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Examiners' Report
June 2018

GCSE Chemistry 1CH0 1F

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Introduction

This paper was the first paper of the new 9-1 Chemistry specification, graded 9-1.It consisted of 10 questions. 60 marks of which were in the Foundation Tier Combined Science for Chemistry paper.The paper also has questions in common with Higher Tier Combined Science and Higher Tier Chemistry.

The level of knowledge of some candidates was low. Whilst some candidates could explain some areas of knowledge, their response was not always directed to the question being asked. There were a significant number of blank responses seen.

Candidates' application of knowledge to new situations is a challenge for many, another area that caused difficulty was questions regarding practical work, including the specified core practicals.

Question 1 (a) (ii)

Many could give the formula for the molecule of ammonia, where learners did not score, it was often because they had not used the correct scientific conventions.

(ii) Give the formula for the molecule of ammonia.

(1)

Nh₃

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Examiner Comments

In some cases, candidates lost marks as they did not write the formula using the correct conventions and used lower case rather than upper case letters in their formula or used a superscript number rather than subscript.

ResultsPlus
Examiner Tip

Candidates should be taught to write formula using the correct scientific conventions.

(ii) Give the formula for the molecule of ammonia.

(1)

N^3H

ResultsPlus
Examiner Comments

Candidates should be taught that numbers in formula should be subscript not superscript. This response did not score the mark.

(ii) Give the formula for the molecule of ammonia.

(1)

NH_3

ResultsPlus
Examiner Comments

Thsi response gained the mark.

(ii) Give the formula for the molecule of ammonia.

(1)

NH_3^+

ResultsPlus
Examiner Comments

In some cases, candidates added a charge to the ammonia, this did not score.

Question 1 (b) (i)

The majority of candidates were able to recall the meaning of the symbol and stated that it meant that the reaction is reversible.

(b) (i) Ammonia can be manufactured by the Haber process.

The word equation for the reaction is

nitrogen + hydrogen ⇌ ammonia

State the meaning of the ⇌ symbol.

(1)

The reaction is reversable - ammonia can be brought back to Nitrogen and Hydrogen

ResultsPlus
Examiner Comments

This answer gained the mark.

(b) (i) Ammonia can be manufactured by the Haber process.

The word equation for the reaction is

nitrogen + hydrogen ⇌ ammonia

State the meaning of the ⇌ symbol.

(1)

equilibrium

ResultsPlus
Examiner Comments

Some candidates stated that the symbol meant equilibrium which was accepted for the mark.

Question 1 (b) (ii)

The majority of candidates were able to use the graph to describe what happened to the percentage yeild of ammonia as the temperature increases.

(ii) In the Haber process, the percentage yield of ammonia at equilibrium changes with temperature.

Figure 2 shows how the percentage yield of ammonia at equilibrium changes with temperature.

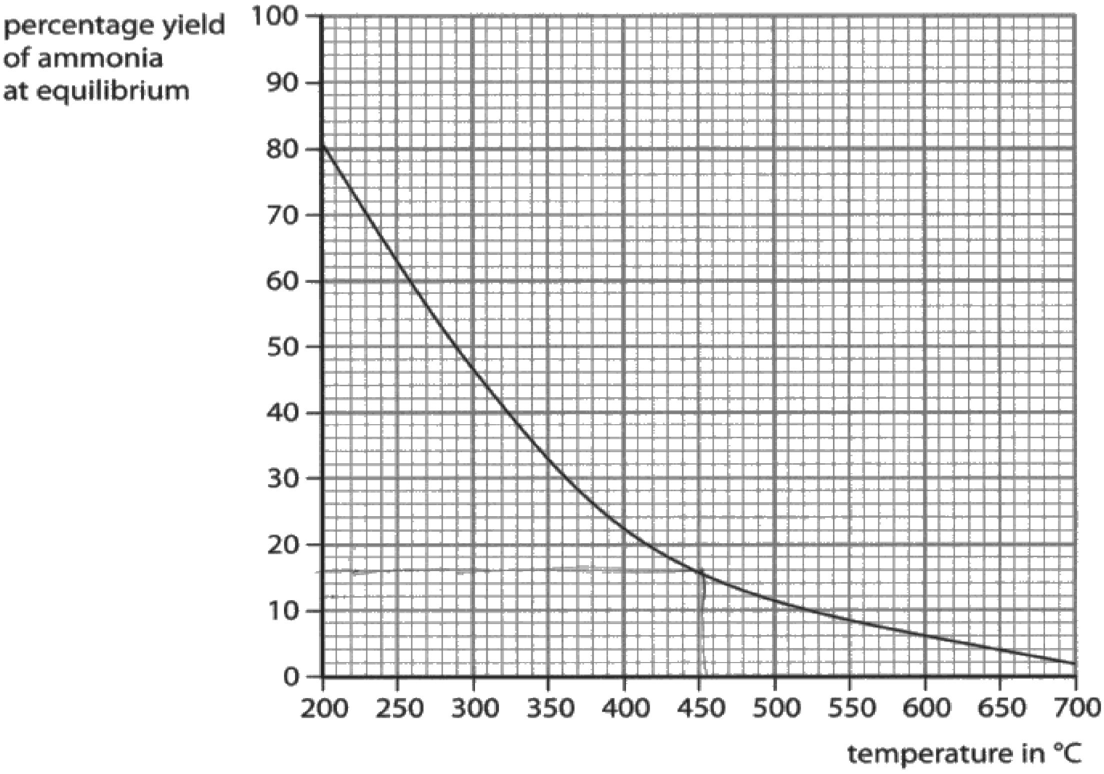

Figure 2

State what happens to the percentage yield of ammonia at equilibrium as the temperature increases.

(1)

As the temperature increases, the percentage yield of ammonia decreases.

ResultsPlus
Examiner Comments

This answer gained the mark.

Question 1 (b) (iii)

A large proportion of candidates were able to read off the values correctly to gain the mark.

(iii) Use the graph to find the percentage yield of ammonia at equilibrium at 450 °C.

(1)

percentage yield of ammonia at equilibrium = 13

ResultsPlus
Examiner Comments

In some cases, candidates did not read the scale correctly and gave a value of 13 or 18 rather than 16.

(iii) Use the graph to find the percentage yield of ammonia at equilibrium at 450 °C.

(1)

percentage yield of ammonia at equilibrium = 16

ResultsPlus
Examiner Comments

The correct answer that scored the mark.

Question 1 (c) (i)

Candidates generally performed well in this question, with many able to complete the word equation for the reaction between ammonia and nitric acid.

(c) Ammonia reacts with nitric acid to form ammonium nitrate.

(i) Complete the word equation for this reaction.

(1)

Ammonia + Nitric acid → ammonium nitrate.

ResultsPlus
Examiner Comments

The correct answer, that scored the mark.

(c) Ammonia reacts with nitric acid to form ammonium nitrate.

(i) Complete the word equation for this reaction.

(1)

nitric acid + Ammonium → ammonium nitrate.

ResultsPlus
Examiner Comments

Where candidates lost the mark is was often because they stated that ammonium rather ammonia was reacting or that ammonia reacts with nitrate.

ResultsPlus
Examiner Tip

Candidates should be taught to use the information given in the stem of the question to help them form their answer.

(c) Ammonia reacts with nitric acid to form ammonium nitrate.

(i) Complete the word equation for this reaction.

(1)

NH_3 + NCL → $2NH_3$CL

ResultsPlus
Examiner Comments

In some cases, candidates tried to write the symbol rather than the word equation. To be allowed marks, the symbol equation would have to be entirely correct.

ResultsPlus
Examiner Tip

Candidates should be taught that if a word equation is asked for, they should not attempt a symbol equation as it is much harder to gain credit.

Question 1 (c) (iii)

Candidates generally performed well on this question, with most scoring at least 1 mark for showing an understanding that the ammonium nitrate promotes crop growth or yield. Many knew that it was a fertilizer.

(iii) Explain why farmers spread ammonium nitrate on their fields.

(2)

They increase the efficiency of their crops growing, and acts as a fertiliser.

ResultsPlus
Examiner Comments

This good answer scored both marks.

(iii) Explain why farmers spread ammonium nitrate on their fields.

(2)

To make the yield of their crops increase and kill any pest.

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Examiner Comments

A common misconception seen was that the ammonium nitrate was used as a pesticide.

This example still gained 1 mark for improving crop yield.

Question 2 (a) (i)

Question 2 focused on the titration core practical – which requires the use of a burette, pipette and suitable indicator. It was found that few candidates were able to describe how the pipette should be used.

2 (a) A titration of sodium hydroxide solution with hydrochloric acid can be carried out as follows

1. a pipette is used to measure 25.00 cm^3 of sodium hydroxide solution into a conical flask
2. a few drops of indicator are added to the sodium hydroxide solution
3. the burette is filled with hydrochloric acid
4. the hydrochloric acid is added to the sodium hydroxide solution until the indicator changes colour.

(i) Describe how the pipette should be used to measure exactly 25.00 cm^3 of sodium hydroxide solution into the conical flask.

(2)

because its more accurate than just pouring it into a flask

ResultsPlus
Examiner Comments

Some candidates did not read the question carefully and tried to explain why the pipette should be used rather than how it is used.

ResultsPlus
Examiner Tip

Candidates should be taught to read the question carefully and learn the difference between how and why as well as describe and explain.

2 (a) A titration of sodium hydroxide solution with hydrochloric acid can be carried out as follows

1. a pipette is used to measure 25.00 cm^3 of sodium hydroxide solution into a conical flask
2. a few drops of indicator are added to the sodium hydroxide solution
3. the burette is filled with hydrochloric acid
4. the hydrochloric acid is added to the sodium hydroxide solution until the indicator changes colour.

(i) Describe how the pipette should be used to measure exactly 25.00 cm^3 of sodium hydroxide solution into the conical flask.

(2)

If a burette is used then it could ~~message~~ measure 25.00cm3 as a pipette can only measure 5cm3 of a liquid.

ResultsPlus
Examiner Comments

Candidates found it hard to describe how to use the pipette. Many described the use of a dropping or Pasteur pipette or described the use of a burette instead.

2 (a) A titration of sodium hydroxide solution with hydrochloric acid can be carried out as follows

1. a pipette is used to measure 25.00 cm^3 of sodium hydroxide solution into a conical flask
2. a few drops of indicator are added to the sodium hydroxide solution
3. the burette is filled with hydrochloric acid
4. the hydrochloric acid is added to the sodium hydroxide solution until the indicator changes colour.

(i) Describe how the pipette should be used to measure exactly 25.00 cm^3 of sodium hydroxide solution into the conical flask.

(2)

fill the ~~Pipet~~ Pipette using a pipette filler on the top then up the sodium hydroxide ~~[illegible]~~ soq up watch the ~~[illegible]~~ maniscus and when it ~~[illegible]~~ reaches the line stop.

ResultsPlus
Examiner Comments

This answer scored the two marks available.

2 (a) A titration of sodium hydroxide solution with hydrochloric acid can be carried out as follows

1. a pipette is used to measure 25.00 cm^3 of sodium hydroxide solution into a conical flask
2. a few drops of indicator are added to the sodium hydroxide solution
3. the burette is filled with hydrochloric acid
4. the hydrochloric acid is added to the sodium hydroxide solution until the indicator changes colour.

(i) Describe how the pipette should be used to measure exactly 25.00 cm^3 of sodium hydroxide solution into the conical flask.

(2)

Squeeze the solution out of the pipette and into a measuring cylinder first and keep putting it in until it reaches the 25cm^3 mark

ResultsPlus
Examiner Comments

The most common incorrect answer seen described the use of a dropping pipette used to fill a measuring cylinder or beaker to the correct value.

Question 2 (a) (ii)

A fair proportion of candidates understood that the acid was used to remove any water that was in the burette, but few were able to take the further and explain that the water would otherwise dilute the acid or would make the titration inaccurate. Some stated that it would effect the experiment but did not say how it would effect the experiment.

Candidates should be taught to always be explicit in their answers and not leave room for doubt, simply stating that a result would be affected is not sufficient, candidates should state in which way the result would be affected.

(ii) The burette is first washed with water.
It is then rinsed with some of the acid before it is filled with the acid to begin the titration.

Explain why the burette is rinsed with the acid.

(2)

~~The~~ To kill any other ~~germs~~ jerms that the water couldn't get rid off & so ~~the~~ the results will not be affected.

ResultsPlus
Examiner Comments

A common misconception was that the burette was rinsed with acid to kill any bacteria that was present.

Question 2 (b) (i)

The majority were able to identify an indicator. Most gave phenolphthalein or methyl orange, some gave litmus which was accepted.

(b) Universal indicator solution is not a suitable indicator for an acid-alkali titration.

(i) Give the name of an indicator that is suitable for use in the titration of sodium hydroxide solution with hydrochloric acid.

(1)

methyl orange

ResultsPlus
Examiner Comments

A correct answer that scored the mark. In some cases, candidates wrote methane orange rather than methyl orange and were not awarded credit.

(b) Universal indicator solution is not a suitable indicator for an acid-alkali titration.

(i) Give the name of an indicator that is suitable for use in the titration of sodium hydroxide solution with hydrochloric acid.

(1)

~~Ui~~ ~~Universal indicator~~ Litmus paper

ResultsPlus
Examiner Comments

Litmus alone was allowed. However, those who gave litmus paper did not gain credit. Other incorrect answers seen were benedicts solution and iodine.

(b) Universal indicator solution is not a suitable indicator for an acid-alkali titration.

(i) Give the name of an indicator that is suitable for use in the titration of sodium hydroxide solution with hydrochloric acid.

(1)

phenolthalein solution

ResultsPlus
Examiner Comments

Candidates found it hard to recall the spelling for phenolphthalein but phonetic spellings were accepted.

Question 2 (b) (ii)

Candidates found this question very hard. Few understood the need for a definite end point when using an indicator for titrations.

(ii) Universal indicator goes through a series of gradual colour changes as the pH changes in a solution.

Give a reason why universal indicator is not a suitable indicator to use in an acid-alkali titration.

(1)

The colour change is too gradual, this would cause confusion

ResultsPlus
Examiner Comments

Many answers repeated the stem of the question which gained no credit.

ResultsPlus
Examiner Tip

Candidates should be taught not to repeat the stem of the question as no credit will be awarded for this.

(ii) Universal indicator goes through a series of gradual colour changes as the pH changes in a solution.

Give a reason why universal indicator is not a suitable indicator to use in an acid-alkali titration.

(1)

No specific end point can be identified.

ResultsPlus
Examiner Comments

A good answer that scored the mark.

Question 2 (c)

In general, this question was answered well with many being able to calculate an average.

(c) Figure 3 shows some titration results obtained from an experiment in which an alkali is titrated with an acid.

	titration		
	rough	1	2
final burette reading in cm^3	25.75	49.35	23.70
initial burette reading in cm^3	0.00	25.75	0.00
volume of acid used in cm^3	25.75	23.60	23.70

Figure 3

Calculate the accurate volume of acid reacting with the alkali.

(2)

25.75 + 23.60 + 23.70 = 73.05

$\frac{73.05}{3}$ = 24.35

accurate volume of acid reacting 24.35 cm^3

ResultsPlus
Examiner Comments

A large proportion of candidates knew that they should not include the rough titraton within their average and scored both marks. In some cases candidates did not and so scored just 1 mark. As in this example.

(c) Figure 3 shows some titration results obtained from an experiment in which an alkali is titrated with an acid.

	titration		
	rough	1	2
final burette reading in cm^3	25.75	49.35	23.70
initial burette reading in cm^3	0.00	25.75	0.00
volume of acid used in cm^3	25.75	23.60	23.70

Figure 3

Calculate the accurate volume of acid reacting with the alkali.

(2)

~~49.35 + 23.70 ÷ 2 = 36.525~~

23.60 + 23.70 ÷ 2 = 23.65

accurate volume of acid reacting 23.65 cm^3

ResultsPlus
Examiner Comments

A correct answer that scored both marks.

(c) Figure 3 shows some titration results obtained from an experiment in which an alkali is titrated with an acid.

	titration		
	rough	1	2
final burette reading in cm^3	25.75	49.35	23.70
initial burette reading in cm^3	0.00	25.75	0.00
volume of acid used in cm^3	25.75	23.60	23.70

Figure 3

Calculate the accurate volume of acid reacting with the alkali.

(2)

accurate volume of acid reacting 23.70 cm^3

ResultsPlus
Examiner Comments

Where learners did not score it was often because they had tried to give a midpoint of the values or simply gave the last value in the table.

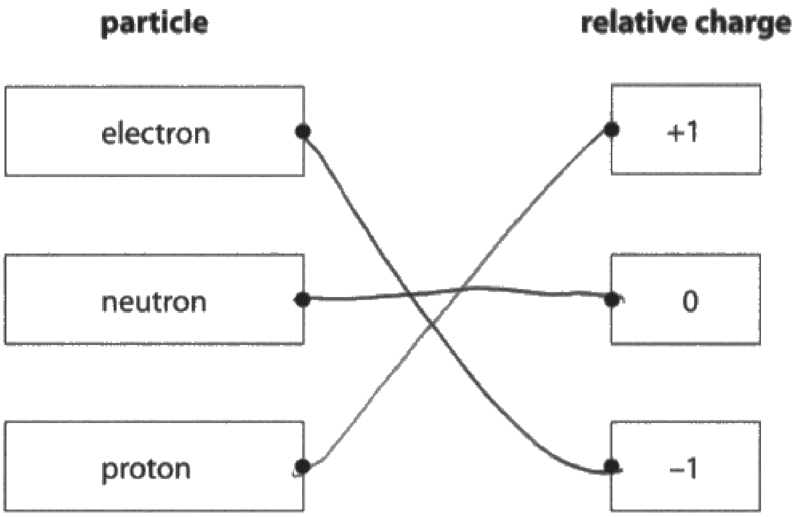
Question 3 (a) (i)

In general, candidates were able to select the correct charges of sub-atomic particles, where full marks were not scored, it was often because they had reversed the charges on the electron and the neutron.

3 (a) Atoms contain electrons, neutrons and protons.

(i) Draw one line to link each particle to its correct relative charge.

(2)



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Examiner Comments

The correct answer that scored 2 marks.

Question 3 (c)

Question 3C proved quite difficult, the better answers clearly described the structure of the two atoms.Where candidates lost marks, it was often because they gave a generalized description of what an isotope was, rather than using the data given in the stem to calculate the number of sub-atomic particles.

(c) Figure 4 shows the atomic number and mass number of two isotopes of argon.

isotope	atomic number	mass number
argon-38	18	38
argon-40	18	40

Figure 4

Describe the structure of an atom of argon-38 and of an atom of argon-40.

(3)

argon-38 has 18 protons, 18 electrons and 20 neutrons. where as argon-40 has 18 protons, 18 electrons but this time has an additional two neutrons meaning it has 22 neutrons. So argon-40 has more neutrons than argon-38

ResultsPlus
Examiner Comments

A correct answer that scored all three marks available.

(c) Figure 4 shows the atomic number and mass number of two isotopes of argon.

isotope	atomic number	mass number
argon-38	18	38
argon-40	18	40

Figure 4

Describe the structure of an atom of argon-38 and of an atom of argon-40.

(3)

Argon-38 has an electronic configuration of 2·8·8 and argon-40 has an electronic configuration of 2·8·8 aswell. The mass number shows how many protons the atom has and in this case argon-40 has 2 more protons than argon-38.

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Examiner Comments

Some candidates gave the electronic configuration of the atom rather than the number of electrons, this was accepted.

Question 4 (b)

A good proportion of candidates were able to correctly calculate the relative formula mass of butene as 56 to gain both marks.

In some cases, only a final, incorrect answer was given which scores 0. Candidates are strongly advised to show working, even in a simple calculation, as they may then receive part marks if they make an error.

(b) Calculate the relative formula mass of butene, C_4H_8.

(relative atomic masses: H = 1, C = 12)

(2)

48

(12×4) + (1×8) = 48 + 8 = 56

relative formula mass 56

ResultsPlus
Examiner Comments

A good answer that scored both marks.

(b) Calculate the relative formula mass of butene, C_4H_8.

(relative atomic masses: H = 1, C = 12)

(2)

1 X 4 + 12 X 8 = 4 + 96

relative formula mass 100

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Examiner Comments

Sometimes the atomic masses were transposed 8 x 12 + 4 x 1 = 100. With this one error carried forward a mark of 1 was awarded.

(b) Calculate the relative formula mass of butene, C_4H_8.

(relative atomic masses: H = 1, C = 12)

(2)

H = 8 C = 48 C48H8

relative formula mass C48 H8

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Examiner Comments

A number of candidates seemed to be unsure of what was expected as they gave the correct calculation i.e. (4 x 12) and (8 x 1) but then did not do the addition, or wrote answer of $C_{48}H_8$

Question 4 (c) (i)

Candidates found balancing the equation difficult, although some gained 1 mark, a smaller number gaining the full two marks available. In some cases, candidates inserted the symbols of elements instead of using numbers to balance the equation.

(c) When burnt completely in air, butene forms carbon dioxide and water.

(i) Balance the equation for this reaction by putting numbers in the spaces provided.

(2)

$$C_4H_8 + 6O_2 \rightarrow 4\,CO_2 + 4\,H_2O$$

ResultsPlus
Examiner Comments

The correct answer that scored both marks.

Question 4 (c) (ii)

There were a large amount of blank responses on this question, of those that attempted the question a large proportion could not name lime water – alternatives given included limestone, lime juice, lemon juice or just water.

In general, those that could give limewater as the liquid got both marks by saying it went cloudy/milky.

(ii) Describe the test to show that a gas is carbon dioxide.

(2)

You get a test tube with the gas in then hold your thumb over the end of it so they can not escape then get a lint splint and put it over the opening and it will make a squeky pop if its present.

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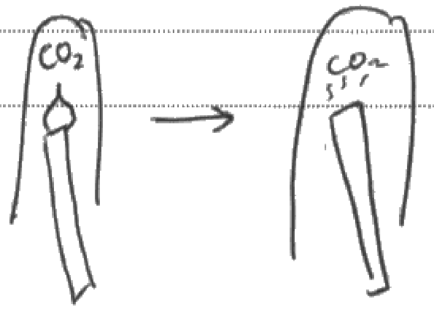
Examiner Comments

A large percentage of candidates gave the test for hydrogen rather than the test for carbon dioxide. Other tests included glowing splint relighting, using litmus paper, all of which gained no credit.

(ii) Describe the test to show that a gas is carbon dioxide.

(2)

lit splint into test tube with carbon Dioxide, splint should go out.



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Examiner Comments

Many candidates stated that carbon dioxide would extinguish a lit splint.

ResultsPlus
Examiner Tip

It should be noted that extinguishing a lit splint is not an acceptable answer (whilst true this will also happen for a number of other gases and thus does not prove the prescence of carbon dioxide).

(ii) Describe the test to show that a gas is carbon dioxide.

(2)

To test for carbon dioxide with lime water and if the lime water begins to bubble this shows that carbon dioxide is present.

ResultsPlus
Examiner Comments

In some cases, the candidate knew the method but did not give the positive result of the test so gained just 1 mark.

(ii) Describe the test to show that a gas is carbon dioxide.

(2)

using lime water testing for it to go cloudy

ResultsPlus
Examiner Comments

A correct answer that gained both marks.

Question 4 (e)

In general, candidates performed well in this question with many scoring the mark for being able to state a correct property of diamond.

(e) Diamond has a giant covalent structure.

State one property of diamond that is the result of its giant covalent structure. **(1)**

High boiling point.

ResultsPlus
Examiner Comments

A correct property that scored the mark.

(e) Diamond has a giant covalent structure.

State one property of diamond that is the result of its giant covalent structure. **(1)**

Strong bonds.

ResultsPlus
Examiner Comments

Where candidates did not score it was found that this was because they did not understand the meaning of the word 'property', linking their answer to the structure/ bonding of diamond rather than giving a property.

Question 5 (a)

The majority of candidates were able to state the correct meaning of the hazard symbol.

5 Two compounds of barium are barium sulfide and barium chloride.

(a) The hazard symbol shown in Figure 5 is on bottles containing barium metal.

Figure 5

State the meaning of this hazard symbol.

(1)

flammable

ResultsPlus
Examiner Comments

A correct answer that scored the mark.

Question 5 (b)

Barium and sulfur were often stated and scored the mark.

Where candidates did not score the mark, it was often because they thought that the elements combined in barium sulfide included barium and sulfide, other elements were also included in incorrect answer, the most common element added was oxygen, indicating confusion between sulfide and sulfate.

(b) Give the names of the elements combined in barium sulfide.

(1)

a barium, Sulfor

ResultsPlus

Examiner Comments

A correct answer that scored the mark.

(b) Give the names of the elements combined in barium sulfide.

(1)

barium sulphuric acid.

ResultsPlus

Examiner Comments

In some cases, candidates tried to give reactants that might form barium sulfide such as barium and sulfuric acid.

(b) Give the names of the elements combined in barium sulfide.

(1)

barium, Sulfur & oxygen

ResultsPlus

Examiner Comments

Another error seen frequently was to include oxygen in the list of elements present in the compound. This answer scored no marks.

(b) Give the names of the elements combined in barium sulfide.

(1)

sulfur and beryllium

ResultsPlus
Examiner Comments

A common error seen was to state that boron or beryllium was present rather than barium.

Question 5 (c)

The majority of candidates were able to identify a safety precaution that should be taken when using barium chloride, many were also able to go on to give a valid reason for the statement.

Those that did not score, did not think about the specific safety hazard here and gave random and often generic precautions such as tying hair back, use well-ventilated room or simply stated 'wear protective clothing' or 'PPE' all of which gained no credit.

(c) Barium chloride is toxic.

Explain one safety precaution that should be taken when using barium chloride.

(2)

Windows open so that gas can't build up and cause harm to the person.

ResultsPlus
Examiner Comments

Opening the windows was not deemed a suitable safety precaution and no credit was awarded.

(c) Barium chloride is toxic.

Explain one safety precaution that should be taken when using barium chloride.

(2)

wear safety goggles so that it doesnt get in your eye and ~~s~~ burn you. Also girls with long hair tie it up.

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Examiner Comments

THis example gained two marks, one for the precaution of goggles and one for the explanation, that it deos not go in your eyes.
Generic lab rules such as tie hair up, put your bags under the table were ignored.

ResultsPlus
Examiner Tip

When asked for saftey precuations, candidates should be taught to look for safety considerations specific to the situation or hazard rather than giving generic lab rules.

Question 5 (d) (ii)

Candidates found it quite hard to name barium sulfate as the precipitate formed.

(ii) Give the name of the white precipitate formed by the reaction of barium chloride solution with dilute sulfuric acid.

(1)

barium sulphate precipitate

ResultsPlus
Examiner Comments

The correct answer that scored the mark.

(ii) Give the name of the white precipitate formed by the reaction of barium chloride solution with dilute sulfuric acid.

(1)

barium

ResultsPlus
Examiner Comments

A common error seen was to simply state barium as the white precipitate formed.

(ii) Give the name of the white precipitate formed by the reaction of barium chloride solution with dilute sulfuric acid.

(1)

Barium Sulfide

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Examiner Comments

In some cases candidates gave 'barium sulfide' or were too vague with their answer and just stated salt.

Question 5 (e) (i)

Candidates did not perform well in this question. In some cases, candidates showed some understanding that the movement of particles was important for electrical conductivity in solution. However, many referred to the movement of electrons rather than the movement of ions.

In other cases, candidates thought that the reason was that you would not be able to get the electrodes into a beaker of solid, this did not gain credit. Some candidates gave vague statements such as the reaction would not work or repeated the stem and said that a solution should be used. Candidates should be taught that no credit will be awarded for repeating the stem of the question.

(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

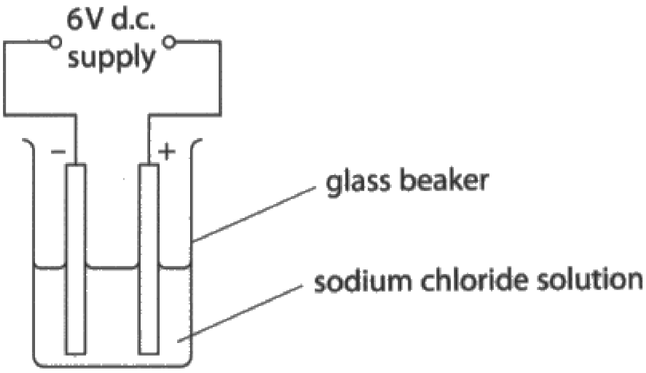


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

~~So that~~ Because it would not conduct electricity in solid state.

ResultsPlus
Examiner Comments

Where other candidates gained credit, it was often for stating that the liquid or solution would conduct or for saying that the solid would not conduct electricity.

(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

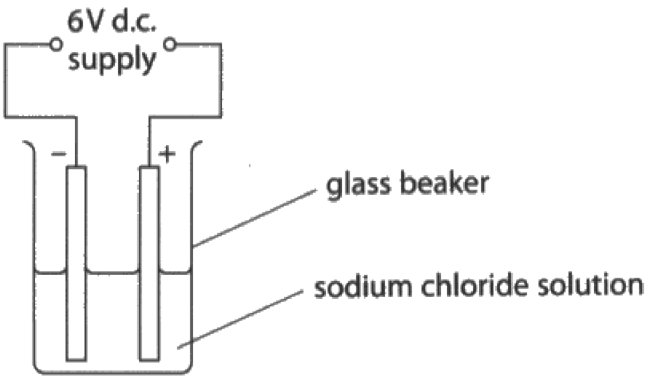


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

So the electrons can move freely

ResultsPlus
Examiner Comments

In this case the candidate referred to the movement of electrons rather than the movement of ions and so did not gain the mark.

Question 5 (e) (iii)

Many candidates found this question hard with the most common incorrect answer being that a lid should be placed on the apparatus.

Few candidates mentioned using a Bunsen burner some discussed using a blow torch which was allowed. Many suggested using a hot water bath, which was not allowed.

(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

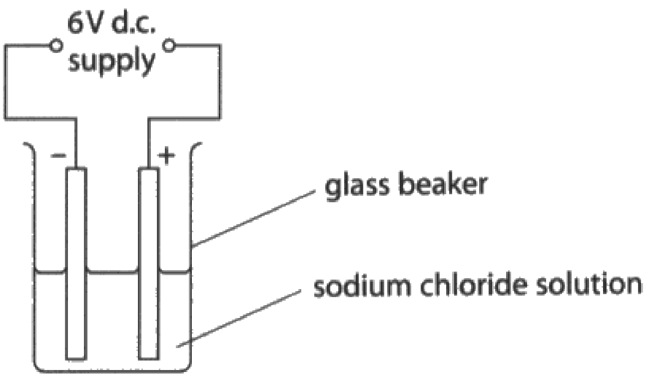


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

It has to be a liquid to work for electrolysis

(ii) The formulae of the ions present in the sodium chloride solution are

Na^+ Cl^- H^+ OH^-

Circle the ions that would be attracted to the anode.

(1)

(iii) Molten lead bromide can be electrolysed to form molten lead and bromine gas.

Explain how a student could modify the apparatus shown in Figure 8 to carry out this electrolysis.

(2)

They would use the same equipment but would use molten lead bromide instead of sodium chloride solution

ResultsPlus
Examiner Comments

Some candidates did not read the question carefully and stated that the sodium chloride should be changed to molten lead bromide and did not explain how the apparatus could be modified.

(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

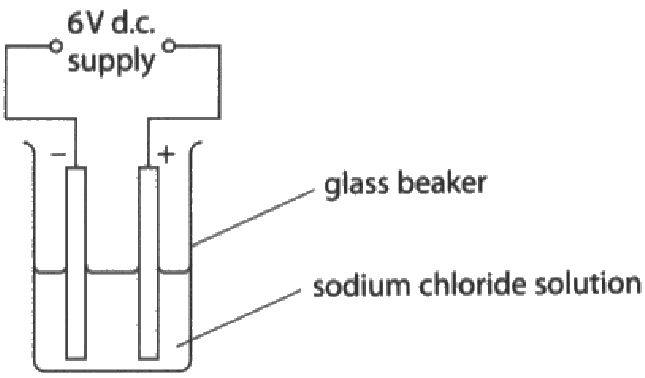


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

Sodium chloride has no free flowing electrons. Sodium Chloride solution does.

(ii) The formulae of the ions present in the sodium chloride solution are

Na^+ Cl^- H^+ OH^-

Circle the ions that would be attracted to the anode.

(1)

(iii) Molten lead bromide can be electrolysed to form molten lead and bromine gas.

Explain how a student could modify the apparatus shown in Figure 8 to carry out this electrolysis.

(2)

Place a lid ontop. This would trap he bromine gas and prevent it from escaping.

ResultsPlus
Examiner Comments

This common misconception that a lid should be placed on the beaker gained no credit.

(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

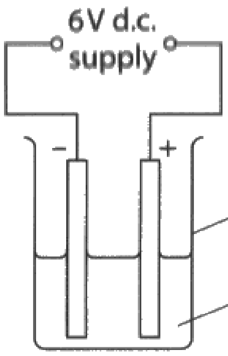


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

because sodium chloride solution will have a chemical reaction.

(ii) The formulae of the ions present in the sodium chloride solution are

Na^+ (circled) Cl^- (circled) H^+ OH^-

Circle the ions that would be attracted to the anode.

(1)

(iii) Molten lead bromide can be electrolysed to form molten lead and bromine gas.

Explain how a student could modify the apparatus shown in Figure 8 to carry out this electrolysis.

(2)

to carry out this electrolysis you need to change the 6v d.c. suppy to something more higher.

ResultsPlus
Examiner Comments

Other incorrect answers seen were that to 'catch' the bromine gas or that the voltage should be increased, adding a light bulb/ ammeter or using a bigger beaker.

Question 6 (b) (i)

A Liebig condenser is necessary apparatus in the core practicals. However, it was felt that few candidates have used or seen this demonstrated , those that had have not actually understood what was happening.

Many candidates did not have the water running through the outside jacket of the condenser at all. Of those that did, most of them had the water running downhill. A large number of candidates had the water coming out of the end of the condenser (into the beaker). Some candidates simply showed the water evaporating and going up the flask with the condensate coming down the middle of the condenser.

A significant group believed that the water flow began from the condenser and was somehow connected to the inner section, so many drew an arrow from the top of the condenser and an arrow finishing where the condensed vapor was exiting.

(b) The apparatus shown in Figure 9 can be used to separate water from ink.

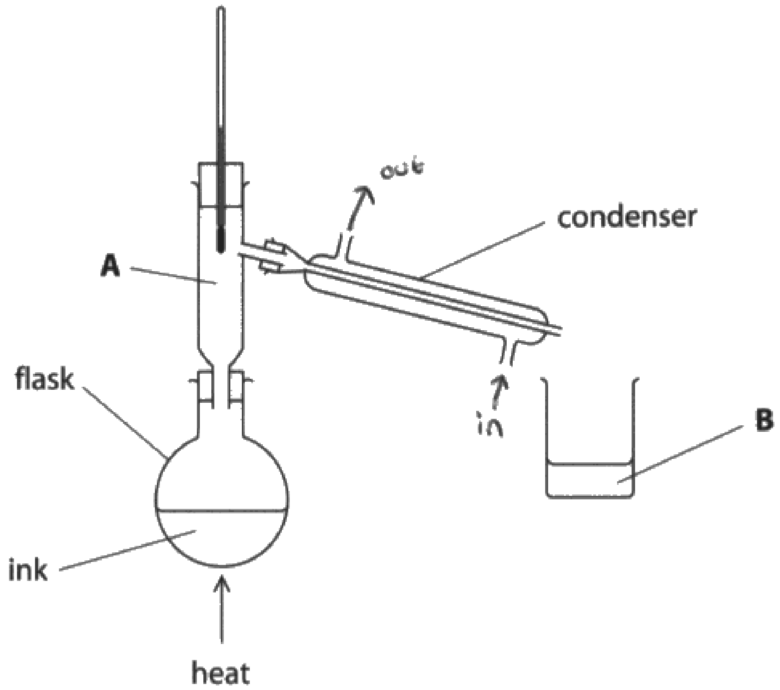


Figure 9

(i) Cold water flows through the condenser.

On Figure 9 use arrows to show where the water should flow in and where it should flow out.

(1)

ResultsPlus
Examiner Comments

A correct answer that gained the mark.

(b) The apparatus shown in Figure 9 can be used to separate water from ink.

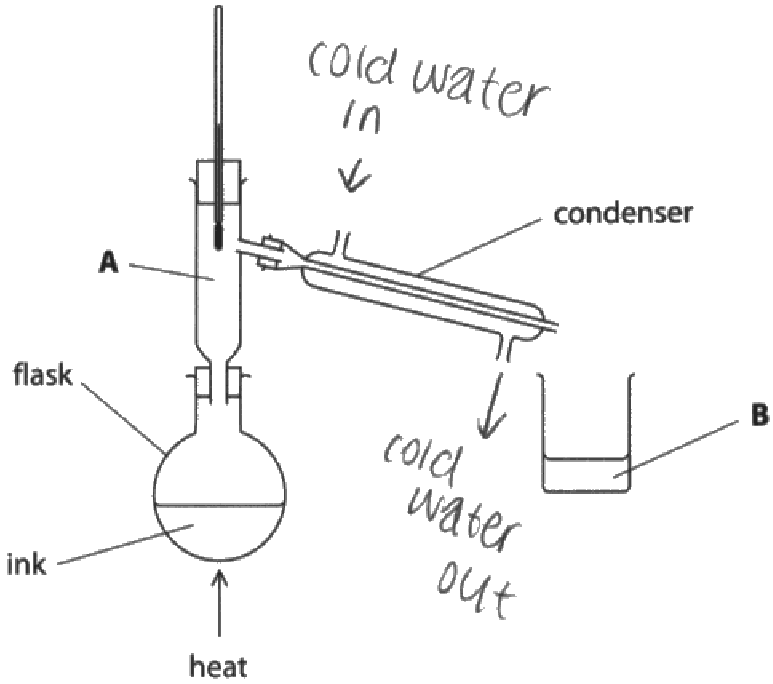


Figure 9

(i) Cold water flows through the condenser.

On Figure 9 use arrows to show where the water should flow in and where it should flow out.

(1)

ResultsPlus
Examiner Comments

Many candidates had the water flow in the wrong direction.

(b) The apparatus shown in Figure 9 can be used to separate water from ink.

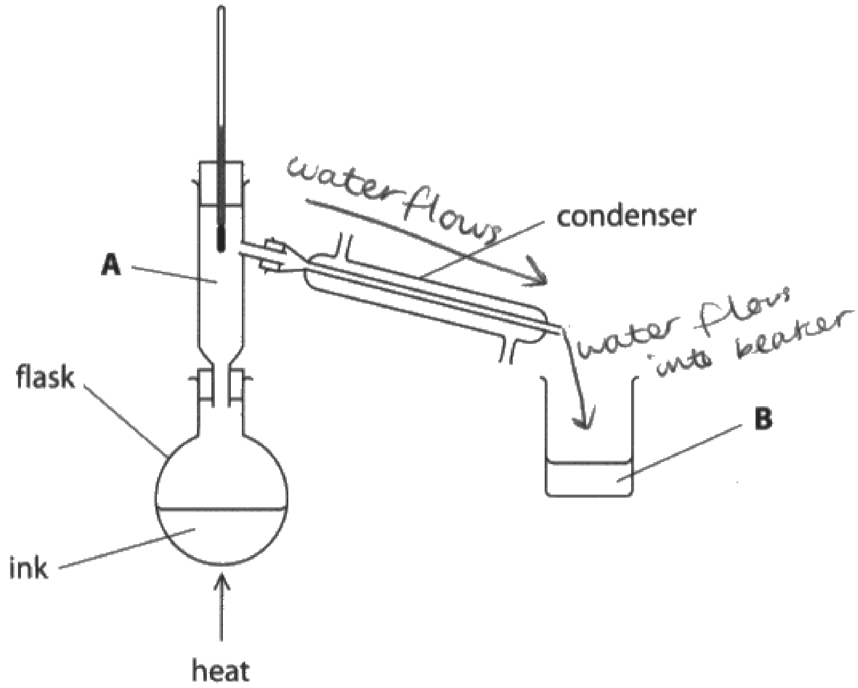


Figure 9

(i) Cold water flows through the condenser.

On Figure 9 use arrows to show where the water should flow in and where it should flow out.

(1)

ResultsPlus
Examiner Comments

Many candidates had the water coming out of the end of the condenser (into the beaker), this gained now credit.

Question 6 (b) (ii)

Candidates found explaining why the condenser was used in the experiment difficult. Some candidates were able to state it turns the gas back to a liquid, however some seemed a little confused referred to water being evaporated in the condenser.

A reference to cooling was often omitted. Candidates that simply stated that the condenser condenses the gas did not gain this mark.

Some vaguer answers just said it "separates the water from the ink" or that the "condenser collects the water in the beaker" without explaining how this happens.

(ii) Explain why a condenser is used.

(2)

So that the watr vapour is cooled back into a liquid state

ResultsPlus
Examiner Comments

A good answer that scored both of the marks available.

(ii) Explain why a condenser is used.

(2)

To turn the liquid water into a gas ~~(steam)~~ (vapour)

ResultsPlus
Examiner Comments

This example had the process the incorrect way around and thought that the condenser was turn the liquidinto a gas. No credit was awarded.

Question 6 (b) (iii)

Candidates found this question hard with few being able to provide a valid alternative to a Bunsen burner.

Some candidates stated electric heating mantle or spirt burner but the majority of correct responses referred to the use of a blow torch.

The most common incorrect alternative given was a water bath.

(iii) The flask was heated with a Bunsen burner.

Give the name of an alternative piece of apparatus that could be used to heat the flask.

(1)

oil burner/alchalol burner

ResultsPlus
Examiner Comments

An oil burner or alcohol burner was an acceptable alternative and gained a mark.

(iii) The flask was heated with a Bunsen burner.

Give the name of an alternative piece of apparatus that could be used to heat the flask.

(1)

Bunsen burner.

ResultsPlus
Examiner Comments

Many candidates did not read the whole question and stated that a Bunsen burner would be an alternative piece of equipment to the Bunsen burner. This did not score.

(iii) The flask was heated with a Bunsen burner.

Give the name of an alternative piece of apparatus that could be used to heat the flask.

(1)

blow torch

ResultsPlus
Examiner Comments

Blow torch was allowed and gained a mark.

(iii) The flask was heated with a Bunsen burner.

Give the name of an alternative piece of apparatus that could be used to heat the flask.

(1)

Water Bath

ResultsPlus
Examiner Comments

A waterbath was not an acceptable alternative to a Bunsen burner and no credit was awarded.

~~cotes~~ cools in back down to a liquid

(iii) The flask was heated with a Bunsen burner.

Give the name of an alternative piece of apparatus that could be used to heat the flask.

(1)

A candle.

ResultsPlus
Examiner Comments

Candidates often gave examples that were just a source of heat but would not be suitable for heating the flask such as candles, matches, lit splint, hot water, lighter, microwave and oven.

Question 6 (c)

A good number of candidates realised that the coloured particles would not be present. Of these, a further, a good number then realised that the particles would be closer together in the liquid (B) than the gas (A). It is advisable in a gas diagram just to draw a few, scattered particles, and in a liquid more densely arranged randomly ordered particles.

(c) The particles in the ink in the flask can be shown as in Figure 10.

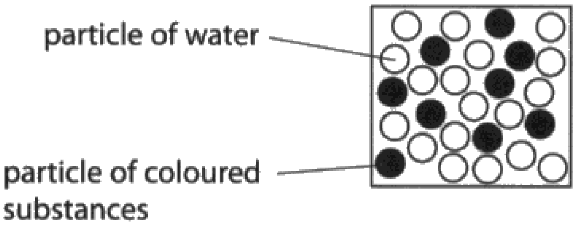
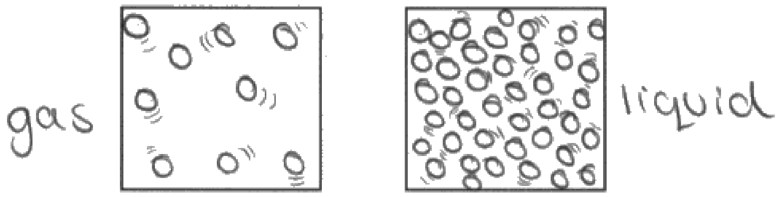


Figure 10

In the boxes below, draw the arrangement of particles that would be expected at **A** and **B** shown in Figure 9.

(2)



particles at **A** particles at **B**

ResultsPlus
Examiner Comments

Fully correct answer that scored both marks.

(c) The particles in the ink in the flask can be shown as in Figure 10.

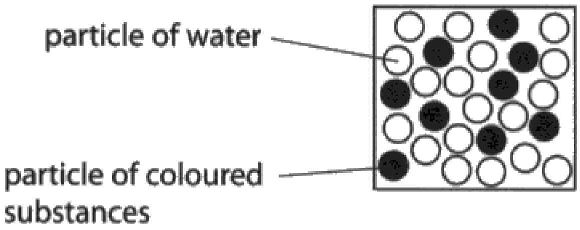
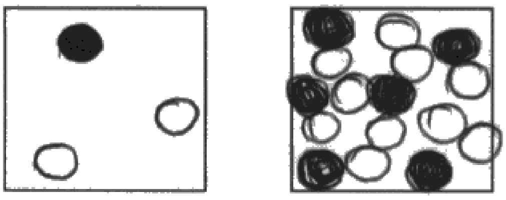


Figure 10

In the boxes below, draw the arrangement of particles that would be expected at **A** and **B** shown in Figure 9.

(2)



particles at **A** particles at **B**

ResultsPlus
Examiner Comments

In this example, the canidate has understood that a gas would be at point A and a liquid at point B, however they have not understood that ink particles would not be present, a mark of 1 was therefore awarded.

(c) The particles in the ink in the flask can be shown as in Figure 10.

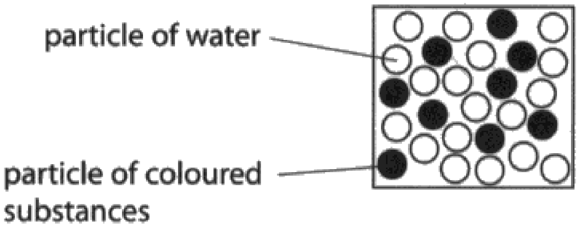
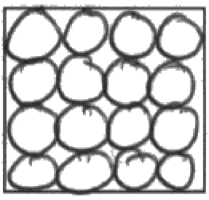


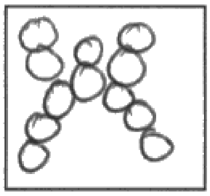
Figure 10

In the boxes below, draw the arrangement of particles that would be expected at **A** and **B** shown in Figure 9.

(2)



particles at **A**



particles at **B**

ResultsPlus
Examiner Comments

Candidates must be careful in liquid diagrams to draw a random distribution and not particles in rows or connected strings.

Question 6 (d)

Candidates found it hard to put into words the difference between a physical and chemical change. A common misconception was that a physical change could be seen where a chemical change could not been seen.

Where candidates did score, it was often for stating that the physical change could not be reversed or that no chemical reaction had taken place.

(d) Changes of state between the three states of matter are shown in Figure 11.

SOLID $\underset{\text{freezing}}{\overset{\text{melting}}{\rightleftarrows}}$ LIQUID $\underset{\text{condensing}}{\overset{\text{evaporating}}{\rightleftarrows}}$ GAS

Figure 11

The changes shown are physical changes.

Explain why these changes are called physical changes rather than chemical changes.

(2)

This is because they do not change the substances they only change the ~~atoms~~ particles structure and they are reversible. chemical changes are irreversible

ResultsPlus
Examiner Comments

A correct answer that scored both marks.

(d) Changes of state between the three states of matter are shown in Figure 11.

	melting		evaporating	
SOLID	⇄	LIQUID	⇄	GAS
	freezing		condensing	

Figure 11

The changes shown are physical changes.

Explain why these changes are called physical changes rather than chemical changes.

(2)

These changes are called physical changes because they are visible to the eye, however chemical changes are not.

ResultsPlus
Examiner Comments

Many candidates thought that a chemical change could not be seen, whereas a physical change could. This gained no marks.

Question 7 (a)

Candidates made a good attempt at this question and could explain how alloying changed the pure metals to make the alloys more suitable.

Good answers explained how the structure of the pure metal is changed when alloyed and how this changed the properties of the metal to make it more suitable for the uses given.

7 *(a) Pure metals are often converted into more useful alloys.
For example, aluminium is converted into an alloy used in aircraft, iron is converted into an alloy used in cutlery and gold alloys are used in jewellery.
These processes of alloying change the structures of the metals.

Some properties of pure aluminium, iron and gold are shown in Figure 12.

	density in g cm^{-3}	malleability	relative strength
aluminium	2.70	easy to bend	low
iron	7.75	easy to bend	low
gold	19.3	easy to bend	low

Figure 12

Explain how alloying changes these pure metals to make the alloys more suitable for the given uses.

(6)

An alloy is where atoms of another ~~element~~ metal or gas etc are added to another ~~element~~ metal. Pure ~~element~~ metals only contain one kind of atom, leaving them to have ~~an~~ an arranged and neat structure where the atoms can slide. When the atoms can slide this means the metal is weaker and more malleable (as evident in figure 12).

Alloys are made by adding another atom of another element to the pure metal which helps to make it stronger and less malleable. Adding other atoms disruptes the neat and ordered lattice structure of the metal atoms to which decreases the capability for the atoms to slide. By stopping the ~~days~~ layers of atoms to slide, it makes them remain in the same position and overall makes the the metal harder and stronger now it's an alloy.

By alloying aluminium, it will make it more suitable for it's function by being able to withstand the high temperature changes as it's used on aircraft (different altitudes have different temperatures). It would also mean it would be strong but could potentially allow it to be malleable allowing it to be easily fitted. As well as the density could remain low allowing the aircraft to go faster than if the aluminium was more dense.

Making iron into an alloy allows it to have an increased strength, decreased malleability, meaning it can't be bent easily, and the density could be lowered making it more light weight. ~~the~~ This would allow the alloy of iron to be suitable for cutlery as it's light weight but strong and can't bend.

Lastly changing gold into an alloy makes it more durable, have an increased strength and decreased malleability making it less likely to break. It would decrease ~~the~~ the density as well making it more portable and easier to carry around as an accessory. Although it would decrease the value, which makes ~~it~~ it ~~more~~ ~~eas~~ easier for people to buy.

~~Overall~~

Overall showing how alloying these pure metals can help make them more adapted to their functions or given uses.

ResultsPlus
Examiner Comments

In this example the candidate starts by explaining how alloying increases the properties of metals. The discussion of alloying in general here is detailed, the candidate then goes onto discuss each metal and its properties and how alloying them improves the properties specific to that use. The discussions are not perfect but do not have to be. There is discussion of the metals and how alloying changes the properties and therefore a mark of 6 in level 3 is awarded.

7 *(a) Pure metals are often converted into more useful alloys.
For example, aluminium is converted into an alloy used in aircraft, iron is converted into an alloy used in cutlery and gold alloys are used in jewellery.
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gold	19.3	easy to bend	low

Figure 12

Explain how alloying changes these pure metals to make the alloys more suitable for the given uses.

(6)

All three metals are changed to suit their purposes. Aluminium is used in aircraft meaning it can not be malleable whatsoever. It also needs to be very strong to take the weight of the ~~at~~ passengers etc.

Iron is used in ~~cuttt~~ cutlery, therefore it needs to be strong so that it doesn't snap while ~~picking~~ cutting food. It also needs to not be malleable as we would not be able to cut or pick food up with bendy cutlery.

Lastly, Gold. As it is used in jewellery, it needs to ~~s~~ be strong so that it doesn't break. They also need to be less dense or else it would be extremely ~~heavy~~ ~~heavy~~ heavy to carry around. The gold would need to be changed to make it less maleable because nobody wants bendy jewellery.

ResultsPlus
Examiner Comments

In this example, the candidate has discussed all three metals and why they would not be suitable for their given uses if a pure metal was used. They have not stated how they alloy would make a difference or given any general ideas about alloys. Therefore this was awarded level 2 - 4 marks.

7 *(a) Pure metals are often converted into more useful alloys.
For example, aluminium is converted into an alloy used in aircraft, iron is converted into an alloy used in cutlery and gold alloys are used in jewellery.
These processes of alloying change the structures of the metals.

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gold	19.3	easy to bend	low

Figure 12

Explain how alloying changes these pure metals to make the alloys more suitable for the given uses.

(6)

- Relative strength become high (so aircraft doesn't fall appart)
- Density ~~ing~~ in g cm^{-3} ~~becomes~~ stays the same?
- Malleability goes from easy to bend to hard to bend as the aircraft should be stable.
- ~~Isn't~~ Doesn't conduct ~~energy~~ electricity.
- ~~Conducts~~
- Doesn't dissolve in water?

ResultsPlus
Examiner Comments

In this example, only one metal has been discussed. There is some correct science. However, there is no discussion of why alloying might change the properties.

Only 1 metal has been discussed and not in great detail, therefore there is not sufficient for level 2. If a very detailed discussion of 1 metal was given, it could be possible to reach level 2.

A mark of 2 in level 1 was awarded.

7 *(a) Pure metals are often converted into more useful alloys.
For example, aluminium is converted into an alloy used in aircraft, iron is converted into an alloy used in cutlery and gold alloys are used in jewellery.
These processes of alloying change the structures of the metals.

Some properties of pure aluminium, iron and gold are shown in Figure 12.

	density in g cm^{-3}	malleability	relative strength
aluminium	2.70	easy to bend	low
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gold	19.3	easy to bend	low

Figure 12

Explain how alloying changes these pure metals to make the alloys more suitable for the given uses.

(6)

Gold alloys are suitable to be used in jewellery because they are malleable and have a high density. Aluminium is a good alloy to be used in aircraft parts because it has a low density and is easy to bend while gold would not be suitable for aircraft parts because it has a high density. Iron is a good alloy to use for cutlery because it is easy to bend into shapes and has a low relative strength.

A low relative strength is good for cutlery so it isn't to hard to cut things.

ResultsPlus
Examiner Comments

In this example. the candidate has not understood the question correctly and tried to explain thinking that the data is the data for the alloy not the pure metal, this does not answer the question and therefore 0 marks were awarded.

Question 7 (b) (i)

Candidates found it quite hard to recall what is meant by the term oxidation.

Where candidates scored the mark was split between those that recalled the simple definition, the gain of oxygen and those that knew that it was the loss of electrons.

(b) Iron objects can corrode when exposed to the atmosphere.

(i) Corrosion involves the oxidation of iron.

State what is meant by **oxidation**.

(1)

where something reacts with oxygen

ResultsPlus
Examiner Comments

A common answer that did not score was something reacts with oxygen.

(b) Iron objects can corrode when exposed to the atmosphere.

(i) Corrosion involves the oxidation of iron.

State what is meant by **oxidation**.

OILRIG

(1)

oxidation is loss of electrons, so iron objects lose electrons meaning they corrode.

ResultsPlus
Examiner Comments

Loss of electrons was a common correct response which was allowed for the mark.

Question 7 (b) (ii)

Many candidates were able to gain credit on this question as they knew that the paint gives a protective layer to the iron, many could often explain this this layer excludes air, oxygen or water to help prevent the corrosion.

In some cases, candidates simply restated the stem of the question which did not gain credit.

(ii) Painting iron objects prevents corrosion.

Explain why painting iron objects prevents corrosion.

(2)

stops them from rusting.

ResultsPlus
Examiner Comments

Many candidates did not read the question carefully and simply restated that paints stops the objects from rusting rather than answering the question and giving an explaination of why.

ResultsPlus
Examiner Tip

Candidates should be taught to read the question carefully, taking care to understand what is meant by different command words.

(ii) Painting iron objects prevents corrosion.

Explain why painting iron objects prevents corrosion.

(2)

Painting iron objects prevents corrosion because you're applying a protective layer stopping the oxygen from getting to the pure iron and stopping it corroding.

ResultsPlus
Examiner Comments

A good answer that scored both marking points.

Question 7 (b) (iii)

Candidates found stating another way of preventing the corrosion of iron objects difficult. Many restated the stem of the question and stated that the iron should be painted or electroplated. Answers that related to changing the object entirely for example by alloying it were not accepted.

Those that stated keep the iron out of water or to keep dry did not gain credit.

(iii) Corrosion of iron objects can be prevented by painting them or by electroplating them.

State one **other** way of preventing the corrosion of iron objects.

(1)

Glavinisation

ResultsPlus
Examiner Comments

A correct answer that scored the mark.

(iii) Corrosion of iron objects can be prevented by painting them or by electroplating them.

State one **other** way of preventing the corrosion of iron objects.

(1)

Keeping them dry

ResultsPlus
Examiner Comments

Those that stated keep the iron out of water or to keep dry did not gain credit.

(iii) Corrosion of iron objects can be prevented by painting them or by electroplating them.

State one **other** way of preventing the corrosion of iron objects.

(1)

moving them into a vaccum where there is no oxygen

ResultsPlus
Examiner Comments

Impractical methods of stopping rusting were not accepted.

Question 7 (c) (i)

The majority of candidates were able to state what the anode and cathode would have to be connected to in order to carry out the electroplating. With the majority stating a power pack or battery. A good proportion were more specific with their answer and stated a DC supply.

(c) The apparatus shown in Figure 13 was used to electroplate a spoon with nickel.

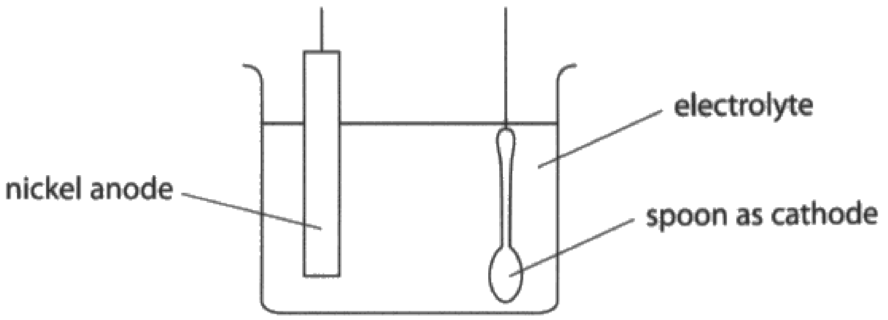

Figure 13

(i) State to what the anode and cathode have to be connected in order to carry out the electroplating.

(1)

A power source

ResultsPlus
Examiner Comments

A correct answer that scored the mark.

(c) The apparatus shown in Figure 13 was used to electroplate a spoon with nickel.

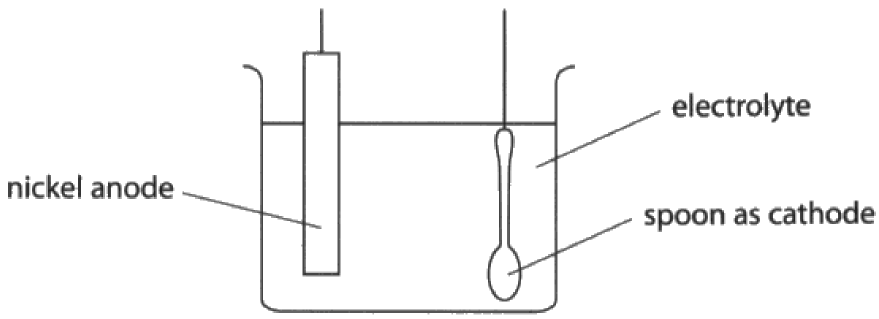

Figure 13

(i) State to what the anode and cathode have to be connected in order to carry out the electroplating.

(1)

electricity.

ResultsPlus
Examiner Comments

Simply stating electricity was not creditworthy.

Question 7 (c) (ii)

Very few candidates were able to name a soluble salt of nickel that could be used to form the electrolyte for the electroplating.

A large proportion of candidates did not read the question carefully and stated that sodium chloride or salt should be used.

(ii) Predict the name of a substance that could be dissolved in water to form the electrolyte for this electroplating.

(1)

nickel sulphate.

ResultsPlus
Examiner Comments

A correct answer that scored the mark.

(ii) Predict the name of a substance that could be dissolved in water to form the electrolyte for this electroplating.

(1)

Nickel oxide

ResultsPlus
Examiner Comments

A common incorrect answer that did not score.

(ii) Predict the name of a substance that could be dissolved in water to form the electrolyte for this electroplating.

(1)

Salt

ResultsPlus
Examiner Comments

A large proportion of candidates simply stated that 'a salt' should be used. This was insufficient and did not gain credit.

ResultsPlus
Examiner Tip

Candidates should be taught it be specific with their answers.

(ii) Predict the name of a substance that could be dissolved in water to form the electrolyte for this electroplating.

(1)

sodium chloride

ResultsPlus
Examiner Comments

A common incorrect answer that did not score.

Question 8 (a)

The majority of candidates scored at least one mark in this question with many scoring the two marks available for giving two characterisic properties of metals.

Where candidates did not score, it was often because they did not understand the meaning of 'property'. In some cases candidates simply named two metals.

Candidates often confused strong with hard thinking that they are synonymous.

8 (a) State **two** characteristic properties of metals.

(2)

property 1 maluble

property 2 ductile

ResultsPlus
Examiner Comments

A good answer that scored both marks.

8 (a) State **two** characteristic properties of metals.

(2)

property 1 ~~dense~~ Solid

property 2 tensile strength

ResultsPlus
Examiner Comments

This answer scored no marks.

If the candidate had stated high tensile strength a mark could have been awarded.

8 (a) State **two** characteristic properties of metals.

(2)

property 1 have strong bonds

property 2 all ~~[illegible]~~ atoms structured in rows tightly packed

ResultsPlus
Examiner Comments

In others, candidates tried to describe the structure of a metal rather than a property, this gained no marks.

8 (a) State **two** characteristic properties of metals.

(2)

property 1 Iron

property 2 Aluminium

ResultsPlus
Examiner Comments

In some cases candidates simply named two metals, this did not score.

Question 8 (b)

A good proportion of candidates knew that hydrochloric acid was required, however a large number stated that chlorine should be used.

Other candidates suggested other acids they knew such as sulfuric or nitric.

(b) Acids are used to make salts.

Give the name of the acid used to make chlorides.

(1)

hydrochlauric acid

ResultsPlus
Examiner Comments

A correct answer that scored the mark.

(b) Acids are used to make salts.

Give the name of the acid used to make chlorides.

(1)

chlorine

ResultsPlus
Examiner Comments

A very common answer that did not score.

Question 8 (c) (i)

Candidates could recall the test for hydrogen more easily than the earlier test for carbon dioxide. However, some did still leave out the method of the test.

Candidates should be taught that in every test, two components are required: what you do and what you observe for a positive result. Some did not say that they splint had to be lit or that it was glowing and so gained no credit.

In some cases, candidates simply stated the 'squeaky pop test' this was not sufficient for marks and did not gain credit.

(c) Salts of metals can be prepared by reacting the metal with an acid to produce the salt and hydrogen.

(i) Describe the test to show that the gas is hydrogen.

(2)

Squeaky pop with a lit splint.

ResultsPlus
Examiner Comments

A correct response which gained both marks.

(c) Salts of metals can be prepared by reacting the metal with an acid to produce the salt and hydrogen.

(i) Describe the test to show that the gas is hydrogen.

(2)

When there is hydrogen, when let off in air there will be a loud squeaky pop due to it reacting with the elements in the air.

ResultsPlus
Examiner Comments

A fair few stated that a pop would spontaneously be heard, e.g. after taking the bung out the test tube.

(c) Salts of metals can be prepared by reacting the metal with an acid to produce the salt and hydrogen.

(i) Describe the test to show that the gas is hydrogen.

(2)

place a metal & acid in a closed flask using a tune at the top to hold produced hydrogen. simmular to simple distillation

ResultsPlus
Examiner Comments

In some cases, candidates described how to produce the hydrogen, by reacting an acid and a metal, rather than stating the test for the hydrogen.

Question 8 (c) (ii)

Candidates found question 8(c)(ii) quite difficult with few scoring the full two marks available.

A common misconception seen was where candidates knew that two electrons were involved in the transfer but thought that the electrons were gained rather than lost. In these cases, one mark was awarded for showing an understanding that two electrons were involved.

In other cases, candidates knew that the ion has lost electrons but did not mention how many and so did not gain the second mark.

(ii) Nickel is a metal.

Explain how the structure of a nickel atom, Ni, changes when it forms a nickel ion, Ni^{2+}.

(2)

The nickel atom loses two electrons when it creates a nickel ion ~~as~~ therefore it becomes positive.

ResultsPlus
Examiner Comments

A good answer that scored 2 marks.

(ii) Nickel is a metal.

Explain how the structure of a nickel atom, Ni, changes when it forms a nickel ion, Ni^{2+}.

(2)

gains 2 electrons so it has full outer shells. ~~so~~ ~~therefore~~

ResultsPlus
Examiner Comments

In this example. one mark was awarded for showing an understanding that two electrons were involved.

(ii) Nickel is a metal.

Explain how the structure of a nickel atom, Ni, changes when it forms a nickel ion, Ni^{2+}.

(2)

The structure of a nickel atom changes when it forms a nickel ion is, the nickel ion has ~~lots~~ lost an electron so it has become positive.

ResultsPlus
Examiner Comments

This candidate knew that the ion has lost electrons but did not mention how many and so gained just 1 mark.

Question 8 (d)

It was pleasing to see that a good proportion of candidates were able to calculate the concentration correctly to gain the two marks available.

A common error seen was where candidates did not convert the volume from cm^3, obtaining 0.094, in these cases 1 mark was awarded.

(d) A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm^3 of solution.

Calculate the concentration of the solution in g dm^{-3}.

(2)

$250 \div 1000 = 0.25\ dm^3$

$\frac{23.5\ g}{0.25\ dm^3} = 94\ g\ dm^{-3}$

concentration = 94 g dm^{-3}

ResultsPlus
Examiner Comments

The correct calculation that scored both marks.

(d) A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm^3 of solution.

Calculate the concentration of the solution in g dm^{-3}.

(2)

$23.5 \div 250 = 0.094$

concentration = 0.094 g dm^{-3}

ResultsPlus
Examiner Comments

This candidate scores just 1 mark.

(d) A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm^3 of solution.

Calculate the concentration of the solution in $g\,dm^{-3}$.

(2)

Concentration = 250 ÷ 23.5

= 10.64

ResultsPlus
Examiner Comments

Another common error was to invert the fraction, this scored no credit.

Question 8 (e)

Many candidates were able to score some credit on this question, however few could give a complete description of this basic practical to gain all three of the available marks.

(e) Excess solid nickel carbonate is added to dilute sulfuric acid in a beaker.

nickel carbonate + sulfuric acid → nickel sulfate + carbon dioxide + water

Nickel sulfate is formed in solution.

Describe how a sample of pure, dry nickel sulfate crystals can be obtained from the mixture of nickel sulfate solution and excess solid nickel carbonate in the beaker.

(3)

nickel sulfate crystals can be obtained from the mixture using ~~[illegible]~~ filtration. A funnel is added to the top of a beaker and filter paper added, with the cloth. the mixture is poured into the funnel, where the filter paper allows the small solution liquid molecules ~~[illegible]~~ through, which are the collected in the beaker. but the nickel sulfate crystals are too large to go through the filter paper so collect in the funnel, ready to be collected/obtained.

(of nickel sulfate and nickel carbonate.)

(Total for Question 8 = 12 marks)

ResultsPlus
Examiner Comments

Many answers had no filtration at all. Others filtered but thought that this would filter out nickel sulfate crystals. In this example, although filtering is mentioned, because nickel sulfate is the residue this cannot score. They are filtering the crystals from a solution which is incorrect and so scored no marks.

(e) Excess solid nickel carbonate is added to dilute sulfuric acid in a beaker.

nickel carbonate + sulfuric acid → nickel sulfate + carbon dioxide + water

Nickel sulfate is formed in solution.

Describe how a sample of pure, dry nickel sulfate crystals can be obtained from the mixture of nickel sulfate solution and excess solid nickel carbonate in the beaker.

(3)

burn off the excess sulfuric acid and water from the ~~nickel~~ mixture. Filtration is needed and once filtration has happened, repeat it without the acid, and then leave it in a warm place for the dry nickel sulfate crystals to form.

ResultsPlus
Examiner Comments

In some cases, candidates started by describing an alternative method of making the nickel sulfate solution and therefore scored a maximum of 1 mark. In this example, the candidate scored 1 mark for showing an understanding that the solution should be left in a warm place for the crystals to form.

(e) Excess solid nickel carbonate is added to dilute sulfuric acid in a beaker.

nickel carbonate + sulfuric acid → nickel sulfate + carbon dioxide + water

Nickel sulfate is formed in solution.

Describe how a sample of pure, dry nickel sulfate crystals can be obtained from the mixture of nickel sulfate solution and excess solid nickel carbonate in the beaker.

(3)

Filtration + crystallisation. Filter the mixture of nickel sulfate solution + excess solid nickel carbonate into a beaker. The insoluble nickel carbonate (excess) will stay in the filter paper. then ~~use~~ heat ~~on~~ slowly untill bubbling occurs, then take off heat + leave to stand and crystals appear of pure nickel sulfate.
Larger crystals will form if cooled slowly/evaporation takes longer

(Total for Question 8 = 12 marks)

ResultsPlus
Examiner Comments

A good answer that scored all three marks.

Question 9 (a) (ii)

In general, foundation tier candidates found calculating the maximum mass of iron produced in the reaction difficult. However, many were able to score at least 1 mark for calculating the formula mass of iron oxide.

A good proportion of candidates were able to calculate the number of moles as 1.5, but this was often then given as a final answer with no further calculation made.

(ii) The formula of the iron oxide is Fe_2O_3.

Calculate the maximum mass of iron that can be obtained from 240 tonnes of iron oxide, Fe_2O_3.

(relative atomic masses: O = 16, Fe = 56)

(3)

$56 \times 2 = 112$ $16 \times 3 = 48$

240×160

mass of iron = 38400 tonnes

ResultsPlus
Examiner Comments

1 mark was awarded here for correctly calculating the relative formula mass of the iron oxide as 160.

(ii) The formula of the iron oxide is Fe_2O_3.

Calculate the maximum mass of iron that can be obtained from 240 tonnes of iron oxide, Fe_2O_3.

(relative atomic masses: O = 16, Fe = 56)

(3)

56 × 2   16 × 3

112 + 48

160   28   12

224   96   40

320

mass of iron = 168 tonnes

ResultsPlus
Examiner Comments

A fully correct answer that scored all three marks available.

Question 9 (b)

Candidates found explaining why aluminium has to be extracted by electrolysis to gain the full two marks available quite difficult. Where candidates scored marks, it was often as they showed the understanding that aluminum is very reactive. Fewer went on to score the second marking point saying that could not be reduced by carbon or alternatively that carbon cannot displace aluminum.

(b) Aluminium cannot be extracted by heating its oxide with carbon.
Aluminium has to be extracted from its oxide by electrolysis.

Explain why.

(2)

because aluminium is more reactive than carbon, its higher in the reactivity series, so will not react properly so has to be done using electricity in electrolysis.

ResultsPlus
Examiner Comments

This example scored 1 mark. Aluminium is more reactive than carbon gained the first marking point, they then say give the same idea again, that it is higher in the reactivity series. Stating that the aluminium will not react properly, was not sufficient to gain the second mark.

(b) Aluminium cannot be extracted by heating its oxide with carbon.
Aluminium has to be extracted from its oxide by electrolysis.

Explain why.

(2)

Aluminium has a very high melting point so it is not possible to melt it.

ResultsPlus
Examiner Comments

A common misconception seen was that melting point was too high to be heated with carbon. This scored no marks.

Question 9 (d)

Candidates found the second of the two extended response (6 mark) questions more difficult.

Vague comments such as ‘better for the environment’ and ‘less pollution’ were not awarded credit. However, more specific answers that referred to the ores being finite resources and the fact that recycling conserves them or the fact that less fossils fuel are burned and therefore less carbon dioxide is produced, which in turn reduces the greenhouse effect and global warming did gain credit. Damage to the landscape and habitats due to mining were also credited.

In some cases, there were references to the ozone layer in an evident confusion with the greenhouse effect, this was not awarded credit.

A good proportion of candidates understood energy would be saved with recycling instead of extraction. However only a few went to detail what type of energy would be saved for example electricity in electrolysis and heat in the extraction iron.

Unqualified arguments about cost were not credited. However, if candidates made reference to the cost of electricity in aluminium extraction this was accepted.

*(d) Aluminium is extracted from its ore by electrolysis.
Iron is extracted from its ore by heating with carbon.
Both metals can also be obtained by recycling.

Explain the advantages of recycling aluminium and iron rather than extracting them from their ores.

(6)

~~T~~ One of the main advantages of recycling Aluminium and iron is that it is alot cheaper than exstracting it from the ground because both electrolysis and heating with carbon uses up alot of energy which cost alot of money so it is cost effective ~~for~~ for companys to recycle then it is to exstract new ones from the ground.

Another advantage of recycling Aluminium and iron is that ~~the~~ we have dug up and used most of the giant deposit extracts so it is becoming ineffecient as you are using alot of energy to get not as much and if we dont recycle then we will run out of these resources.

A ~~find~~ final ~~reason why~~ advantage is that it is better for the environment to ~~recycle~~ recycle as we mentioned it takes up alot of energy which is releasing ~~the~~ green house gasses into the atmosphere which is ~~causing~~ harming the planet through global warming. We are also harming the planet by digging in to it to find ~~new~~ new material in areas we haven't ~~mind~~ mined yet which are places that were occupied by different animals and species which are facing exstinction as we destroy there habitats and enviroments.

ResultsPlus
Examiner Comments

The candidate has given a good explanation of the advantages of recycling aluminium and iron rather than extraction them from their ores to gain full credit in level 3.

*(d) Aluminium is extracted from its ore by electrolysis.
Iron is extracted from its ore by heating with carbon.
Both metals can also be obtained by recycling.

Explain the advantages of recycling aluminium and iron rather than extracting them from their ores.

(6)

I saves resources and money by using recycled ones. There is no need for the digging and the man power to get the aluminium or Iron. Also alot of time is saved. Once the recycled lot has been used to many times there will still be materials left.

If all the materials are used up at once when we run out there will be no backup supply. If we recycle there will be plenty left when needed once we finish recycling the availible resources.

It also creates less green ~~hoos~~ house gases than heating with carbon and is needed alot less. Pollution would decrease which is another advantage.

ResultsPlus
Examiner Comments

In this example, the candidate states that recycling saves resource... and that there will still be 'materials' left if we recycle them. They go on to state that there is no man power to dig (mining) for the 'aluminium or iron' They re-explain that if we use the ore up there will be no supply, which is the same point about conservation of reserves so there is no further credit here. In the last paragraph they state that less 'green house gases than heating with carbon' which was credited. The answer was therefore placed in level 2 with 4 marks as there is some explanation of conserving resources and statements about less mining and greenhouse gases.

*(d) Aluminium is extracted from its ore by electrolysis.
Iron is extracted from its ore by heating with carbon.
Both metals can also be obtained by recycling.

Explain the advantages of recycling aluminium and iron rather than extracting them from their ores.

(6)

There are many advantages to ~~extracting~~ recycling aluminium and iron rather than extracting them from their ores. One of the advantage is that it saves resources. If you can recycle something rather than get a new one it is the better option as it saves money. Not only does it save money but also means you can reserve and restore both of the materials rather than wasting new bits of each material everytime you use it. It also will not use as much time as you are not needing to ~~recycle~~ carry out the method to remove the ore everytime you require it. By recycling it you are ultimately treating the environment better because you are not extracting as much from the earth.

ResultsPlus
Examiner Comments

In this example, the candidate understands that recycling saves resources. They say that it saves time and money, but does not justify either of these in any way and is therefore ignored and the answer gained just 1 mark.

*(d) Aluminium is extracted from its ore by electrolysis.
Iron is extracted from its ore by heating with carbon.
Both metals can also be obtained by recycling.

Explain the advantages of recycling aluminium and iron rather than extracting them from their ores.

(6)

- made into otler things
- better for the enviroment
- cheaper
- doesn't need to use a power source

ResultsPlus
Examiner Comments

It should be noted that full credit can be scored from answers that involved bullet points and tables can score full credit.

However in this case, the content of the bullets is not sufficient.

There is an unqualified comment about cost and a vague statement about recycling being better for the environment. Both of which do not score here.

Stating that recycling doesn't need to use a power source is not correct and does not score.

Question 10 (a) (i)

Candidates appeared to understand what was meant by the term state symbol, however they did not use the information in the table to inform their answer but simply gave the states of the substances at room temperature.

10 (a) Hydrogen burns in air at a temperature well above 100 °C to form water.

(i) The boiling points of hydrogen and water are shown in Figure 15.

	boiling point in °C
hydrogen	–253
water	100

Figure 15

Use this information to add the missing state symbols to the equation for the reaction taking place as the hydrogen burns.

(2)

$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

ResultsPlus
Examiner Comments

A correct answer that scored both marks.

10 (a) Hydrogen burns in air at a temperature well above 100 °C to form water.

(i) The boiling points of hydrogen and water are shown in Figure 15.

	boiling point in °C
hydrogen	−253
water	100

Figure 15

Use this information to add the missing state symbols to the equation for the reaction taking place as the hydrogen burns.

(2)

$2H_2(\text{.......g...}) + O_2(g) \rightarrow 2H_2O(\text{........L..})$

ResultsPlus
Examiner Comments

For hydrogen this was sufficient and 'g' gained a mark. However for the water those that gave 'l' did not score the mark because in this reaction water would be formed as a gas.

ResultsPlus
Examiner Tip

Candidates should be taught to use the information in the stem to inform their answer.

10 (a) Hydrogen burns in air at a temperature well above 100 °C to form water.

(i) The boiling points of hydrogen and water are shown in Figure 15.

	boiling point in °C
hydrogen	−253
water	100

Figure 15

Use this information to add the missing state symbols to the equation for the reaction taking place as the hydrogen burns.

(2)

$$2H_2(\ldots 2) + O_2(g) \rightarrow 2H_2O(\ldots 2)$$

ResultsPlus
Examiner Comments

In some cases, it was clear that candidates were not familar with state symbols are tried adding numbers to balance the equation rather than adding state symbols.

Question 10 (a) (ii)

Candidates found it quite difficult to put into words why the atom economy of the reaction is 100%, many simply stated that the equation is balanced or the same on both sides, whilst this is true, it is not what shows that the atom economy is 100%. Few refered to the useful product.

Where candidates scored the mark, it was usually for saying that there were no waste products.

(ii) The atom economy for the reaction in (i) is 100%.

State how the equation shows that the atom economy is 100%.

(1)

Everything is used up nothing is left

ResultsPlus
Examiner Comments

Everything is used up did not gain credit.

(ii) The atom economy for the reaction in (i) is 100%.

State how the equation shows that the atom economy is 100%.

(1)

It is balanced.

ResultsPlus
Examiner Comments

A common answer that did not score was that the equation was balanced.

(ii) The atom economy for the reaction in (i) is 100%.

State how the equation shows that the atom economy is 100%.

(1)

there are no exess products of the reaction, all of the reactants made 1 product.

ResultsPlus
Examiner Comments

This answer gained 1 mark.

Question 10 (b)

Whilst candidates did find the question difficult it was pleasing to see a good number of candidates that scored full marks for the correct answer given to two significant figures.

(b) Lead can be obtained by heating its oxide with carbon.
The balanced equation for the reaction is

$$2PbO + C \rightarrow 2Pb + CO_2$$

Calculate the atom economy for the production of lead in this reaction.
(relative atomic masses: C = 12, O = 16, Pb = 207
relative formula masses: PbO = 223, CO_2 = 44)

Give your answer to two significant figures.

(4)

and O_2 of oxygen are produced nothing is lost, they are still both gases.

lead. 2Pb

Mr of desired product / Mr of total product x 100

414 / 458 = 0.90

2Pb = 207x2 = 414

0.90 x 100 = 90%

total product = 414 + 44 = 458

atom economy = 90 %

ResultsPlus
Examiner Comments

The correct answer, with clear working that scored all 4 marks available.

(b) Lead can be obtained by heating its oxide with carbon.
The balanced equation for the reaction is

$$2PbO + C \rightarrow 2Pb + CO_2$$

Calculate the atom economy for the production of lead in this reaction.
(relative atomic masses: C = 12, O = 16, Pb = 207
relative formula masses: PbO = 223, CO_2 = 44)

Give your answer to two significant figures.

(4)

223×2=446+12=458
207× 2=414+12=426+(16×2)=458
$\frac{414}{458}$ × 100 = 90.39

atom economy = 90.4 %

ResultsPlus
Examiner Comments

The answer has been calculated correctly but not given to the correct number of significant figures so gained three rather than 4 marks.

(b) Lead can be obtained by heating its oxide with carbon.
The balanced equation for the reaction is

$$2PbO + C \rightarrow 2Pb + CO_2$$

Calculate the atom economy for the production of lead in this reaction.
(relative atomic masses: C = 12, O = 16, Pb = 207
relative formula masses: PbO = 223, CO_2 = 44)

Give your answer to two significant figures.

(4)

414 446
207×2 + 16×2 + 12 = 458/458 × 100
414 + 44
458

atom economy = 100 %

ResultsPlus
Examiner Comments

A common error was to divide the masses of all of the products added together, rather than just the mass of theuseful product, by the masses of all of the reactants to come to an answer of 100%. Whilst incorrect, candidates that showed their working did gain some credit. This answer scored 2 marks.

Question 10 (c) (i)

In general this question was answered well with many scoring at least 1 mark for being able to calculate a percentage and a good proportion of candidates being able to correctly calculate the percentage yield to gain both available marks.

(c) (i) In an experiment to produce lead, 7.67 g of lead are obtained.
The theoretical yield of lead for the experiment is 11.80 g.

Calculate the percentage yield of lead in this experiment.

(2)

~~11.80/7.67 x100~~

$\frac{7.67}{11.80} \times 100 = 65\%$

percentage yield = 65%

ResultsPlus
Examiner Comments

A correct answer that scored both marks.

(c) (i) In an experiment to produce lead, 7.67 g of lead are obtained.
The theoretical yield of lead for the experiment is 11.80 g.

Calculate the percentage yield of lead in this experiment.

(2)

$\frac{11.80g}{7.67g}$ = 1.538461538 × 100
= 153.8461538
= 153

percentage yield = 153%

ResultsPlus
Examiner Comments

The fraction has been inverted in this answer and so the first mark could not be awarded. However a mark was awarded for the incorrect fraction x100.

Question 10 (c) (ii)

This question proved difficult with few gaining the full two marks available.

Many thought that the percentage yield was only an estimate and so would not be 100%, others repeated the stem of the question and simply stated that the percentage yield could never be 100%.

(ii) In most reactions, the percentage yield of any product is less than 100%.

Give **two** reasons why the percentage yield is less than 100%.

(2)

reason 1 not all the Reactants have ~~hate~~ Reacted

reason 2 The hve been side Reactions

ResultsPlus
Examiner Comments

A good answer that scored both marks. Stating that not all the reactants have reacted was accepted for an incomplete reactions and the fact that there has been side reactions was also credidted.

(ii) In most reactions, the percentage yield of any product is less than 100%.

Give **two** reasons why the percentage yield is less than 100%.

(2)

reason 1 The theoretical yield isn't accurate as it's a prediction.

reason 2 For it to be 100% both yields must be exactly the same

ResultsPlus
Examiner Comments

Many thought that the therotical yield is simply a prediction rather than a calcuation.

Paper Summary

Candidates that did well this series read the question carefully, taking care to note the command word and answered taking this into consideration. Good and specific subject language was used. They had a good knowledge and understanding of the core practicals and could apply their knowledge of chemistry to new situations.

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

- learn definitions as outlined in the specification
- ensure that you have seen and understand and explain the core practicals detailed in the specification, including the specific pieces of equipment that are used in the practical
- ensure that you know what is required by different command words such as describe and explain and the difference between how and why
- learn how to write formula using correct scientific conventions
- learn how to use state symbols and balance equations
- know what key terms mean for example property
- practice 6-mark questions, focus on succinct layout and logical presentation of relevant information.

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