Qualification Accredited

Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

TWENTY FIRST CENTURY SCIENCE CHEMISTRY B

J258

For first teaching in 2016

J258/03 Summer 2022 series

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers are also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our website.

Paper 3 series overview

J258 03 is the Higher Tier paper of two papers for GCSE examination for Chemistry B. This paper is designed to test the breadth of candidates' knowledge. As such, candidates are tested across the specification with multiple specification areas being assessed within each question in order to test the breadth of candidates' knowledge and understanding. The question style is short answer to target knowledge and understanding predominantly aimed at the assessment objectives AO1 and AO2. The Science for the Twenty First Century suite of specifications include integral Ideas about Science, which are also assessed through the contextualised and issue-based question style, where candidates are expected to process unfamiliar information, make informed decisions and solve problems.

Candidates generally approached this paper very positively. They showed engagement, with few unanswered questions. The first two questions on the Higher Tier paper are 'overlap' questions and are shared with the Foundation Tier paper. These were typically very well answered, as would be expected.

Candidates who did well on this paper generally do the following:	Candidates who did less well on this paper generally do the following:
• read questions carefully and took care to answer all parts of the task. For longer answer questions complex instructions are often used which ask candidates to discuss more than one factor or idea. Candidates who do well are careful to address the question fully. • take note of instructions such as to use a specific number of decimal places or significant figures in calculations. • pay attention to instructions to 'use ideas about….' in answers. These instructions are designed to support candidates to understand the level and type of answer expected. • are precise and unambiguous in the points that they make.	• do not address all areas of the question but rather answer only one aspect. • repeat information without explaining it or using it to show any interpretation, comparison or processing. • give vague responses rather than clear, factual statements which show knowledge of the area being tested.

Question 1 (a)

1 Mia investigates the rate of reaction when zinc reacts with dilute sulfuric acid.
She adds zinc pieces to dilute sulfuric acid at room temperature.

Fig. 1.1 shows the apparatus she uses:

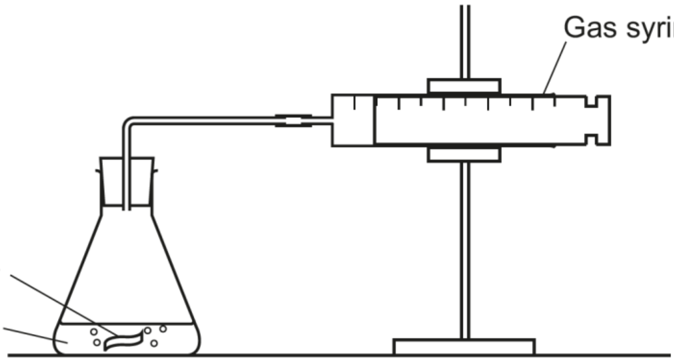


Fig. 1.1

(a) Complete the symbol equation for the reaction.

Include a **state symbol**.

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) +$ ....

[2]

Almost all candidates gave 'H_2' as the correct formula, and most gave the correct state symbol, (g). Some omitted the state symbol.

Question 1 (b) (i)

(b) Mia measures the volume of gas in the gas syringe every two minutes.

Fig. 1.2 shows a graph of her results:

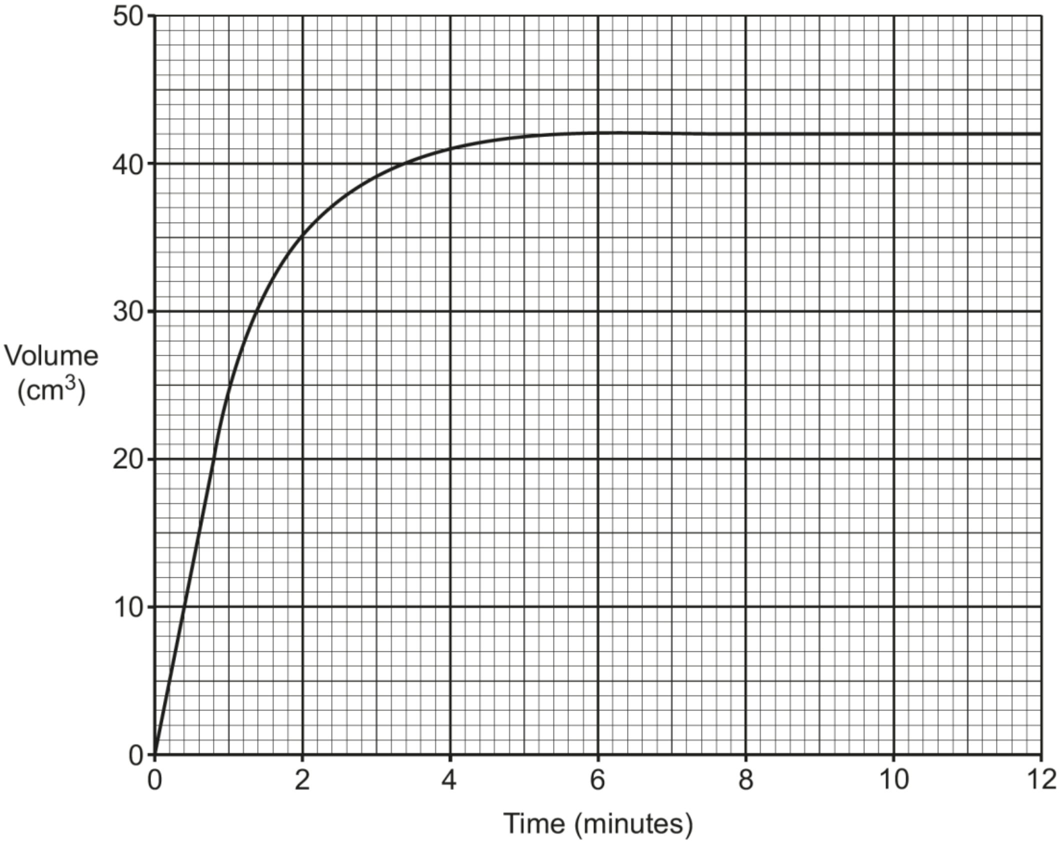


Fig. 1.2

(i) Calculate the rate of reaction during the first minute, using **Fig. 1.2**.

Give your answer in cm^3/s.

Rate of reaction = ... cm^3/s **[3]**

Most correctly read the graph at 1 minute (24). The two most common errors were to either neglect to convert this value into cm^3/s by dividing by 60 or to take the original volume measurement over a longer period of time, such as over 2 or 4 minutes. Taking a reading over a longer period of time is incorrect as the rate slows significantly after the first minute.

Question 1 (b) (ii)

(ii) Explain why the mass of the flask and its contents decreases during the reaction.

....

.... **[1]**

Most correctly stated that either a gas or hydrogen was made. Some gave vague answers such as 'the reactants are used up'.

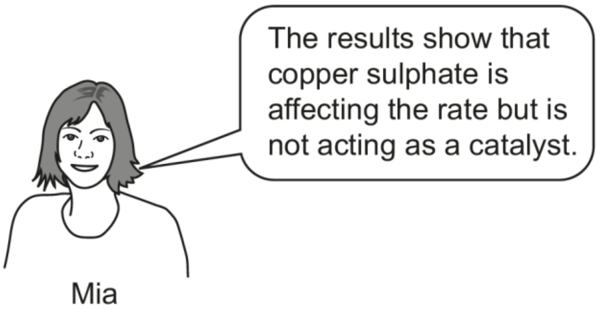
Question 1 (c)

(c) Mia repeats the experiment at the same temperature.
She adds a few drops of blue copper sulfate.

Her results show that:

- more gas is produced in the first minute, than in the first experiment.
- the blue colour changes to colourless during the reaction.

Mia makes a statement about the results:



How do the results support Mia's statement?

Explain your answer.

....

....

....

....

....

.... **[3]**

This question was generally well answered, with most candidates both explaining the usual role of a catalyst and processing the information to show why the copper sulfate was not acting as a catalyst. Some repeated the information without explaining further such as by saying 'the copper sulfate affects the rate' rather than stating that the rate is increased (based on the information that more gas forms in the first minute). Many gave a clear statement that catalysts are not used up and linked this to the colour change which shows that copper sulfate is used up and hence is not acting as a catalyst.

Question 2 (a)

2 The table shows some properties of metals, polymers and clay ceramics:

Type of material	Effect of force on material	Electrical conductivity	Hardness
Metals	malleable	good	hard
Polymers	flexible	poor	soft
Clay ceramics	snaps	....	....

(a) Complete the table by adding the two missing properties of clay ceramics. **[2]**

Most gained a mark. It is to be noted, however, that in this type of response, candidates should base the entries they make in the table on those modelled. The obvious correct answers are 'poor' and 'hard'. Some used other terminology such as 'no' and 'stiff' or similar, which do not express the properties as clearly.

Assessment for learning

It is an important examination technique to base answers in table on those modelled by entries that are provided.

Question 2 (b)

(b) Layla has three different water jugs.
The jugs are made from aluminium, poly(ethene) and pottery (clay ceramic).

Draw lines to connect each **material** with its correct **property**.

Material	**Property of jug**
	Softens easily when heated.
Aluminium	
	Goes out of shape if dropped.
Poly(ethene)	
	Breaks if dropped.
Pottery	
	Rusts quickly.

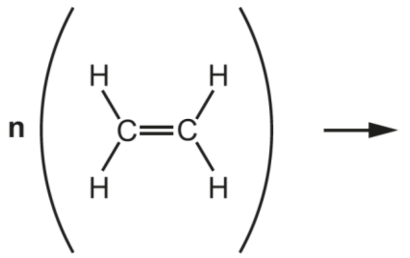
[3]

Candidates found this surprisingly challenging. Many thought aluminium rusts or softens easily.

Question 2 (c)

(c) Poly(ethene) is made from ethene.

Complete the equation by drawing the structure of the repeating unit of poly(ethene).



Ethene **Poly(ethene)**

[1]

Some incorrect answers attempted to draw a long polymer section of ethene rather than the repeating unit. Some added continuation bonds onto ethene but left the double bond in place.

Question 3 (c)

(c) Gradually, plants began to grow on Earth.
Explain how this affected the composition of the atmosphere.

....

....

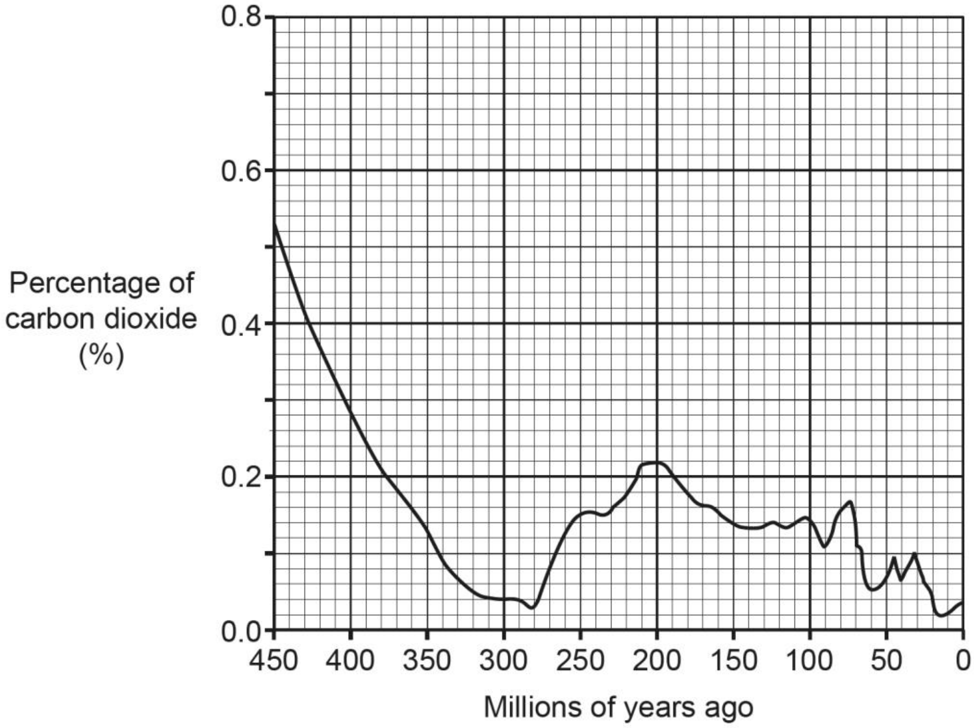
....

.... **[2]**

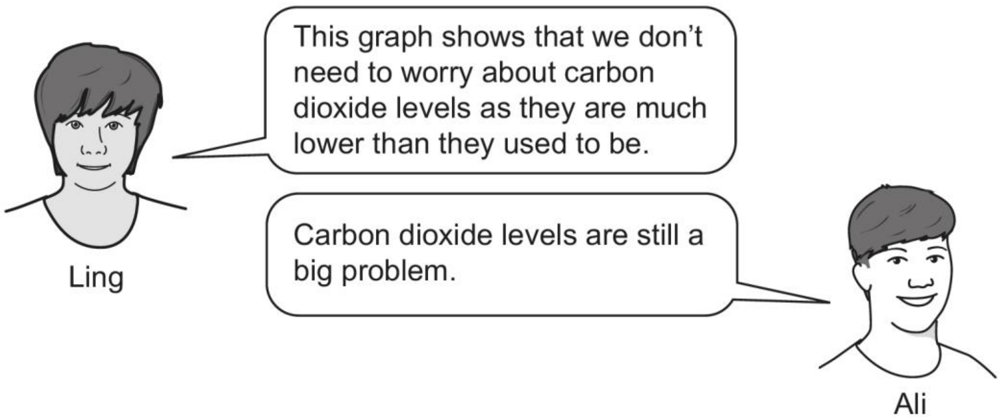
Changes to the atmosphere were well known. Almost all candidates knew that photosynthesis removed carbon dioxide from the atmosphere and produced oxygen.

Question 3 (d)

(d) The graph shows how the percentage of carbon dioxide in the atmosphere has changed over time:



Ling and Ali discuss the graph:



Explain why Ling is wrong and Ali is correct.

Ling ....

....

Ali ....

....
[2]

This question was moderately well answered The most common error was to only address part of the task, giving access to only some of the marks available.

Assessment for learning

In this type of question, candidates need to take care to engage with ALL of the points raised by the 'talking heads'. Ling makes two points: carbon dioxide levels are lower AND that we don't need to worry about this. Some candidates gave basic responses such as 'yes, they are lower' without engaging with the fact that they are increasing now. Some restated the question saying 'this is a big problem' without identifying why we do need to worry because of the nature of the problem. Best answers referred to the impacts of climate change..

Question 4 (b)

(b) The equation for the reaction is:

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

Complete **Fig. 4.1** to show the reaction profile for this reaction.
Include on **Fig. 4.1**:
- the formulae of the reactants and products
- a label for the activation energy.

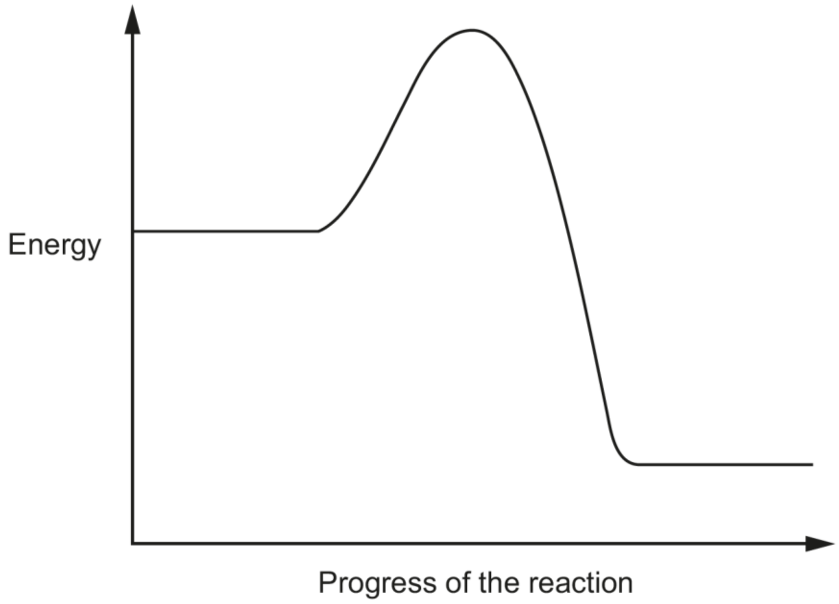
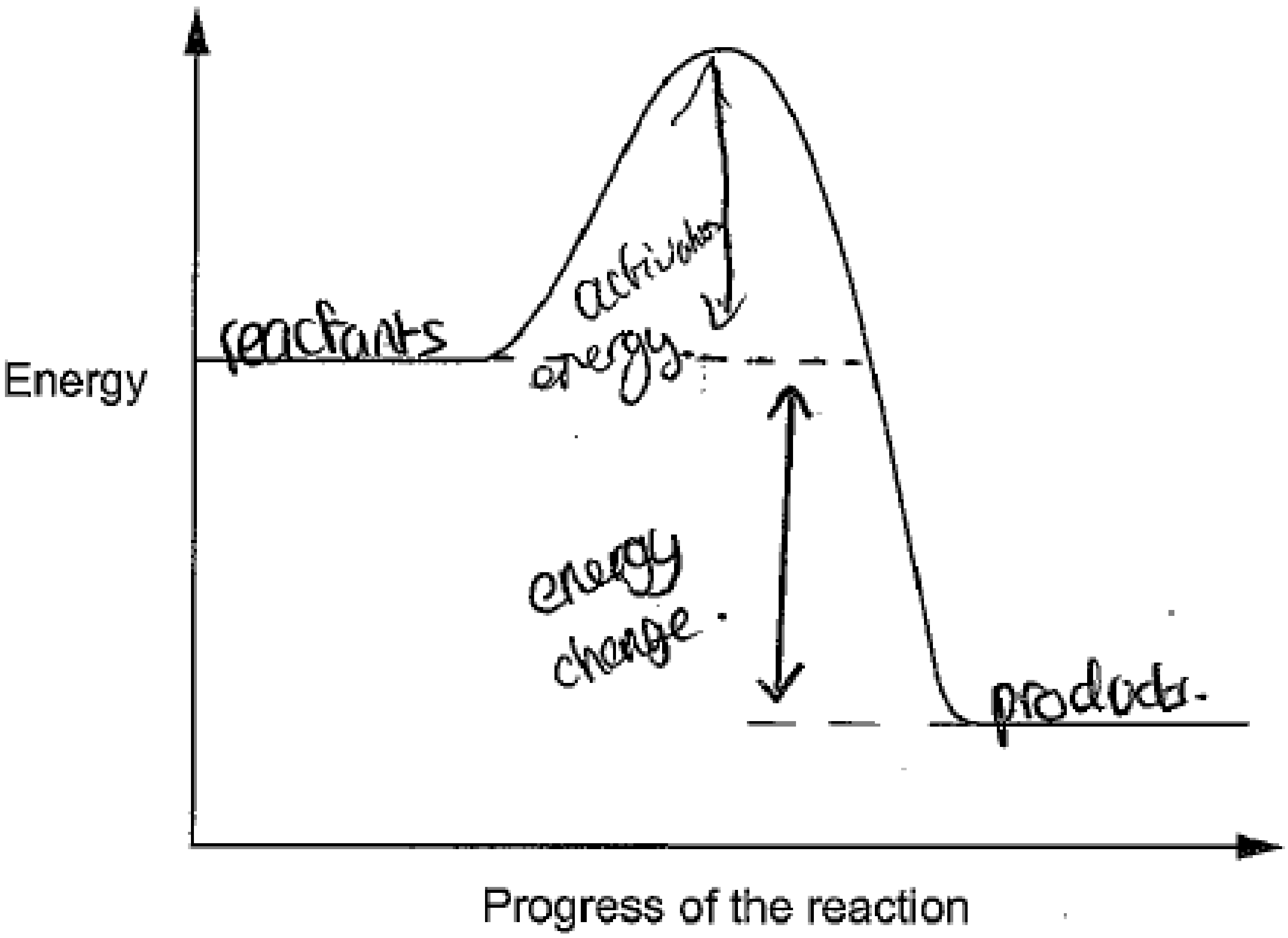


Fig. 4.1

[2]

Energy profile diagrams need to be completed with care. The question asked for the formulae of the reactants and products. Some candidates used 'reactants' and 'products' for labels. The fully correct way to show activation energy is by drawing an upward arrow which starts on the level of the reactants and ends at the point of the hump. Arrows or lines which were too far short of the 'true value' were not given credit.

Exemplar 1



This response gained no marks. The candidate has not followed the instruction to show the formulae of the reactants and products. Although they appear to know that the activation energy is the difference in energy level between the reactants and the top of the 'hump' the arrow is a long way short of the actual value. Ideally the arrow should be single headed, pointing upwards, but a double headed arrow of the correct length was accepted as correct.

OCR support

Our GCSE (9-1) Science Exam hints for students is a useful resource to provide students with when revising to help them avoid this common issue. They can also be downloaded as an A3 version to display in classrooms.

Question 4 (d)

(d) **Fig. 4.2** shows what happens when 2 moles of hydrogen burn:

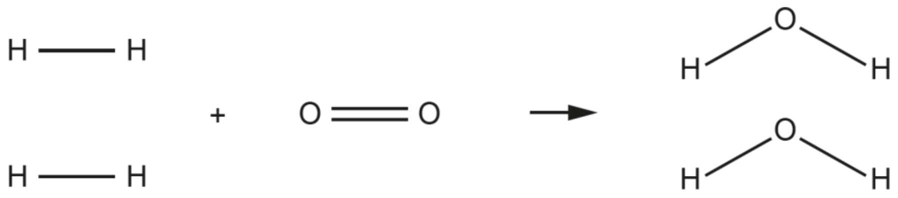


Fig. 4.2

Calculate the energy given out when 2 moles of hydrogen burn.

Use data from the table.

Bond	Energy (kJ/mol)
O–H	464
O=O	498
H–H	436

Bonds broken = ... kJ/mol

Bonds made = ... kJ/mol

Energy given out = ... kJ/mol

[3]

This calculation was well answered. Candidates generally knew how to identify and total the energy for the bonds broken and made.

Question 5 (b)

(b) 1.00 cm^3 of iodine has a mass of 4.93 g.

Calculate the volume of 1.00 mol of I_2.

Use the equation: number of moles = $\frac{\text{mass of substance (g)}}{\text{relative formula mass (g)}}$

Give your answer to **1** decimal place.

Volume = ... cm^3 **[3]**

Most candidates correctly calculated the relative formula mass of iodine. However, many candidates substituted incorrectly, often inverting the formula. The instruction to give the final answer to 1 decimal place was sometimes ignored. Some candidates rounded in the middle of their calculation. They should avoid doing this as it can significantly alter the final answer.

Question 5 (c) (i)

(c) Sodium iodide solution reacts with chlorine. This is a symbol equation for the reaction:

$2NaI(aq) + Cl_2(aq) \rightarrow 2NaCl(aq) + I_2(aq)$

(i) What would you **see** when this reaction happens?

....

.... **[1]**

Candidates did not typically know the colour of aqueous iodine. Grey and violet were common incorrect answers, as were orange and green. Some stated iodine is blue-black, implying confusion with the starch test.

Question 5 (c) (ii)

(ii) What information does this reaction show about the reactivity of the halogens?

....

.... **[1]**

Most candidates stated that chlorine is more reactive than iodine or that reactivity decreases down the halogen group.

Question 5 (d)

(d) An isotope of iodine has a mass number of 127.

How many neutrons and electrons does an atom of this isotope have?

Use the Data Sheet.

Number of neutrons = ...

Number of electrons = ...
[2]

Most earned at least 1 mark for one of the values being correct.

Question 5 (e)

(e) Phosphorus reacts with iodine to form a compound.

The compound contains 7.5% by mass of phosphorus. The rest of the compound is iodine.

Determine the formula of the compound.

Use the equation: number of moles = $\frac{\text{mass of substance (g)}}{\text{relative formula mass (g)}}$

Formula = ... **[3]**

Candidates found this question very challenging. Most worked out that iodine accounted for 92.5% of the compound but did not know how to then convert these percentages into mole ratios. A single mark was given if the relevant masses for iodine and phosphorus were used in the calculation. This was usually the only mark given.

Question 6 (b)

(b) Bromine reacts with ethene.

Fig. 6.1 shows the fully displayed formula of ethene:

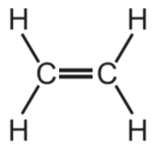


Fig. 6.1

Draw the fully displayed formula of the product made when bromine reacts with ethene.

[1]

Best answers showed a clear structure for dibromoethane. However, many candidates gave structures with bromine bonded to hydrogen atoms and the double bond left intact.

Question 6 (c) (i)

(c) **(i)** The reactions of organic compounds depend on their functional groups.

Put a (ring) around the functional groups present in ethene and ethanol in **Fig. 6.2**.

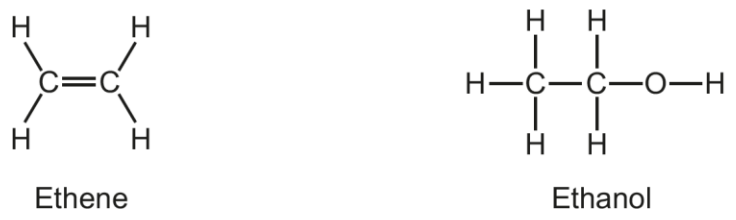


Fig. 6.2

[2]

Some candidates correctly circled the functional groups in each structure. However, although some drew circles to include the C=C double bond or the -OH group, they included other parts of the structures.

Question 6 (c) (ii)

(ii) A carboxylic acid can be made by oxidising ethanol.

Name the carboxylic acid made by oxidising ethanol.

Name .... **[1]**

Some gave the correct answer 'ethanoic acid, but this product of oxidation was not well known; 'ethane' was the most common incorrect answer.

Question 6 (c) (iii)

(iii) Draw the fully displayed formula of the carboxylic acid made by oxidising ethanol.

[1]

Best answers gave a clear structure for ethanoic acid. Some candidates drew propanoic acid, while other candidates showed -COOH without showing the -C=O bond clearly.

Question 7 (a) (i)

7 **(a)** Iron ore contains iron oxide. Iron can be made from iron ore.
This is a symbol equation for the reaction:

$$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$$

(i) Complete the half equation to show what happens to iron in this reaction.

Fe^{3+} + ... e^- $\rightarrow$ ....

[1]

Most candidates knew that iron ions gain electrons to form iron atoms.

Question 7 (a) (ii)

(ii) Explain, in terms of electrons, why Fe^{3+} is reduced in the half equation in **(a)(i)**.

....

.... **[1]**

Reduction as gain of electrons was well known. Many candidates expressed this idea clearly.

Question 7 (b)

(b) Calculate the percentage by mass of iron present in iron oxide, Fe_2O_3.

Give your answer to **3** significant figures.

Percentage of Fe = ... % **[3]**

Most candidates gained some credit in this question and most obeyed the instruction to quote their answer to 3 significant figures. A very common error was to calculate a percentage using the oxygen content rather than the iron content.

Assessment for Learning

In calculations which ask for values to be correct to 3 significant figures, candidates should not round values within the calculation to fewer than this. The atomic mass of iron on the periodic table is given as 55.8 and this value, to 3 significant figures, should be used in working. Internal rounding of answers in working may lead to a significant difference in the final answer. Candidates should show working but do their calculation in their calculator without internal rounding. This applies to questions which ask for working to be correct to a specified number of significant figures.

Question 7 (c)

(c) Iron can be made into steel. The main disadvantage of steel is that it rusts.

Explain **one** method of preventing steel from rusting.

....

....

....

.... **[2]**

This is a 'recall' question where candidates are asked to recall a technique which is stated in the specification. Some gave detailed and full answers. However, many stated vaguely to 'coat it' without specifying what coating should be used (for example oil, grease, paint). Most said to 'exclude air' without mentioning that rusting relies on the presence of both oxygen (in air) and water. Those who suggested sacrificial methods often said that more reactive metals, such as zinc 'rust'. It is only iron that rusts, other metals corrode.

Question 7 (d)

(d) Used steel is collected and recycled.
Recycling used steel has advantages and disadvantages.

Suggest one **advantage** and one **disadvantage** of recycling used steel.

Advantage ....

....

Disadvantage ....

.... **[2]**

Many candidates wrote long answers to this question but sometimes the answers did not address the points at a level high enough to earn marks. Answers which were not given credit included partial ideas such as 'saves steel' or 'recycling uses up energy'. Best answers were more specific stating that 'less iron needs to be mined' or 'less waste in landfill' and, for disadvantages, 'recycling uses energy for collection and sorting'. Many misunderstood what recycling of a material such as steel involves and stated points that were about reuse of a material rather than recycling. These answers gave incorrect statements such as 'products made from recycled steel are already rusty' or 'are weak'.

Question 8 (a)

8 Magnesium reacts with iron sulfide. This is a symbol equation for the reaction:

$$Mg + FeS \rightarrow Fe + MgS$$

(a) What information does this reaction give about the reactivity of magnesium?

....

.... **[1]**

This was well answered. Most candidates stated that magnesium is more reactive than iron.

Question 8 (b)

(b) Magnesium sulfide, MgS is an ionic compound which contains the ions Mg^{2+} and S^{2-}.

Explain why magnesium sulfide has a high melting point.

....

....

....

.... **[2]**

Most candidates made a statement about strong attraction or strong bonds. There was some confusion about what the attractions in an ionic compound are. It was relatively common to see errors such as 'strong bonds between molecules' or 'strong intermolecular forces'.

Misconception (bonding and state changes)

Asking candidates to justify melting points or boiling points in terms of attractive forces is a very, very common question on all chemistry papers. There is a frequent misconception that this always involves intermolecular forces. It is worth spending time ensuring that candidates know which state changes involve overcoming attraction between ions, which involved breaking covalent bonds (in giant covalent structures) and which involve breaking intermolecular forces while leaving covalent bonds intact (simple covalent structures).

Exemplar 2

It has stronger intermolecule forces

It is also stronger than the pure substance

as magnesium and sulfar are compounded

together **[2]**

This response gained 0 marks. Notice how the candidate has discussed intermolecular forces, despite the question emphatically saying that MgS is an ionic compound. This was a very, very common error.

Question 8 (c)

(c) Complete **Fig. 8.1** to show the 'dot and cross' diagrams for an Mg^{2+} ion and an S^{2-} ion.

Show **all** the electrons.

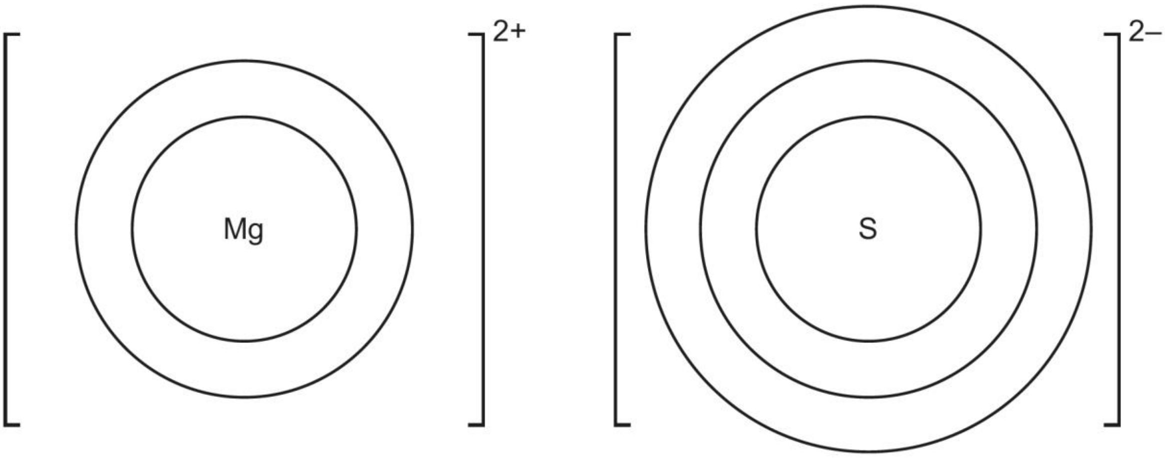


Fig. 8.1

[2]

Candidates answered this well, often showing electrons paired. Although this is not essential at GCSE, it does seem to support candidates to count electrons. Those who did not 'pair' their electrons were more likely to make errors in counting up to 8 for the full shells.

Question 9 (a)

9 Alex adds the **same** volume of dilute sulfuric acid to different samples of zinc carbonate. The reaction fizzes.

(a) Name the gas that causes the fizzing.

.... **[1]**

Most identified carbon dioxide, although 'hydrogen' was a common incorrect answer.

Question 9 (b) (i)

(b) **Table 9.1** shows Alex's results:

Experiment	Mass of zinc carbonate (g)	Concentration of acid (mol/dm^3)	Type of zinc carbonate	Time to stop fizzing (minutes)	Relative average rates
1	2.0	1.0	lumps	10	1
2	2.0	1.0	powder	4	

Table 9.1

(i) Explain why the rates of **Experiment 1** and **Experiment 2** are different in **Table 9.1**.

Use ideas about particles in your answer.

....

....

....

.... **[2]**

The fact that powders have a larger surface area was often stated. Best answers identified this and went on to say that a higher surface area gives an increased collision frequency and hence increases reaction rate. This is an area where most candidates showed at least some understanding. Some tried unsuccessfully to use everyday language to explain the idea, talking about 'more space for reactions' or 'more of the solid can react'. Candidates need to use terminology such as 'surface area' correctly to make it clear what they are expressing. The second mark was for discussing frequency of collisions between particles. Many answers did not discuss particles even though the question asked them to do so. Answers which stated only 'more collisions' were not given credit. To explain an increase in rate it is essential that the idea of collision frequency or number of collisions per unit time is expressed.

Key point call out (rate)

To explain an increase in rate it is essential that the idea of collision frequency or number of collisions per unit time is expressed. 'More collisions' alone is insufficient to explain why reaction rate increases. This is the case for all questions about particle collisions and rate of reaction.

Question 9 (b) (ii)

(ii) Relative average rate is the number of times faster one reaction is compared to another.

Calculate the relative average rate of **Experiment 2**, compared to **Experiment 1**.

Relative average rate = ... **[2]**

The relative rate was Experiment 2 compared to Experiment 1. Almost all candidates did some partial processing of the rate values, which they extracted from the table. However, many did this upside down, leading to the incorrect value 0.4.

Question 9 (c)

(c) Alex does two more experiments, **Experiment 3** and **Experiment 4**.

The results are shown in **Table 9.2**.

Experiment	Mass of zinc carbonate (g)	Concentration of acid (mol/dm^3)	Type of zinc carbonate	Time to stop fizzing (minutes)	Relative average rates
1	2.0	1.0	lumps	10	1
2	2.0	1.0	powder	4	
3	4.0	1.0	lumps	....	
4	2.0	2.0	lumps	....	

Table 9.2

Complete **Table 9.2** by predicting the time taken for the reactions to stop fizzing. **[2]**

Most candidates suggested correct values of greater than 10 minutes for Experiment 3 and less than 10 minutes for Experiment 4. This was well answered.

Question 10 (a)

10 Nina is given some diluted drain cleaner called 'Drainclear'. 'Drainclear' contains sodium hydroxide.

Nina titrates 25.0 cm^3 of diluted 'Drainclear' with dilute hydrochloric acid and an indicator.

(a) Nina uses a burette to measure out the dilute hydrochloric acid in the titration.

Nina wants to minimise errors in her method.

Describe **one** thing she should do when taking burette readings.

....

.... **[1]**

This was well answered. 'Look at the meniscus' was not given credit. It was necessary to state that readings should be taken from the bottom, a few candidates thought readings should be taken from the top.

Question 10 (b)

(b) The table shows Nina's results:

	Rough	**Titration 1**	**Titration 2**	**Titration 3**
2nd reading (cm^3)	14.05	20.55	10.60	22.05
1st reading (cm^3)	3.00	10.05	0.05	11.60
Volume (cm^3)	11.05	10.50	10.55	10.45
Mean (cm^3)		10.50		

Explain why Nina's results are repeatable but **not** reproducible.

....

....

....

.... **[2]**

The meaning of repeatable and reproducible were not well known. Some candidates discussed human error, while others mixed up the two ideas. Best answers discussed that the variation in Nina's own results were small, within 0.1 cm^3, showing that they are repeatable, but that no other person had checked her results so there is no data about whether they are reproducible.

OCR support

Our Language of Measurement in context resource can be used with candidates to help familiarise them with terms such as reproducible and repeatable, and how to apply them in chemistry experiments.

Question 10 (c)

(c) In her titration, Nina used 25.0 cm^3 of diluted 'Drainclear' with 0.20 mol/dm^3 hydrochloric acid. A symbol equation for the reaction is:

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

Calculate the concentration of sodium hydroxide, NaOH, in the diluted 'Drainclear'.

Use the equation: concentration (mol/dm^3) = $\frac{\text{number of moles of solute}}{\text{volume } (dm^3)}$

Use Nina's mean result of 10.50 cm^3.

Concentration of sodium hydroxide = ... mol/dm^3 **[3]**

Candidates found this calculation challenging. It was common to see the wrong values being used as numerator and denominator and to see at least one value omitted altogether from the equation. Many tried to include relative formula masses in their working. Some tried to convert between cm^3 and dm^3 but made errors, leading to answers to the wrong order.

Question 10 (d)

(d) Nina says:

'I would have preferred my titration result to be larger than 10.50 cm^3.
This would reduce the percentage uncertainty in my titration result.'

Explain how Nina could get a larger titration result without changing her apparatus.

....

....

....

.... **[2]**

In order to answer this question, candidates needed to think about what a 'larger titration result' means. In practice it means more acid should be used. This could be achieved either by using a more concentrated drain cleaner, a larger volume of drain cleaner or by using a more dilute acid. It was common to see incorrect ideas such as 'use more acid' alone or 'use more concentrated acid' which would make the problem worse.

Question 11 (a) (i)

11 Aluminium and chlorine can be made by electrolysis.

(a) Aluminium is made by the electrolysis of molten aluminium oxide.

(i) At which electrode is aluminium formed?

.... **[1]**

Almost all candidates knew that aluminium is formed at the negative electrode or cathode.

Question 11 (a) (ii)

(ii) Give **one** reason for your answer to **(a)(i)**.

....

.... **[1]**

Most candidates correctly explained that opposing charges attract each other.

Question 11 (b) (i)

(b) Some elements are extracted using electrolysis.

(i) Explain why hydrogen, **not** sodium, is made at the negative electrode when sodium chloride solution is electrolysed.

....

.... **[1]**

Many candidates correctly explained and contrasted the difference in reactivity of hydrogen and sodium.

Question 11 (b) (ii)

(ii) Write the half equation for the formation of hydrogen at the negative electrode.

.... **[2]**

This question was not well answered. Many gave incorrect formulae for hydrogen ions, such as H^-. Some had hydrogen producing, rather than accepting, electrons.

Exemplar 3

$H^+ + e^- \rightarrow H$

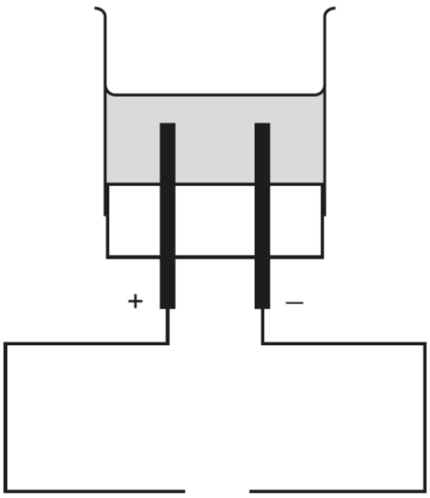
Answers which showed a correct formula for a hydrogen ion and showed that electrons are gained at the negative electrode were given a single mark. In this case notice that the formula for the hydrogen gas formed is incorrect. 1 mark only.

Question 11 (c)

(c) Kareem electrolyses sodium chloride solution. Hydrogen gas and chlorine gas are made.

Describe what Kareem needs to do to measure the volumes of hydrogen gas and chlorine gas made.

You may add to the diagram to help explain your answer. The diagram is **not** complete.



....

....

....

.... **[2]**

Candidates found this very difficult. Many correctly stated that a battery was needed or added an appropriate symbol in the diagram. However, very few candidates knew how to collect and measure volumes of gas at the electrodes. Many suggested complex vertical systems involving gas syringes, which would be unlikely to work. Most had a single gas syringe over the whole apparatus, rather than showing an appropriate, individual gas collection such as a separate measuring cylinder over each electrode.

Question 12 (a)

12 Eve has some copper sulfate crystals. The formula of copper sulfate is $CuSO_4$.

(a) Eve says, 'Copper sulfate is a mixture of several elements. It is not a pure substance.'

Explain why Eve is wrong.

....

....

....

.... **[2]**

Many correctly stated that copper sulfate is a compound and contains elements chemically bonded together.

Question 12 (b) (i)

(b) Eve dissolves the copper sulfate crystals in water.
She does two tests on the copper sulfate solution.

(i) In **test 1** she adds sodium hydroxide solution to the solution of copper sulfate.
She sees a blue precipitate of copper hydroxide.

Write a **word** equation for the formation of copper hydroxide.

.... **[1]**

This was well answered for a question so late in the paper. The most common error was to omit the second product, sodium sulfate, from the right hand side.

Question 12 (b) (ii)

(ii) In **test 2** she adds acidified barium chloride solution to the solution of copper sulfate.
She sees a white precipitate of barium sulfate.

Write an **ionic** equation for the formation of the white precipitate.

.... **[2]**

Candidates did not typically understand what was meant by 'ionic equation' and attempted to include copper sulfate in the equation. The formula for the precipitate, $BaSO_4$, was not well known.

Supporting you

Post-results services

If any of your students' results are not as expected, you may wish to consider one of our post-results services. For full information about the options available visit the OCR website.

Keep up-to-date

We send a weekly roundup to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular CPD courses to hear directly from a senior assessor or drop in to a Q&A session. Most of our courses are delivered live via an online platform, so you can attend from any location.

Please find details for all our courses on the relevant subject page on our website or visit OCR professional development.

Signed up for ExamBuilder?

ExamBuilder is the question builder platform for a range of our GCSE, A Level, Cambridge Nationals and Cambridge Technicals qualifications. Find out more.

ExamBuilder is **free for all OCR centres** with an Interchange account and gives you unlimited users per centre. We need an Interchange username to validate the identity of your centre's first user account for ExamBuilder.

If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Active Results

Review students' exam performance with our free online results analysis tool. It is available for all GCSEs, AS and A Levels and Cambridge Nationals.

It allows you to:

- review and run analysis reports on exam performance
- analyse results at question and/or topic level
- compare your centre with OCR national averages
- identify trends across the centre
- facilitate effective planning and delivery of courses
- identify areas of the curriculum where students excel or struggle
- help pinpoint strengths and weaknesses of students and teaching departments.

Find out more.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit
- **ocr.org.uk/qualifications/resource-finder**
- **ocr.org.uk**
- **/ocrexams**
- **/ocrexams**
- **/company/ocr**
- **/ocrexams**

We really value your feedback

Click to send us an autogenerated email about this resource. Add comments if you want to. Let us know how we can improve this resource or what else you need. Your email address will not be used or shared for any marketing purposes.

I like this **I dislike this**

Please note – web links are correct at date of publication but other websites may change over time. If you have any problems with a link you may want to navigate to that organisation's website for a direct search.

CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT