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Examiners' report

GATEWAY SCIENCE COMBINED SCIENCE A

J250

For first teaching in 2016

J250/03 Summer 2022 series

Version 1

ocr.org.uk/science

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

J250/03 is the first of two foundation tier papers for the Chemistry content of Gateway Combined Science A. This component assesses topics C1-C3 and CS7 (PAGs C1-C5).

To do well on this paper, candidates need to demonstrate knowledge and understanding of scientific ideas, techniques and procedures across all four topics. They need to be able to apply their knowledge and understanding to unfamiliar contexts as well as displaying the ability to analyse information. Candidates also need to be familiar with a range of experimental procedures.

J250/03 has an equal emphasis on knowledge and understanding of the assessment outcomes from the specification and application of this knowledge.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
• Correctly balanced chemical equations. • Drew clear diagrams to show atomic structure and the bonding within a covalent compound. • Used the charges on ions to determine the formula of an ionic compound. • Showed clear working in calculations. • Successfully analysed information and evaluated plans. • Produced a clear, relevant answer for the Level of Response Question 14. • Applied their knowledge and understanding to unfamiliar contexts in Question 15. • Attempted all the questions.	• Were unable to balance simple equations. • Were unable to illustrate the structure of an atom or show the bonding in a covalent compound. • Often wrote an answer to a calculation without showing any working. • Were unable to make any relevant points when evaluating a practical procedure in the Level of Response Question 14. • Found it difficult to apply what they had learnt to unfamiliar situations. • Omitted to answer some questions, including those which only required them to select an option.

Section A overview

Almost all candidates attempted all the questions.

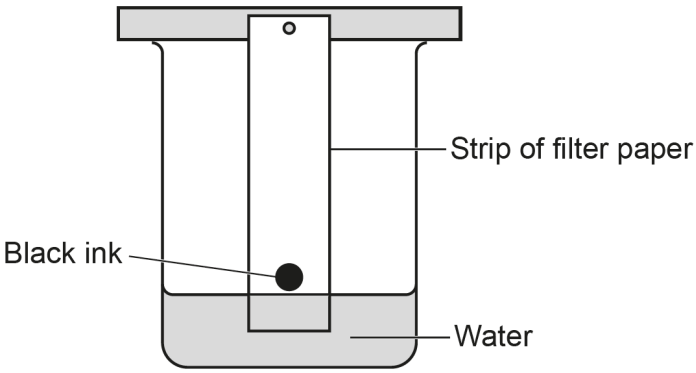
When answering multiple choice questions, centres should encourage candidates who wish to change an answer to cross through their answer and write their new response to the right of the answer box, rather than trying to overwrite their original answer. The latter can result in examiners being unable to decipher their answer.

Candidates should also take care to write the letters clearly as examiners may not be able to distinguish between poorly written letters B and D.

Question 1

1 A black ink is a mixture of different colours.

The diagram shows how the colours in the black ink can be separated.



What is the name of this method of separation?

A Chromatography

B Crystallisation

C Distillation

D Filtration

Your answer ☐ **[1]**

The majority of candidates could identify this as chromatography, with common incorrect answers being filtration or distillation.

Question 2

2 What is the test for **oxygen** gas?

A It goes 'pop' when lit.

B It relights a glowing splint.

C It turns damp red litmus paper blue.

D It turns limewater cloudy.

Your answer ☐ **[1]**

Just over half of candidates recognised the test for oxygen, many others chose hydrogen.

Question 3

3 The table shows the start and end temperatures of four different reactions.

Reaction	Start temperature (°C)	End temperature (°C)
A	–3	9
B	14	37
C	20	16
D	23	23

Which reaction is **endothermic**?

Your answer ☐ **[1]**

Candidates found this difficult with less than half choosing C. Common wrong answers were B and D.

Question 4

4 Which particles in an aqueous solution of sodium hydroxide, NaOH(aq), make it alkaline?

A H^+

B H_2O

C OH^-

D Na^+

Your answer ☐ **[1]**

Candidates struggled to identify hydroxide ions with only about a third choosing response C. D was a popular choice.

Question 5

5 The table shows the colours of universal indicator in solutions of different pH.

pH	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Colour	red		orange		yellow		green	blue				purple		

A sample of water has a pH of 7. A small amount of dilute hydrochloric acid is added to the water.

Which colour does universal indicator turn in this solution?

A Blue

B Green

C Orange

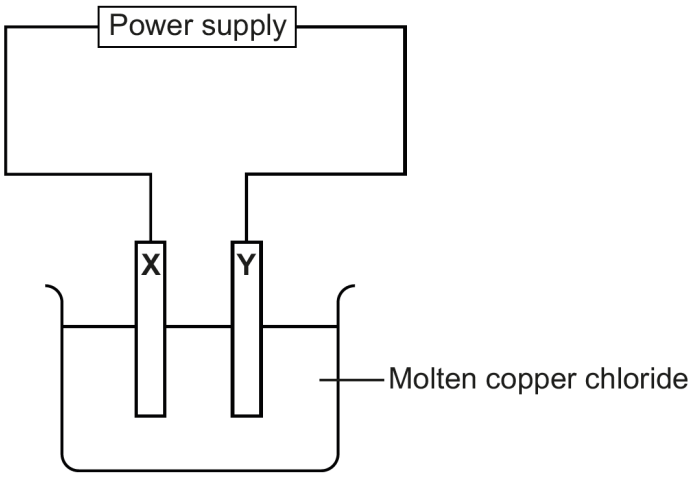
D Purple

Your answer ☐ **[1]**

Around a third of candidates realised this produced a weak acid so chose orange, with a range of other responses given.

Question 6

6 The diagram shows the electrolysis of molten copper chloride, $CuCl_2$.



Chlorine is formed at electrode **X** and copper is formed at electrode **Y**.

Which row in the table describes electrodes **X** and **Y**?

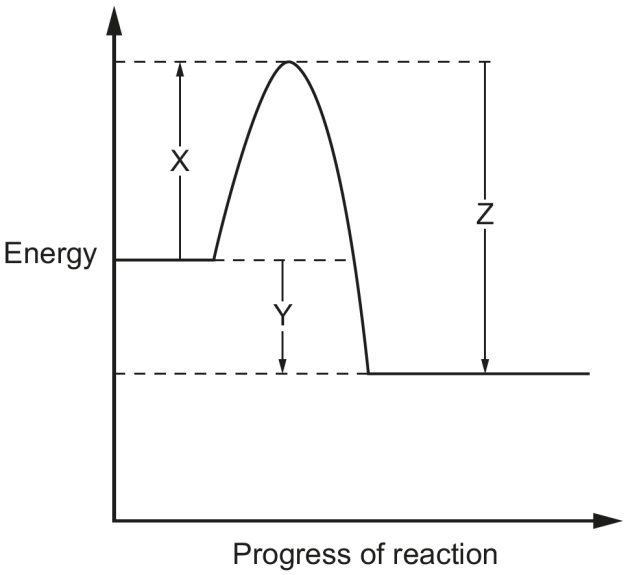
	Electrode X	Electrode Y
A	anode	cathode
B	anion	cation
C	cathode	anode
D	cation	anion

Your answer ☐ **[1]**

Around half of candidates could identify the anode and cathode, but some chose C suggesting that they were not clear which ion would move to which electrode.

Question 7

7 The diagram shows the reaction profile for a reaction.



Which row represents the **activation energy** and the **energy change** for the reaction?

	Activation energy	**Energy change**
A	X	Y
B	X	Z
C	Z	X
D	Z	Y

Your answer ☐ **[1]**

Most candidates could identify the activation energy, but less than half selected Y as the energy change, mostly confusing it with Z.

Question 8

8 Which particles in a metal allow it to **conduct electricity**?

A Atoms

B Electrons

C Ions

D Protons

Your answer ☐ **[1]**

Over half of candidates knew this, with the most common error being C.

Question 9

9 A molecule of glucose has the molecular formula $C_6H_{12}O_6$.

What is the **empirical formula** of glucose?

A CHO

B CH_2O

C $C_6H_{12}O_6$

D $(CO_6)H_{12}$

Your answer ☐ **[1]**

A range of answers were given, suggesting that many candidates do not understand the concept of empirical formula.

Question 10

10 The equation shows the reaction between carbon dioxide, CO_2, and hydrogen, H_2.

$CO_2 + H_2 \rightarrow CO + H_2O$

What is the **oxidising agent** in the reaction?

A CO

B CO_2

C H_2

D H_2O

Your answer ☐ **[1]**

Candidates do not seem familiar with the term oxidising agent so found this question difficult. A range of incorrect answers were selected.

Section B overview

Many candidates answered all the questions. All candidates should be encouraged to attempt all questions especially where options are provided. Candidates can often gain helpful information from the question, for example the particle diagram in Fig. 11.1 could help with balancing the symbol equation in Question 11 (b). The answer to Question 15 b (ii) could be obtained by counting the bonds in Fig 15.1.

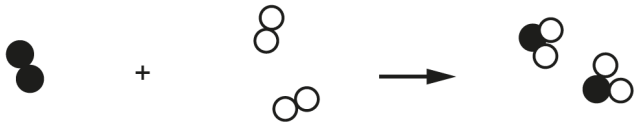
When reading the question, candidates need to be clear exactly what is required, and should consider highlighting important instructions such as 'give your answer to 1 decimal place' so they don't forget to do this. Candidates should also be aware that some questions require them to apply their knowledge to unfamiliar situations, rather than just recall facts.

Question 11 (a)

11 Nitrogen dioxide, NO_2, is formed when nitrogen, N_2, reacts with oxygen, O_2.

Fig. 11.1 shows the particle model diagram for the formation of nitrogen dioxide.

Fig. 11.1



Nitrogen Oxygen Nitrogen dioxide

(a) Complete each sentence to describe the formation of nitrogen dioxide.

Use the words or phrases in the list.

break apart
change of state
chemical change
dissolve
freeze
join together
physical change

The molecules of nitrogen and oxygen ..... .

The atoms then ..... to form nitrogen dioxide.

This is called a ..... .

[3]

Most candidates gained at least one mark for this question, often for correctly stating 'chemical change'. Mostly marks were dropped for writing 'break apart' and 'join together' the wrong way round. Common errors were 'physical change' or 'change of state' instead of 'chemical change'. Some candidates seemed unclear what was required and appeared to have chosen phrases from the list at random.

Question 11 (b)

(b) The equation shows the formation of nitrogen dioxide.

$$N_2 + \ldots\ldots O_2 \rightarrow \ldots\ldots NO_2$$

Complete the **balanced symbol** equation for the reaction.
Use **Fig. 11.1**. **[1]**

Less than half of candidates were able to balance this equation, and a significant number did not attempt an answer. Many incorrect responses contained letters rather than numbers. Correct multiples of the equation could have gained marks but none were seen, as those who wrote 4 did not use $2N_2$ so the equation was not balanced.

Question 11 (c) (i)

(c) The table shows the melting point and boiling point of pure nitrogen dioxide.

Melting point (°C)	Boiling point (°C)
–9	21

(i) Which state symbol shows the physical state of nitrogen dioxide at –2 °C?

Tick (✓) **one** box.

g ☐

l ☐

s ☐

[1]

Less than half of candidates managed to work out that nitrogen dioxide was a liquid, with the most popular incorrect answer being solid.

Question 11 (c) (ii)

(ii) A scientist measures the melting point of a sample of nitrogen dioxide.

The result shows that the sample of nitrogen dioxide is impure.

Which temperature could be the melting point of the impure nitrogen dioxide?

Tick (✓) **one** box.

–11 °C ☐

–9 °C ☐

23 °C ☐

[1]

Half of candidates knew that impurities reduced the melting point, with the other two possibilities also being selected.

Question 11 (d)

(d) A molecule of nitrogen dioxide has the formula NO_2.

Calculate the **relative formula mass** for nitrogen dioxide.

Relative atomic mass (A_r): N = 14.0 O = 16.0

Relative formula mass = ... **[2]**

Around a quarter of candidates knew how to calculate this answer to be given both marks. Incorrect responses were mainly 224 and 30 as the two relative atomic masses were multiplied or added. Occasionally one number was divided by the other. A few just wrote a number, mostly incorrect, with no working.

Question 11 (e)

(e) Nitrogen dioxide is made from the reaction of nitrogen with oxygen.

Fig. 11.2 shows the bonding in a molecule of oxygen, O_2.

Fig. 11.2

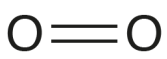
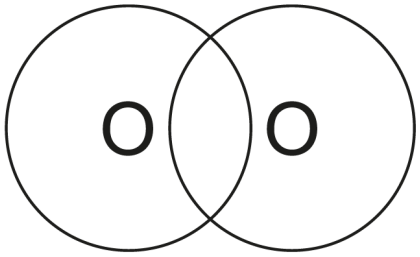


Fig. 11.3 shows an incomplete dot and cross diagram for oxygen.

Fig. 11.3



Complete **Fig. 11.3** to show the arrangement of the electrons in a molecule of oxygen. **[2]**

Few candidates understood that a double bond contained two pairs of electrons, and a significant number did not attempt this question. Where 1 mark was given, it was generally for four electrons in the overlap area (or on the orbital lines around this area). The most common incorrect response was two electrons in the overlap area and six around the rest of each oxygen. A few candidates marked Xs on the O for oxygen, as if it were a ring denoting the inner shell. A small number just drew two parallel lines between the two oxygens as shown in Fig. 11.2

Some candidates made several attempts with many crossings out. Candidates should be advised to redraw a diagram if they think it has become illegible. Examiners cannot give marks where the answer has become illegible.

Question 12 (a)

12 Atoms are made from protons, neutrons and electrons.

(a) The table shows the relative mass and relative charge of a proton, neutron and electron.

Particle	Relative mass	Relative charge
proton	1	.....
neutron	.....	0
electron		.....

Complete the table.

Write your answers in the three boxes in the table. **[3]**

Around half of candidates gained all 3 marks. The most common error was to omit the + and – signs for relative charge. Some may have confused the mass and charge of the particles, giving 0 for the neutron instead of 1, or 0.0005 for the electron instead of -1. A significant number wrote in the greyed-out box.

Question 12 (b)

(b) The mass of a proton is 1.673×10^{-27} kg.

The mass of an electron is 9.109×10^{-31} kg

What is the **relative mass** of an electron compared to a proton?

Tick (✓) **one** box.

1.672×10^{-27} ☐

1.837×10^{3} ☐

5.445×10^{-4} ☐

[1]

Less than half of candidates were able to calculate this correctly. A common incorrect answer was the top box, corresponding to the division done the wrong way round.

Question 12 (c)

(c) An atom of helium contains:

- 2 protons
- 2 neutrons
- 2 electrons.

Draw a **labelled** diagram to show the arrangement of protons, neutrons and electrons in an atom of helium.

[3]

Less than a third of candidates scored all 3 marks, with many having little idea how to draw this diagram. Many gained the first mark for drawing one or more electrons orbiting some representation of a nucleus. However, many included protons and neutrons in outer shells. A few candidates drew the diagram correctly but did not label any of the particles.

Misconception

? Not all candidates realised that they had to choose their responses from letters A to F, so they gave names of elements or symbols for elements. Such answers could be given marks if correct. However, if they wrote C meaning carbon, this could be confused with the letter C from the table.

Question 12 (d) (i)

(d) The table shows some information about the atoms of six elements, **A** to **F**.

Element	Number of protons	Number of neutrons	Number of electrons	Arrangement of electrons
A	11	12	11	2, 8, 1
B	10	10	10	2, 8
C	12	12	12	2, 8, 2
D	6	7	6	2, 4
E	19	20	19	2, 8, 8, 1
F	6	6	6	2, 4

Answer the following questions. Choose your answers from the elements **A**, **B**, **C**, **D**, **E** or **F**.

Each letter can be used once, more than once or not at all.

(i) Which **two** elements are in **Group 1** of the Periodic Table?

Elements = ... and ..... **[1]**

This mark was gained by many candidates for choosing A and E.

Question 12 (d) (ii)

(ii) Which element is in **Period 4** of the Periodic Table?

Element = ... **[1]**

Some candidates knew that elements in period 4 had 4 shells of electrons. A few wrote Ti, which is in period 3 but is not in the table.

Question 12 (d) (iii)

(iii) Which element has a mass number of 12?

Element = ... **[1]**

Few candidates could determine the mass number by adding the number of protons and neutrons. C was a common incorrect answer, possibly because candidates saw 12 protons and confused it with the relative atomic mass (of carbon).

Question 12 (d) (iv)

(iv) Which **two** elements are isotopes?

Elements = ... and ..... **[1]**

Few candidates understood that isotopes have the same number of protons.

Question 12 (d) (v)

(v) Which element forms an ion with a 2+ charge?

Element = ... **[1]**

Around a third of candidates answered correctly with C.

Question 12 (e)

(e) Aluminium forms an Al^{3+} ion and chlorine forms a Cl^{-} ion.

Three students write down the formula of aluminium chloride.

Student **A**: $AlCl$

Student **B**: $AlCl_3$

Student **C**: Al_3Cl

Which student is correct?

Explain your answer.

Student .....

Reason .....

.....

.....

..... **[2]**

Candidates found this question very difficult. Only a few identified B as the correct formula, but most of these could not explain why this was correct. The 'crossover' method shown by a few was inadequate as an explanation. The most common incorrect choice was C.

Exemplar 1

Student B

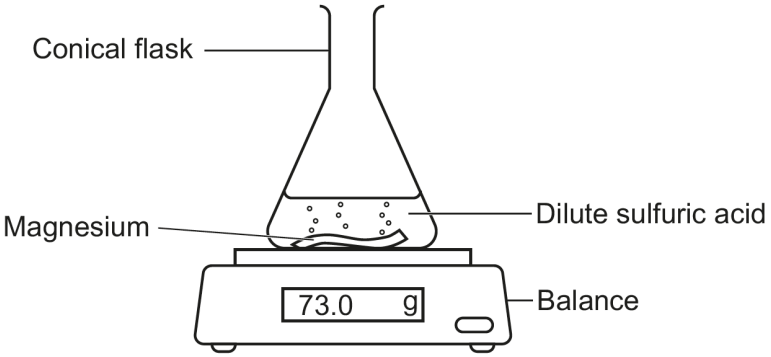
Reason three Cl^- ions are needed to gain the three electrons from Aluminiums Outer Shell

This candidate knows that three chlorine atoms are needed to accept the three electrons being transferred from one aluminium atom. They have referred to Cl^- ions instead of atoms, but this response is still sufficient to gain both marks.

Question 13 (a)

13 A student investigates how the mass changes as magnesium reacts with excess dilute sulfuric acid.

The diagram shows the apparatus they use.



The student measures the mass every minute for 8 minutes.

Table 13.1 shows their results.

Table 13.1

Time (minutes)	Mass (g)
0	73.0
1	71.5
2	70.5
3	.....
4	69.6
5	69.4
6	69.3
7	69.3
8	69.3

(a) Complete the table with an estimate of the missing mass at **3 minutes**.

Write your answer in the box in **Table 13.1**. **[1]**

Most candidates scored this mark. Answers in the range 69.8 to 70.3 g were accepted. However, some candidates did not realise that the mass dropped much more quickly at first, so they calculated the drop in mass in either the first or second minute and deducted it from 70.5. This gave an answer that was lower than the mass at 4 minutes so did not score the mark. A common incorrect response was 69.0g.

Question 13 (b)

(b) The equation shows the reaction between magnesium, Mg, and dilute sulfuric acid, H_2SO_4.

$Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$

Describe and explain how the mass changes during the reaction.

Use information in **Table 13.1** and the equation in your answer.

.....

.....

.....

.....

..... **[3]**

Many candidates scored one mark for the idea that the mass was decreasing, but some did not score as they just said that the mass changes. A few scored a second mark, mostly for the idea that the mass stops decreasing at 6 minutes or alternatively for the idea that hydrogen or a gas was released. Almost no candidates scored all 3 marks.

Many candidates thought that the mass loss was due to magnesium dissolving or magnesium getting lighter. Some discussed changes of state (e.g. solid to aqueous) thinking that this would affect the mass. A minority gave reasons as to why the mass had increased. Some candidates wrote that hydrogen was evaporating from the solution.

A significant number of candidates did not attempt this question.

Assessment for learning

Candidates should be encouraged to make three points when 3 marks are available.

Some candidates are confusing 'Describe' with 'Explain'. It would be useful for them to practise answering both types of question to become confident to distinguish between them.

Question 13 (c)

(c) The student thinks that the results show that all the magnesium had reacted.

Explain why the student is correct. Use data from **Table 13.1**.

.....

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

Some candidates were given this mark, mostly for the idea that the mass has stopped decreasing. However, some lost this mark because they stated the time when it stopped but got this wrong.

Question 13 (d)

(d) The student repeats the experiment three times.

Table 13.2 shows the results of the three experiments at 1 minute.

Table 13.2

Mass in experiment 1 (g)	Mass in experiment 2 (g)	Mass in experiment 3 (g)
71.5	71.4	71.8

Calculate the **mean** mass in the three experiments.

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

Mean mass = ... g **[3]**

Most candidates knew how to calculate a mean with over half scoring all 3 marks. Not all were able to accurately add the three numbers and/or divide by 3, sometimes because they did not appear to have a calculator. Many scored 2 marks but did not give their answer to 1 decimal place. Common incorrect answers were 71.56 or 71.5 (instead of 71.6).

A number of candidates did not seem sure what to do and gave two alternative calculations. Examiners cannot choose which answer to accept, so candidates must remember to cross one answer out.

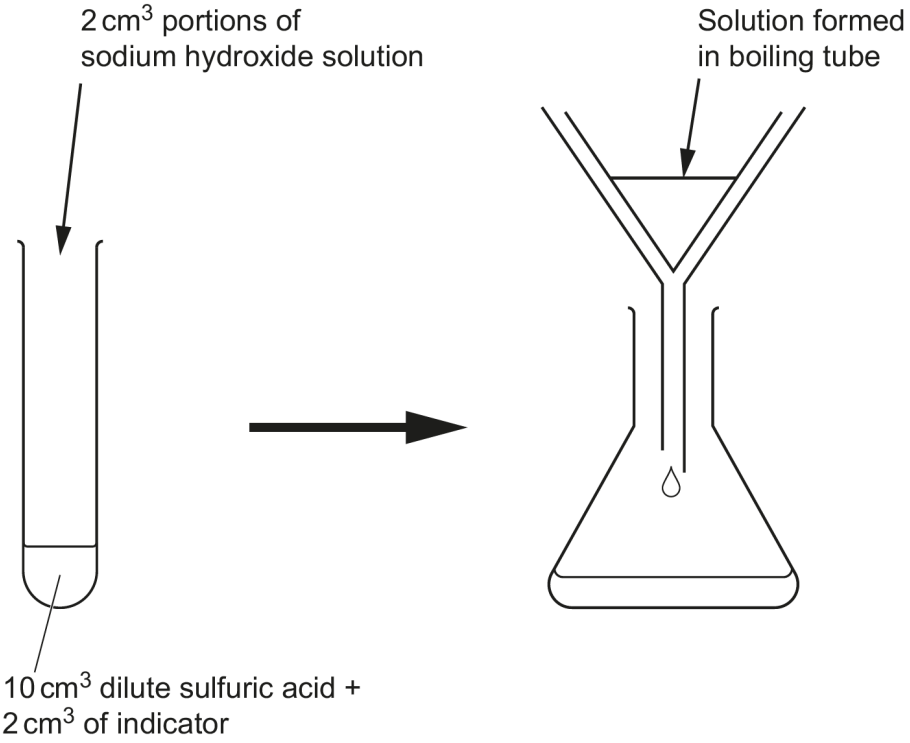
Assessment for learning

Candidates should be encouraged to show clear working, as they may gain marks even if their final answer is incorrect.

Question 14*

14* A student wants to produce a **pure dry** sample of the salt **sodium chloride**.

The diagram shows the method they use.



1. Measure 10 cm^3 of dilute sulfuric acid into a boiling tube.
2. Add 2 cm^3 of indicator.
3. Add sodium hydroxide solution, 2 cm^3 at a time, up to 10 cm^3 in total.
4. Filter the solution to remove the sodium chloride.

Describe the mistakes the student has made and how their method could be improved to produce a **pure dry** sample of **sodium chloride**.

.....

.....

.....

.....

.....

..... **[6]**

Candidates found this question very challenging and almost a quarter of candidates did not attempt it. Few candidates scored more than 2 marks. Although many could identify mistakes, few could explain how to improve the procedure.

At Level 1, marks could be scored for realising that filtration would not work and/or that crystallisation was required. Many did not name crystallisation but described the process, e.g. evaporate the solution to get a pure dry sample. A number of candidates commented on the need to add a filter paper to the funnel, not noticing that there was already one present.

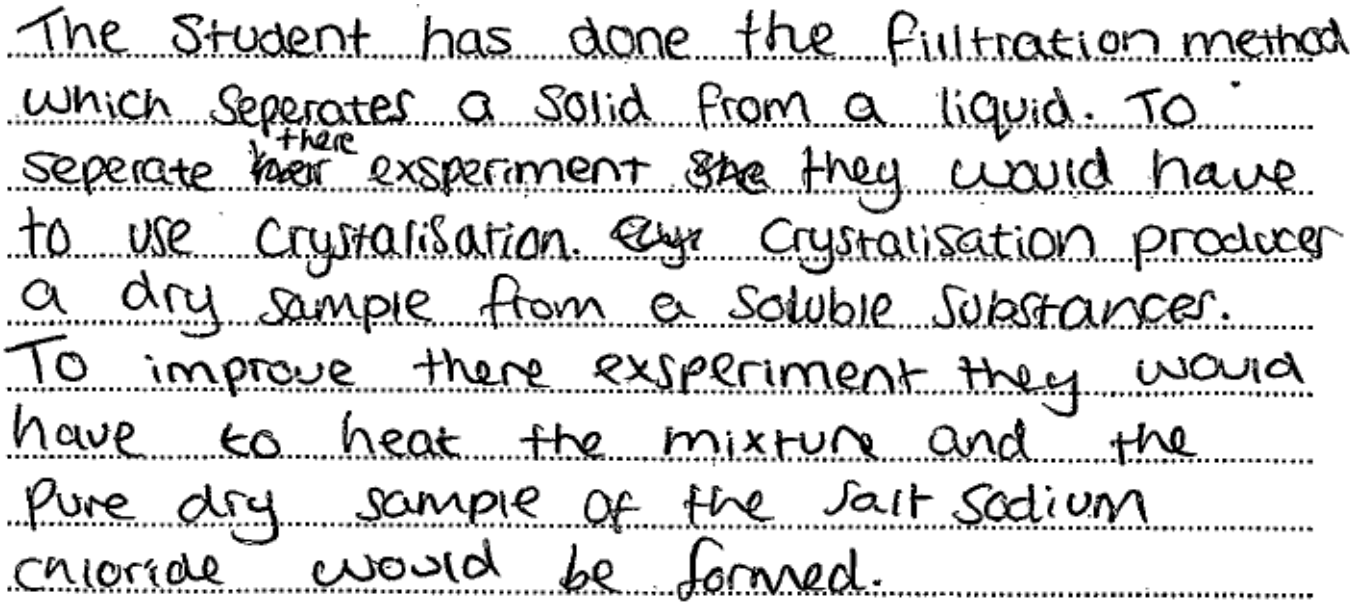
To achieve Level 2, candidates needed to provide some kind of explanation, e.g. why filtration won't work, or how dry crystals can be obtained using crystallisation.

Few candidates noticed that the wrong acid was being used or realised that hydrochloric acid was required. Most were therefore unable to access Level 3.

A few candidates mentioned that the presence of indicator would make the salt impure. However, almost none realised that the solution may not be neutral and that the experiment should be repeated without indicator once the exact quantities for neutralisation had been determined.

Common comments that did not gain marks were: repeats, varying the conditions, safety issues, timing the reaction, adding all the sodium hydroxide at once, adding more indicator, adding the indicator afterwards, using different equipment (including measuring cylinders to measure out the reagents), etc. Lots of candidates suggested distillation instead of filtration.

Exemplar 2


The Student has done the filtration method which seperates a solid from a liquid. To seperate ~~their~~ there exsperiment ~~she~~ they would have to use Crystalisation. ~~Cry~~ Crystalisation produces a dry sample from a soluble substances. To improve there exsperiment they would have to heat the mixture and the pure dry sample of the salt sodium chloride would be formed.

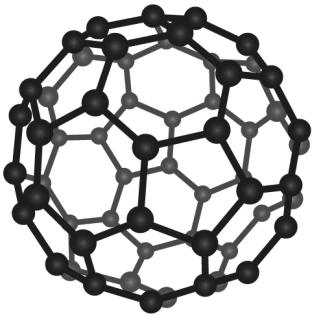
This response has been given Level 2, 4 marks. They have explained why filtration will not work and why crystallisation is a suitable process to use. Their method will produce a dry sample but it will not be sodium chloride, nor will it be a pure sample.

Question 15 (a) (i)

15 Fullerenes are allotropes of carbon that have many uses.

Fig. 15.1 shows a molecule of a fullerene.

Fig. 15.1



(a) (i) Which group of allotropes contain this fullerene?

Tick **one** (✓) box.

Inorganic ☐

Organic ☐

Physical ☐

[1]

Less than half of candidates selected the correct answer.

Question 15 (a) (ii)

(ii) What is the approximate size of a molecule of this fullerene?

Tick **one** (✓) box.

1×10^{-15} m ☐

1×10^{-10} m ☐

1×10^{-5} m ☐

[1]

About half the candidates selected the correct answer. They will have been taught that the size of an atom is around 10^{-10} m, but may have got confused because they know the fullerene contains a lot of atoms. However, they did not appreciate that this will not change the size by a factor of 10^5.

Question 15 (b) (i)

(b) The carbon atoms in fullerenes are joined by covalent bonds.

(i) Explain how two atoms of carbon form a covalent bond.

.....

.....

.....

..... **[2]**

Very few candidates scored any marks here. Occasionally a mark was given for the idea of sharing electrons, but rarely for sharing a pair. A few talked of electrons joining, but not being shared. Many candidates tried to explain why atoms form covalent bonds, but not how. Some did not mention electrons at all. A significant minority wrote about metal ions or intermolecular forces. Many talked about covalent bonding being between two non-metals, or a metal and non-metal.

Question 15 (b) (ii)

(ii) How many covalent bonds does one atom of carbon form in a molecule of fullerene, as shown in **Fig. 15.1**?

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

Less than a quarter of candidates scored this mark. Some gained the mark for the answer 4. This was accepted as fullerenes do actually contain some double bonds and candidates who knew this would be correct with the answer 4.

There was a wide range of answers from one to many thousands. Another incorrect answer was 60, which is the number of carbon atoms in a buckminster fullerene molecule.

Question 15 (c)

(c) The model used to show the molecule of fullerene in **Fig. 15.1** has limitations.

The table shows some statements about the model.

Which statements about this model are **true**, and which are **false**?

Tick (✓) **one** box in each row.

	True	False
It shows the length of the covalent bonds.		
It shows the size of the carbon atoms.		
It shows the three-dimensional shape of the molecule.		

[2]

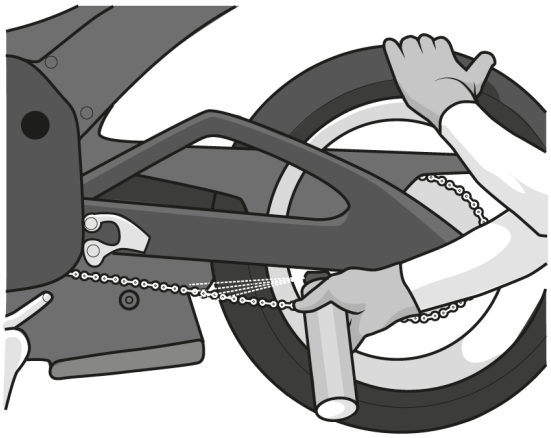
Most candidates scored at least one mark, with some scoring both. The most common incorrect response was "True" that "It shows the size of the carbon atoms".

Question 15 (d) (i)

(d) Fullerenes can be used as lubricants. Lubricants reduce the friction between moving parts.

Fig. 15.2 shows a lubricant being sprayed onto the chain of a motorbike.

Fig. 15.2



(i) Explain why fullerenes can be used as lubricants.

Use ideas about the structure and bonding of the fullerene shown in **Fig. 15.1** in your answer.

.....

.....

.....

..... **[2]**

Few marks were scored here as candidates didn't apply their knowledge of the structure and bonding of molecules to answer this question. They needed to explain that intermolecular forces are weak so the fullerene molecules can slide over one another. Some tried to relate fullerenes to the structure of graphite and incorrectly wrote about the layers sliding over one another.

A few candidates gained 1 mark for the idea that the fullerenes were slippery. There were very occasional references to intermolecular forces, but they were generally thought to be strong. Some candidates wrote about (strong) covalent bonds which was not required in this question.

Some candidates described clearly what a lubricant does with reference to its physical appearance and the benefits of using a lubricant on the moving parts of a chain. Reducing friction, preventing rust and like a grease were common comments, but without explanations at a molecular level as to why fullerenes make good lubricants.

A significant number did not attempt this question.

Question 15 (d) (ii)

(ii) A lubricant may need to be used at high temperatures.

Explain why fullerenes can be used at high temperatures.

Use ideas about the structure and bonding of the fullerene shown in **Fig. 15.1** in your answer.

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.....

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.....

.....

..... **[3]**

Candidates answered this question slightly more successfully than Question 15 d (i), about a quarter scoring 1 mark, with very few scoring 2. Many candidates mentioned covalent bonds but did not say there were many of them or that they were strong. Only a few scored the mark for strong covalent bonds. Most marks were given for the idea that they have a high melting point, rather than the idea of large amounts of energy required to break the bonds. Many candidates just repeated the question by saying that they withstand high temperatures.

A significant number did not attempt this question.

Exemplar 3

It has a really high temperature melting point and is a covalent structure meaning it is very strong. **[3]**

This candidate has scored 1 mark for the idea that fullerenes have a high melting point. They have identified the structure as covalent but they need to state that the bonds are strong, rather than that the structure is strong, in order to gain the second mark. To obtain the third mark they need to say there are many bonds.

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