid.

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Question 7 (a)

Most candidates knew that heat was given out. Some lost the mark for saying that energy was given out with no mention of heat or thermal energy.

Question 7 (b)(ii)

Very few candidates gave even one correct observation. This was a standard practical which most candidates should have been familiar with.

(ii) Apart from the temperature increasing, give two other observations that the student could make during the reaction.

(2)

1 Pink-brown precipitate forms

2 Colorless solution forms The solution turns from blue to colorless.

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Examiner Comments

This candidate gave two correct observations and scored both marks. Mention of precipitate was acceptable here as some copper solid was present in the solution when the reaction had finished.

ResultsPlus
Examiner Tip

Make sure you describe what you see in the reaction and be specific about any colour changes which occur.

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(ii) Apart from the temperature increasing, give two other observations that the student could make during the reaction.

(2)

1 Change of colour.

2 Bubbles.

ResultsPlus
Examiner Comments

This candidate said there was a change of colour but this is not specific enough to score the mark and no gas was given off in the reaction, so no bubbles were formed.

ResultsPlus
Examiner Tip

The equation for the reaction was given in the question and can help you to decide what would be seen in this reaction and it was clear that no gas was produced.

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Question 7 (b)(iii)

Most candidates knew that silver was not very reactive but many candidates were not specific enough to score the mark as they did not always make a comparison with copper.

(iii) State why silver does not react with copper(II) sulfate solution.

(1)

Because silver is less reactive than copper so it cannot displace copper

ResultsPlus Examiner Comments

This candidate made a clear comparison by stating that silver is less reactive than copper. Saying that silver cannot displace copper would also be enough to score the mark.

ResultsPlus Examiner Tip

In a question of this nature, a comparison must be made to gain the mark. Words such as 'less' and 'more' need to be used in the answer.

(iii) State why silver does not react with copper(II) sulfate solution.

(1)

Because Silver is an unreactive metal

ResultsPlus Examiner Comments

Just saying that silver is an unreactive metal is not sufficient to score the mark.

ResultsPlus Examiner Tip

It is true that silver is unreactive but if there is no comparison made the mark cannot be awarded.

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Question 7 (c)

On the whole, candidates performed better than expected on this calculation. The question discriminated well and gave a range of marks.

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

volume of copper(II) sulfate solution	50.0 cm^3
initial temperature of copper(II) sulfate solution	20.5 °C
highest temperature of mixture	37.0 °C

Calculate the heat energy change (Q) in kJ.

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

(4)

$Q = mc\Delta t$

$= 50 \times 4.2 \times 16.5$

$m = 50g$

$c = 4.2$

$\Delta t = 16.5$

$\Rightarrow 3465J$

$\Rightarrow \frac{3465}{1000}$

$\Rightarrow 3.465\,kJ$

$Q =$ 3.465 kJ

ResultsPlus Examiner Comments

This was a very good four mark answer. Working was clearly shown in a logical way and the correct answer was written on the answer line.

ResultsPlus Examiner Tip

Always show your working in calculations of this nature as if you make a mistake, you may still be able to be awarded error carried forward marks.

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

(4)

m c Ø

1.00 × 4.2 × 16.5

= 69.3

20.5 37.0 − 20.5 = 16.5

Q = 69.3 kJ

ResultsPlus Examiner Comments

This candidate found the correct temperature change which gained them the first marking point. They gave the equation for calculating Q but unfortunately they used 1.00 g instead of 50 g in their calculation so lost the second marking point. However they went on to evaluate their expression correctly so gained an error carried forward mark. They did not convert to kilojoules so lost the fourth marking point.

ResultsPlus Examiner Tip

Always read the question carefully and use the data you are provided with. The fourth mark was often lost by not converting the answer into kJ as was instructed in the question.

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Paper Summary

Based on their performance on this paper, candidates should:

- learn definitions and facts from the specification.
- practice writing formulae and chemical equations.
- always show working clearly in calculations.
- pay particular attention to core practicals.
- read questions carefully so as not to miss important points that will help you answer the questions.
- not repeat information that is given in the question as this will not gain you credit.

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