Pearson Edexcel

Examiners' Report
June 2019

IGCSE Single Science 4SS0 1C

ResultsPlus

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

ResultsPlus

Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus.
Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2019
Publications Code 4SS0_1C_1906_ER

Introduction

This single award paper is new to International GCSE and it is the first time that this paper is being examined. The exam paper is a 60 mark paper and candidates are given 70 minutes to complete it.

Although candidates had probably seen some sample assessment material they had not had any access to past papers so may have been uncertain what to expect.

Question 1 was answered well by the majority of candidates but the rest of the paper proved to be more challenging. Areas which proved particularly difficult were the extended writing questions, calculations and the writing of chemical formulae and equations.

Questions which just required recall were not particularly well answered, which implies that more thorough revision is required by many candidates.

It was also apparent from candidate performance, that more experience in doing chemistry experiments is needed.

The last extended writing question on structure and bonding proved to be the most challenging for many candidates. More practise on answering this type of question should help to improve understanding of this topic. Candidates would also benefit from practising chemical calculations and writing chemical equations in order to improve performance on this paper in the future.

Question 1 (a)

The majority of candidates answered this question correctly gaining all three marks. A common error was to mix up protons and neutrons which limited them to one mark.

Question 1 (b)

This question was answered well by the majority of candidates, but a common error was to think that the nucleus was the first electron shell.

Question 1 (c) (iii)

Only around half of candidates correctly identified boron. Carbon was the most common incorrect answer, presumably because the mass number was 12. A few who confused atomic number and mass number thought it was magnesium. Candidates need to realise that it is the number of protons which defines an element not the mass number.

Question 2 (a) (ii)

Several candidates included atomic numbers and the relative formula mass of FeS giving an answer of 88, even though the formula of iron(II) sulfate was given in the stem of the question.

x (ii) Use information from the Periodic Table to calculate the relative formula mass of iron(II) sulfate.

(2)

56 + 32 + (16 x 4)
= 152

relative formula mass = 152

ResultsPlus
Examiner Comments

This candidate has shown their working clearly and the evaluation is correct, so both marks can be awarded.

(ii) Use information from the Periodic Table to calculate the relative formula mass of iron(II) sulfate.

(2)

56 + 32 + 16 = 104

relative formula mass = 104

ResultsPlus
Examiner Comments

This candidate has selected the correct relative atomic masses, but has failed to multiply the 16 by 4. One mark can be awarded here for selecting the correct masses and using them in the calculation.

ResultsPlus
Examiner Tip

When doing a relative formula mass calculation, candidates must take into account the number of each atom present in the formula.

(ii) Use information from the Periodic Table to calculate the relative formula mass of iron(II) sulfate.

(2)

$(1 \times 26) + (1 \times 16) + (4 \times 8)$

$= 26 + 16 + 32$

$= 74$

relative formula mass = 74

ResultsPlus
Examiner Comments

This candidate has used atomic numbers instead of relative atomic masses in their calculation, so no marks can be awarded.

ResultsPlus
Examiner Tip

Candidates need to realise that they will not be awarded marks for using atomic numbers in calculations. The relative atomic mass is the one above the symbol of the element in the Periodic Table and is the larger of the two numbers.

Question 2 (b) (i)

Only around a quarter of candidates realised that the mixture is warmed to increase the rate of the reaction.

(b) Some iron filings are added to dilute sulfuric acid. The mixture is warmed and hydrogen gas is given off.

(i) State why the mixture is warmed.

(1)

To increase the rate of reaction

ResultsPlus
Examiner Comments

This candidate correctly states 'to increase the rate of reaction', receiving 1 mark.

(b) Some iron filings are added to dilute sulfuric acid. The mixture is warmed and hydrogen gas is given off.

(i) State why the mixture is warmed.

(1)

In order for the particles to gain kinetic energy and the reaction to start.

ResultsPlus
Examiner Comments

It is true that the particles will gain kinetic energy, but this is not answering the question as there is no reference to this causing the reaction rate to increase.

Question 2 (b) (ii)

Many candidates thought they would see fumes or vapour or that there would be a smell coming out of the solution. These answers are not creditworthy as hydrogen is a colourless, odourless gas and the only observation is fizzing or bubbles forming in the solution.

Question 2 (b) (iii)

Surprisingly, only about a third of candidates gave a correct test for hydrogen. 'Squeaky pop test' was a common answer, but this is insufficient for the mark. When describing a test candidates need to state how the test is performed and give the result of the test. Candidates need to refer to a lighted splint in their answer, and say that the result of the test is a (squeaky) pop. Some lost the mark by confusing this with the test for oxygen and saying that a glowing splint is used.

Question 2 (c) (i)

Only about a quarter of candidates gained a mark for this question. Many just wrote about reactants being used up or particles running out of energy. Others just stated that 'all the hydrogen has been given off'. The clue here was in the question, as the candidates are told that some iron filings remain, which should prompt them into realising that it is the acid that has been used up.

(c) When the reaction stops, some iron filings remain.

(i) State why the reaction stops.

(1)

The dilute sulfuric acid has been used up.

ResultsPlus
Examiner Comments

The candidate states that the acid has been used up, so the mark can be awarded.

ResultsPlus
Examiner Tip

Candidates need to read the questions carefully and pick up on necessary information which has been given in the stem of the question.

Question 2 (c) (ii)

Only a small minority of candidates wrote a correct equation.

(ii) Give a chemical equation for the reaction between iron and sulfuric acid.

(1)

$Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$

ResultsPlus
Examiner Comments

A correct equation which can be awarded the mark.

(ii) Give a chemical equation for the reaction between iron and sulfuric acid.

(1)

$Fe + SO_4 \longrightarrow FeSO_4$

ResultsPlus
Examiner Comments

This candidate does not seem to know the formula of sulfuric acid and has not included hydrogen in the equation even though it is stated that hydrogen is given off in Q02(b). No marks awarded.

ResultsPlus
Examiner Tip

Candidates need to use the information in the question to help them write a correct equation. The formula of iron(II) sulfate has been given in the stem of the question and they have been told that hydrogen is given off. Candidates should know that all acids contain hydrogen in their formula and they should learn the formulae of common acids as these are often needed when writing chemical equations. They should also learn which elements have diatomic molecules.

Question 3 (a)

The majority of candidates scored 0 marks for this question. Those who scored 1 mark normally did so by naming hydrochloric acid and thinking that it was reacted with sodium. Candidates need to realise that although sodium is an alkali metal, it is not an alkali, and reacting sodium with hydrochloric acid would be dangerous as it would be likely to explode.

3 Sodium chloride is a soluble salt.

(a) Name the acid and the alkali that can be used to make sodium chloride.

(2)

acid Hydrochloric acid / HCl

alkali Sodium hydroxide / NaOH

ResultsPlus
Examiner Comments

A correct answer which scores both marks.

In this example both names and formulae have been given.

ResultsPlus
Examiner Tip

If names are asked for it is probably best to avoid giving formulae as well. In this example the formulae would not have been penalised even if they were incorrect, but this is not always the case.

3 Sodium chloride is a soluble salt.

(a) Name the acid and the alkali that can be used to make sodium chloride.

(2)

acid Sodium

alkali Chlorine

ResultsPlus
Examiner Comments

This was a very common incorrect answer which is not creditworthy. It may be true that sodium chloride could be prepared by reacting sodium with chlorine, but the question asked for the names of the acid and alkali used to make sodium chloride.

ResultsPlus
Examiner Tip

Candidates need to know that salts are normally prepared by reacting the appropriate acid with a suitable base or alkali, not just by reacting two elements together.

Question 3 (b)

A common mistake was to assume the sodium chloride was already a solution, thus limiting them to a maximum of two marks.

(b) A teacher drops a bottle containing sodium chloride. The bottle breaks when it hits the floor. The teacher sweeps up the mixture of sodium chloride and glass.

Describe how the teacher can obtain a pure, dry sample of sodium chloride from the mixture.

(4)

First, take the mixture ~~of~~ and add it to a heated ~~beaker~~ container of water. Stir until all the salt (sodium chloride) has dissolved. Now pour ~~leave~~ the solution with glass through a filter, the glass will remain on the filter paper while the sodium chloride solution passes through. Now take the solution and heat it or leave it out until most of the water has evaporated. Next leave it to cool and crystals of sodium chloride will form at the bottom. Now ~~it~~ pass the solution with crystals through a filter, the crystals will remain and water will go through. Take the crystals and gently press between filter paper to dry them.

ResultsPlus
Examiner Comments

This is a complete answer which scores all four marking points. The candidate clearly understands what they need to do to obtain a pure, dry sample of sodium chloride.

(b) A teacher drops a bottle containing sodium chloride. The bottle breaks when it hits the floor. The teacher sweeps up the mixture of sodium chloride and glass.

Describe how the teacher can obtain a pure, dry sample of sodium chloride from the mixture.

(4)

she can add some water to ~~clean~~ to the sodium chloride and let it dissolve, filter the dissolved sodium chloride to get rid of glass and dirt. Later she can let water evaporate to get a pure, dry sample of sodium chloride from the mixture.

ResultsPlus
Examiner Comments

This is a clear concise answer which scores 3 marks. The second marking point has not been awarded as the candidate has not warmed or stirred the mixture.

(b) A teacher drops a bottle containing sodium chloride. The bottle breaks when it hits the floor. The teacher sweeps up the mixture of sodium chloride and glass.

Describe how the teacher can obtain a pure, dry sample of sodium chloride from the mixture.

(4)

The method of filteration can be used for this as glass remains an undissolved solid so it can be filtered through a filter paper. The sodium chloride solution is a liquid and will pass through the filtering paper but the glass peices will remain as the residue. This occurs because peices of glass are too big to filter through and they don't dissolve in NaCl. This process could be repeated several times until all the glass peices have been filtered and only a filtrate of pure sodium chloride is present.

ResultsPlus
Examiner Comments

This candidate has assumed that the sodium chloride is already a solution, so they have not added water and so cannot be awarded the first two marking points. However, they can score the third marking point as they have filtered to remove the glass. Nothing else after the first sentence is necessary as they are just repeating what they have already said. They have not gone on to remove the water from the sodium chloride solution so the fourth marking point cannot be awarded, so just 1 mark for this answer.

ResultsPlus
Examiner Tip

When answering questions of this nature candidates should not waste time repeating themselves.

Question 4 (a) (i)

The majority of candidates knew that hydrocarbons contain hydrogen and carbon, but many omitted the reference to **only** hydrogen and carbon, limiting themselves to 1 mark. A significant number wrote about a mixture, element or atom containing hydrogen and carbon, which limited them to a maximum of 1 mark.

4 Crude oil is a mixture of hydrocarbons, most of which are alkanes.

(a) (i) State what is meant by the term **hydrocarbon**.

(2)

a substance made up of only carbon and hydrogen atoms.

ResultsPlus
Examiner Comments

A correct answer which scores both marks.

4 Crude oil is a mixture of hydrocarbons, most of which are alkanes.

(a) (i) State what is meant by the term **hydrocarbon**.

(2)

Hydrocarbon is a substance containing only hydrogen and carbon molecules.

ResultsPlus
Examiner Comments

This candidate has lost a mark for referring to 'hydrogen and carbon molecules' instead of atoms which is incorrect, however, as they have stated 'only hydrogen and carbon' they can still score the second marking point.

Question 4 (a) (ii)

Candidates struggled to give a correct general formula for an alkane. It is important that candidates learn the general formulae for this paper as outlined in the specification.

(ii) Give the general formula for the alkanes.

(1)

$C_n H_{2n+2}$

ResultsPlus
Examiner Comments

A correct, general formula which is clearly written, so the mark can be awarded.

Question 4 (b)

Around half the candidates knew fractional distillation was used to separate crude oil into fractions. If candidates wrote just distillation, it was not sufficient to score the mark.

Question 4 (c)

Only around a quarter of candidates scored both marks for this question.

(c) One of the fractions obtained from crude oil is fuel oil.

Fuel oil is used to heat homes.

Explain why burning fuel oil in an insufficient supply of oxygen is dangerous.

(2)

Because it produces toxic gases like carbon monoxide (CO) which can reduce the capacity to carry oxygen in the blood if inhaled.

ResultsPlus
Examiner Comments

This is a good answer which mentions carbon monoxide and clearly explains why it is dangerous, so both marks can be awarded.

(c) One of the fractions obtained from crude oil is fuel oil.

Fuel oil is used to heat homes.

Explain why burning fuel oil in an insufficient supply of oxygen is dangerous.

(2)

Because it can lead to incomplete combution and because of this carbon monoxide is made which is harmful for our body

ResultsPlus
Examiner Comments

This candidate can be awarded 1 mark for mentioning carbon monoxide, but saying it is harmful for our body is too vague and insufficient to gain the second mark.

ResultsPlus
Examiner Tip

Candidates should avoid use of the word 'harmful' in questions of this nature as it does not specify in what way the carbon monoxide is actually harmful.

(c) One of the fractions obtained from crude oil is fuel oil.

Fuel oil is used to heat homes.

Explain why burning fuel oil in an insufficient supply of oxygen is dangerous.

(2)

when burning fuel oil it produces CO_2 when there is insufficient supply of O_2 it is dangerous for ~~inhale~~ humans and animals.

ResultsPlus
Examiner Comments

Unfortunately, this candidate has referred to carbon dioxide rather than carbon monoxide so no marks can be awarded. Even if they had mentioned carbon monoxide they would not have scored the second marking point as they have just stated that it is dangerous for humans and animals, which is the word used in the stem of the question, so is not creditworthy.

ResultsPlus
Examiner Tip

Candidates need to avoid repeating words used in the stem of the question in their responses as this is not going to be creditworthy.

Question 4 (d) (i)

The majority of candidates gained at least 1 mark here, usually for stating that petrol is flammable.

(d) Another fraction obtained from crude oil is gasoline.

Gasoline is used to make petrol for cars.

(i) Explain why it is dangerous to light a match even when standing several metres away from a petrol spillage.

(2)

This is because the petral may diffuse and spread in the air around us as a gas; therefore if a match were to be lit, it would cause ~~combustion~~ fire.

ResultsPlus
Examiner Comments

This is a very good answer which raises three points, but as the question is only worth two marks, two marks are awarded.

Question 4 (d) (ii)

Very few candidates gave the answer of petrol being more volatile. The majority who scored the mark here did so by stating that petrol is more flammable.

(ii) Suggest why a petrol spillage is more dangerous than a fuel oil spillage.

(1)

Petrol is more flamable

ResultsPlus
Examiner Comments

This is a common correct answer, which is enough to score the mark.

(ii) Suggest why a petrol spillage is more dangerous than a fuel oil spillage.

(1)

Because petrol is more reactive than fuel oil,

ResultsPlus
Examiner Comments

Although this candidate has attempted to compare petrol with fuel oil they have just said it is more reactive, which is too vague. Reference to volatility or flammability is required for the mark to be awarded.

(ii) Suggest why a petrol spillage is more dangerous than a fuel oil spillage.

(1)

petrol can cause explosion and destroy people and the surrounding areas

ResultsPlus
Examiner Comments

This candidate has stated that petrol can cause an explosion, but there is no comparison with fuel oil so the mark cannot be awarded.

If they had said that petrol is more likely to cause an explosion than fuel oil then the mark could have been awarded.

ResultsPlus
Examiner Tip

Candidates need to be aware that when asked to make a comparison, comparative words such as **more** or **less** need to be used in their answer to gain credit.

Question 5 (a) (i)

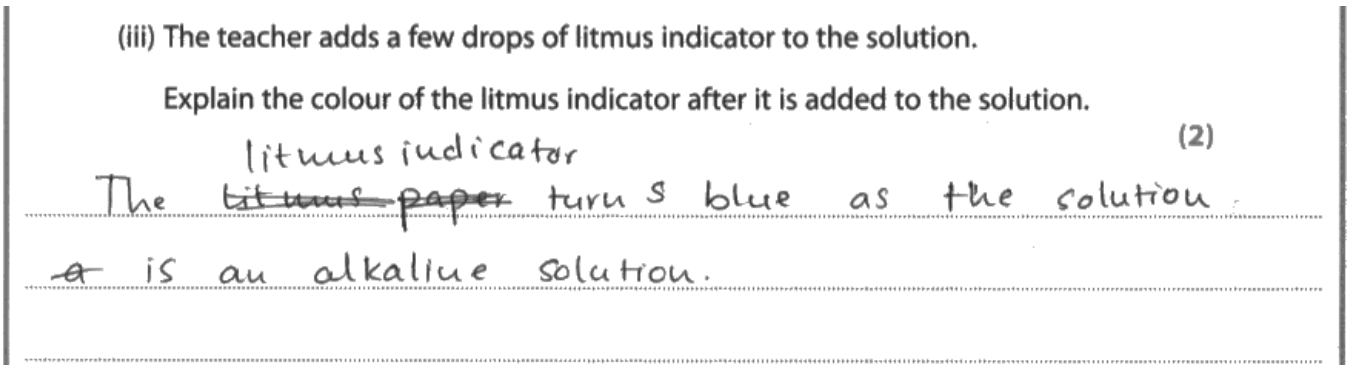
A common incorrect answer was purple, implying that candidates had misread the question and were thinking about the colour of universal indicator in an alkaline solution, rather than a flame colour.

Question 5 (a) (ii)

Those candidates who realised the flame colour was due to the prescence of lithium ions often wrote just Li without the charge or the word lithium. Lithium hydroxide and Li^- were also seen.

Question 5 (a) (iii)

A common error here was to think that the litmus solution turns purple in alkaline solution, probably because candidates confused litmus solution with universal indicator. Some candidates who said that the litmus solution turns blue failed to score the second mark, as they did not state that an alkaline solution forms. It was very rare to see any candidates mentioning OH^- or hydroxide ions.



(iii) The teacher adds a few drops of litmus indicator to the solution.

Explain the colour of the litmus indicator after it is added to the solution.

(2)

litmus indicator

The ~~litmus paper~~ turns blue as the solution

~~a~~ is an alkaline solution.

ResultsPlus
Examiner Comments

This is a good answer which scores both marks.

(iii) The teacher adds a few drops of litmus indicator to the solution.

Explain the colour of the litmus indicator after it is added to the solution.

(2)

It may turn blue or purple as it is an alkaline with a PH>7

ResultsPlus
Examiner Comments

This candidate has stated that the litmus solution turns blue or purple. This is a contradiction as litmus solution is purple in neutral solution, so the first marking point cannot be awarded. This would have been an acceptable answer if the solution used was universal indicator. However, the second marking point can still be awarded for stating that the solution is alkaline.

ResultsPlus
Examiner Tip

If candidates give two answers for a question and one is correct and one incorrect, the incorrect one will cause them to lose the mark.

Question 5 (b) (i)

The majority of candidates gave at least one correct observation for this question, usually by referring to fizzing or bubbles.

(b) The teacher adds a small piece of sodium to a second trough of water.

The sodium floats and moves around the surface of the water as it reacts.

(i) Give two other observations that are made as sodium reacts with water.

(2)

1 Bubbles / fizzing

2 the small piece of sodium slowly disappear.

ResultsPlus
Examiner Comments

This is a good answer which scores both marks.

(b) The teacher adds a small piece of sodium to a second trough of water.

The sodium floats and moves around the surface of the water as it reacts.

(i) Give two other observations that are made as sodium reacts with water.

(2)

1 A gas is given off

2 The sodium piece fizzes when it moves around the water surfaces

ResultsPlus
Examiner Comments

'A gas is given off' is not an observation and is not creditworthy. However, this candidate has also said that the sodium fizzes, so 1 mark can be awarded. The candidate has also mentioned that the sodium moves around the water surface, but this is just repeating what is in the stem of the question and so is not creditworthy.

ResultsPlus
Examiner Tip

Candidates need to realise that when asked for two other observations, repeating the ones given in the stem of the question is not going to be credited.

Question 5 (b) (ii)

Less than half the candidates balanced this equation correctly. Some just put a 2 in front of all the species in the equation, which defeats the point of balancing an equation. A few put 0 in front of the H_2 which is incorrect. If a species does not need a number in front to correctly balance the equation, the safest thing is to leave it blank.

Question 5 (c) (i)

Those candidates who answered this correctly usually mentioned a flame, or the potassium catching fire, or reacting more vigorously. A significant number of candidates just said that potassium is more reactive than sodium, which is not creditworthy, as it is not an observation.

Question 5 (c) (ii)

Surprisingly, many candidates thought the solution was acidic and gave a pH value under 7. A significant number also thought it was neutral and gave a pH value of 7.

Question 5 (d)

Many candidates just stated that rubidium is more reactive than potassium which is insufficient to score any marks here.

(d) Explain why the reaction of rubidium with water is more vigorous than the reaction of potassium with water.

(2)

Because the reactivity increases downwards in the group 1 element. Therefore, rubidium is below potassium, meaning ~~potassium~~ rubidium is more reactive

ResultsPlus
Examiner Comments

This is a good answer which can be awarded both marks.

(d) Explain why the reaction of rubidium with water is more vigorous than the reaction of potassium with water.

(2)

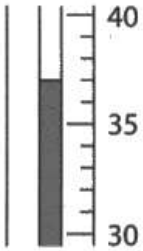
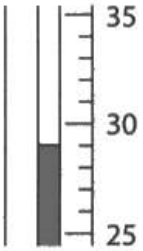
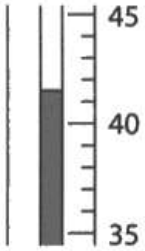
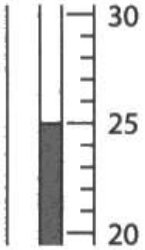
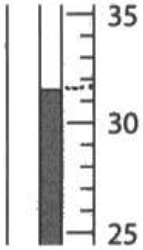
Rubidium is below potassium in the periodic table which shows that is ~~hight~~ highly ~~re~~ reactive than potassium.

ResultsPlus
Examiner Comments

This candidate can be awarded 1 mark for saying that rubidium is below potassium in the Periodic Table. There is no reference to the reactivity increasing down the group so the second marking point cannot be awarded.

Question 6 (a)

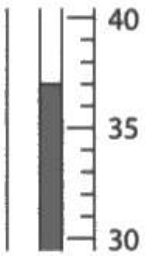
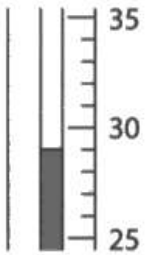
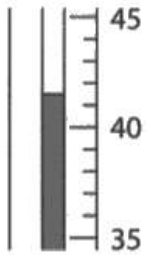
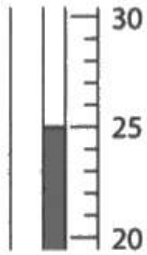
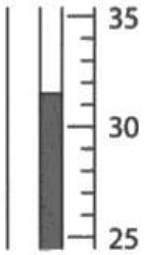
Around half the candidates scored both marks here. Those who scored 1 mark usually did so because they failed to give their answers to the nearest 0.5 °C.

	Aluminium	Iron	Magnesium	Silver	Zinc
Thermometer reading					
Highest temperature reached in °C	37.0	29.0	41.5	25.0	31.5

Complete the table by recording the highest temperature reached for each metal, giving all temperatures to the nearest 0.5 °C.

ResultsPlus
Examiner Comments

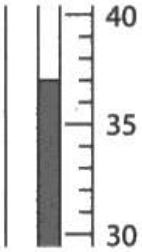
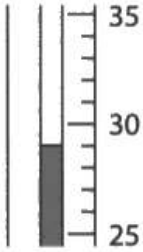
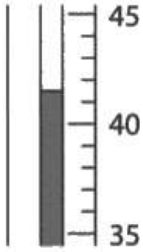
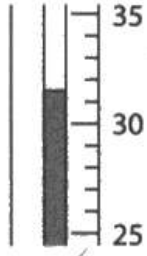
This is a fully correct answer so both marks can be awarded.

	Aluminium	Iron	Magnesium	Silver	Zinc
Thermometer reading					
Highest temperature reached in °C	37	29	41.5	25.0	31.5

Complete the table by recording the highest temperature reached for each metal, giving all temperatures to the nearest 0.5 °C.

ResultsPlus
Examiner Comments

This candidate has given the correct temperature readings but the first two readings are missing the zero after the decimal point, so only 1 mark can be awarded.

	Aluminium	Iron	Magnesium	Silver	Zinc
Thermometer reading					
Highest temperature reached in °C	37.0	29.0	42.0	25.0	32.0

· Complete the table by recording the highest temperature reached for each metal, giving all temperatures to the nearest 0.5 °C.

ResultsPlus
Examiner Comments

The third and fourth readings here are incorrect as they should have been read to the nearest 0.5 °C, so just 1 mark can be awarded for the first and second reading.

Question 6 (b) (i)

(b) The initial temperature of the copper(II) sulfate solution in each experiment is 25.0 °C.

(i) Suggest why magnesium produces the largest temperature rise.

(1)

Magnesium is a more reactive metal than the other metals used. so it reacts more quickly.

ResultsPlus
Examiner Comments

This is a good answer which states that magnesium is more reactive than the other metals, so the mark can be awarded.

(b) The initial temperature of the copper(II) sulfate solution in each experiment is 25.0 °C.

(i) Suggest why magnesium produces the largest temperature rise.

(1)

magnesium reacts highly with the solution.

ResultsPlus
Examiner Comments

This candidate has not compared the reactivity of magnesium to the other metals so the mark cannot be awarded.

Question 6 (b) (ii)

The majority of candidates scored at least 1 mark here, usually for saying that silver does not react with the copper(II) sulfate solution.

(ii) Explain why there is no temperature change with silver.

(2)

Because silver has a very low reactivity and it can not displace copper. Since silver is less reactive than copper.

ResultsPlus
Examiner Comments

This is a good answer which scores both marks.

(ii) Explain why there is no temperature change with silver.

(2)

Because silver doesn't react with copper (II) sulfate solution or it's not as effective as silver.

ResultsPlus
Examiner Comments

This answer scores the first marking point, but there is nothing else worthy of credit, so just 1 mark can be awarded.

(ii) Explain why there is no temperature change with silver.

(2)

Because silver is the least reactive metal.

ResultsPlus
Examiner Comments

This answer is enough to score the second marking point, so just the 1 mark can be awarded.

Question 6 (c)

This question proved very difficult for the majority of candidates. Many candidates stated that the temperature rise would be larger, which meant they automatically lost both marks.

(c) In the experiment with magnesium, using 25 cm^3 of solution means that the copper(II) sulfate is in excess.

In another experiment, the student uses the same amount of magnesium but adds it to 50 cm^3 of copper(II) sulfate solution.

Explain how the change in volume affects the temperature rise.

(2)

The temperature rise will be lower as the same amount of magnesium will produce the same amount of heat energy which ~~therefore~~, will be unable to heat a larger volume of solution to the same extent.

ResultsPlus
Examiner Comments

This is a very good answer which explains clearly why the temperature rise will be lower.

Question 6 (d)

Many candidates scored zero here as they could not recall the equation needed to find Q, so they did not know how to use the data given in the question. For those that did know the equation, a common error was to use 1g for the mass, leading to an answer of 63J.

(d) In another experiment, the student adds a metal to 45 cm^3 of copper(II) sulfate solution and obtains a temperature rise of 15.0 °C.

The mass of 1.0 cm^3 of the solution is 1.0 g.

The specific heat capacity, *c*, of the solution is 4.2 J/g/°C.

Calculate the heat energy, *Q*, in kilojoules (kJ), released in this reaction.

(4)

$Q = mc\Delta T$

$Q = 45 \times 4.2 \times 15.0$

$Q = 2\,835\ J$

$Q = 2.835\ kJ$

Q = 2.835 kJ

ResultsPlus
Examiner Comments

This is a very good answer. The working is clearly shown and the correct answer in kJ is written on the answer line, so all 4 marks can be awarded.

(d) In another experiment, the student adds a metal to 45 cm^3 of copper(II) sulfate solution and obtains a temperature rise of 15.0 °C.

The mass of 1.0 cm^3 of the solution is 1.0 g.

The specific heat capacity, *c*, of the solution is 4.2 J/g/°C.

Calculate the heat energy, *Q*, in kilojoules (kJ), released in this reaction.

(4)

$\Theta = mc\Delta T$

$1 \times 4.2 \times 15$

$= 63$

$Q =$ 63 kJ

ResultsPlus
Examiner Comments

This candidate has quoted the correct equation to find Q and so can score the first mark. They have then gone on to use 1g instead of 45g in their calculation so the second mark is not awarded. However, they have evaluated their answer correctly so the third mark can be awarded as an error carried forward mark. This mark is dependent on the candidate having multiplied a mass by 4.2 and a temperature change. The fourth mark is not awarded as there is no conversion to kJ, so this candidate scores 2 marks.

ResultsPlus
Examiner Tip

Candidates need to learn the equation to find Q because failing to do so is likely to mean that they will score 0 for this type of calculation. If this candidate had just written 63 on the answer line without showing any working, no marks could be awarded, which illustrates the point that candidates should always show their working so that error carried forward marks may be awarded.

Question 7 (a)

The majority of candidates scored at least 1 mark here, usually for a correct formula for calcium fluoride. Ammonium sulfate proved to be the most difficult for most candidates. A few candidates lost marks for incorrect use of superscripts in their answers.

7 (a) Table 1 shows the formulae of some ions.

It also shows the formulae of some compounds containing these ions.

	Ca^{2+}	Al^{3+}	NH_4^+
F^-	CaF_2	AlF_3	NH_4F
NO_3^-	$Ca(NO_3)_2$	$Al(NO_3)_3$	NH_4NO_3
SO_4^{2-}	$CaSO_4$	$Al_2(SO_4)_3$	$(NH_4)_2SO_4$

Table 1

Complete Table 1 by giving the missing information.

ResultsPlus
Examiner Comments

This is a very good answer, with all three formulae correct and clearly written, so all 3 marks can be awarded.

7 (a) Table 1 shows the formulae of some ions.

It also shows the formulae of some compounds containing these ions.

	Ca^{2+}	Al^{3+}	NH_4^+
F^-	CaF2	AlF_3	NH_4F
NO_3^-	$Ca(NO_3)_2$	Al(NO3)3	NH_4NO_3
SO_4^{2-}	$CaSO_4$	$Al_2(SO_4)_3$	NH4So4 2-

Table 1

Complete Table 1 by giving the missing information.

ResultsPlus
Examiner Comments

This candidate has given the correct formula for calcium fluoride so the first mark can be awarded. Unfortunately, they have written the 3 in aluminium nitrate as a superscript, so the second mark is not awarded. Ammonium sulfate is incorrect, so just 1 mark is awarded here.

ResultsPlus
Examiner Tip

Candidates need to be reminded that they may be penalised for incorrect use of case and superscripts when writing formulae.

Question 7 (b)

This question was poorly answered with the majority of candidates scoring zero. Many lost marks for referring to intermolecular forces in aluminium fluoride or weak covalent bonds in aluminium bromide, showing a lack of understanding.

(b) Table 2 gives information about aluminium fluoride and aluminium bromide.

	Bonding	Structure	Melting point in °C
Aluminium fluoride	ionic	giant lattice	1290
Aluminium bromide	covalent	simple molecular	98

Table 2

Explain the difference between the melting points of aluminium fluoride and aluminium bromide. Refer to bonding and structure in your answer.

(5)

Aluminium ~~fluo~~ fluoride has a giant ionic lattice structure. Therefore the electrostatic forces of attraction between the oppositely charged ions are high. ✱
A large amount of energy is needed to break these forces, therefore the melting point is high.
Aluminium bromide has a simple molecular structure. Therefore, the forces of attraction between molecules are weak. A little amount of energy is needed to break these forces, therefore the melting point is low.

ResultsPlus
Examiner Comments

This is a very good answer which scores all 5 marks. The candidate has correctly described the forces in aluminium fluoride and stated that they are 'high'. Although 'strong' would be a better word here, it is clear what the candidate means and so the first two marks can be awarded. There is a clear description of the weak forces between molecules in aluminium bromide which scores the third and fourth marks, and they have related the forces to the energy needed to break them, which then scores the fifth mark.

Explain the difference between the melting points of aluminium fluoride and aluminium bromide. Refer to bonding and structure in your answer.

(5)

① Aluminium fluoride is giant lattice structure and have ionic Bonding ~~Aluminium fluoride have~~ the ionic Bonding is strong.

So Aluminium fluoride need more heat energy to overcome the bond. So Aluminium fluoride have higher Melting point.

② Aluminium bromide is simple molecular structure, and have covalent Bond.

the bond isn't strong.

So Aluminium bromide don't need more heat energy to over come the bond. So Aluminium bromide have lower Melting point.

ResultsPlus
Examiner Comments

This candidate can be awarded 2 marks in total, one for saying the ionic bond in aluminium fluoride is strong and one for saying that more heat energy is needed to overcome the bond. As they have gone on to write about the covalent bonds in aluminium bromide not being strong, the third and fourth marking points cannot be awarded.

Explain the difference between the melting points of aluminium fluoride and aluminium bromide. Refer to bonding and structure in your answer.

(5)

The melting point of Aluminium fluoride is higher than Aluminium bromide. Aluminium fluoride has giant ionic lattice (structure), therefore they have strong bonds between molecules, ~~were~~ which ~~it~~ in turn increases the melting point of the atom. giant ionic lattice gain and lose electrons from one molecule to the other. They also have lots of molecules of Aluminium and fluorine which makes bonds stronger and rises melting and boiling point. Simple covalen molecular molecules such as Aluminium bromide have less bonds and molecules of bromide ~~than~~ and aluminium, which makes bond a bit weaker and doesn't increase the melting point as much as aluminium fluoride which has more molecules and bonds due to the fact that they are giant and gain and lose electrons from each others. Covalent bonds ~~are also~~ also have strong bonds, and a high melting point. They also share pairs of electrons.

ResultsPlus
Examiner Comments

This answer contains contradictions and irrelevant information and cannot be awarded any marks. They have said that there are strong bonds between **molecules** in aluminium fluoride which is incorrect, so the first two marking points cannot be awarded. They have not mentioned intermolecular forces in aluminium bromide and have contradicted themselves by saying that covalent bonds are weaker in one sentence, and stating they are strong in another sentence, so the third and fourth marking points cannot be awarded. There is no mention of energy needed to overcome the forces so the fifth marking point is not awarded.

ResultsPlus
Examiner Tip

When answering an extended writing question candidates should plan their answer carefully before starting to write and avoid giving irrelevant information which may be incorrect and contradictory, and as a result may lose them marks.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Plan answers carefully for extended writing questions and avoid giving unnecessary and irrelevant information.
- Learn any formulae needed for calculations and show all working.
- Read questions carefully in order to use any helpful information which is given in the question.
- Avoid repeating words and phrases that are given in the stem of the question in your response, as these will not be credited.
- Learn the formulae of common acids and gases to help with writing chemical equations.
- Make sure that when asked to record observations you state what is **seen** in the reaction.

Grade Boundaries

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

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London WC2R 0RL.