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Examiners' report

GCSE

COMBINED SCIENCE A (GATEWAY SCIENCE)

OCR Level 1/Level 2 GCSE (9-1) in Combined Science A (Gateway Science)

J250

For first teaching in 2016

J250/03 Summer 2025 series

Version 1

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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 responses is 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 Teach Cambridge.

Paper 3 series overview

J250/03 is the first of two foundation tier papers for the Chemistry content of Gateway Science Combined Science A. It is designed to assess content from Topics C1 to C3 and Topics CS7 (PAGs C1 – C5) and is worth 60 marks. Questions 9, 10 and 15 overlap with the higher tier paper.

There was no evidence to suggest that candidates were short of time in answering this paper. Most candidates attempted every question, but there was a significant omission rate on Question 13 (a) (i). The last question on reactions of acids (Question 15) proved very challenging with several parts omitted.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• could balance an equation (Question 14 (d)) • rounded their answer to 2 significant figures in a calculation (Question 13 (d)) • deduced a formula from a diagram of a model of an ionic lattice (Question 13 (a) (i)) • interpreted graphs and tables of data (Question 11 (d) (ii) and Question 15 (e) (i)) to successfully describe a relationship between the variables • used a dot and cross diagram and their knowledge of chemical bonding to explain in detail how atoms form ions (Question 13 (e))	• confused exothermic and endothermic reactions (Question 12 (b)) • were unable to deduce the number of neutrons and electrons in an element from its atomic number and mass number (Question 14 (c)) • could not give the pH value of an acid, name a suitable indicator or give its colour in acid (Question 15 (a)) • did not show their working in calculations (Question 13 (d) and 14 (b)) • did not know how to calculate a relative formula mass (Question 14 (d) (ii))

Section A overview

Section A contains ten Multiple Choice questions, which focus on Assessment Objectives 1 and 2 (AO1 and AO2). Questions 9 and 10 overlap with the higher tier paper.

It was good to see that almost all candidates attempted every question.

The majority of candidates answered Question 1 (states of matter) correctly. The following questions were often correct: Question 4 (mass decrease in a chemical reaction) and Question 9 (melting points). Questions 2, 4 and 9 discriminated well between candidates at different grades. Question 7 was the most challenging question in this section.

Candidates may find it helpful to underline key words in the question and to show any calculations next to the relevant question. They can write on the paper as they attempt to eliminate the distractors and remove those that they decide are incorrect.

Some candidates are overwriting their answers; if they change their mind, they must remember to cross it out clearly and write the new answer next to the answer box.

Question 2

2 24 g of magnesium reacts with oxygen to make 40 g of magnesium oxide.

What mass of magnesium oxide is made when 12 g of magnesium reacts?

A 20 g

B 24 g

C 36 g

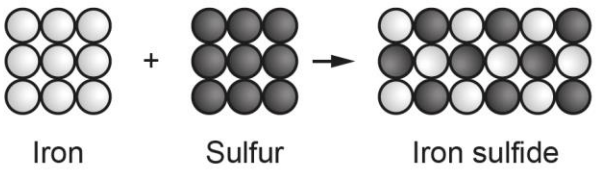
D 40 g

Your answer ☐ **[1]**

Around half of candidates correctly selected A, with B as the most common incorrect answer. It was good to see attempts at a calculation. However, candidates must take care to read the question carefully so they understand exactly what is being asked.

Question 3

3 What type of change is shown in the diagram?



A A change of state

B A chemical change

C A physical change

D A reversible change

Your answer ☐ **[1]**

The majority of candidates recognised this as a chemical change, but A and C were also popular choices.

Question 5

5 Methane reacts with oxygen to make carbon dioxide and water.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Which chemical is being **oxidised**?

A CH_4

B CO_2

C H_2O

D O_2

Your answer ☐ **[1]**

Almost half of candidates correctly chose A but all other responses were seen.

Question 6

6 Which type of mixture can be separated using paper chromatography?

A A mixture of gases.

B A mixture of insoluble liquids.

C A mixture of insoluble solids.

D A mixture of soluble liquids.

Your answer ☐ **[1]**

Around half of candidates correctly selected D, with B as the most common incorrect response.

Question 7

7 Which particle in dilute hydrochloric acid, HC*l*, makes it acidic?

A Cl^-

B H^+

C H_2O

D OH^-

Your answer ☐ **[1]**

This answer was not well known; most candidates selected A.

Question 8

8 The table shows the boiling points of four substances made from simple molecules.

Substance	Boiling point (°C)
A	–196
B	–33
C	36
D	98

Which substance has the **weakest** intermolecular forces?

Your answer ☐ **[1]**

Many candidates were able to link weak intermolecular forces to low boiling points. The most common incorrect answers were C and D.

Question 10

10 Which row describes the **nucleus** of an atom?

	Charge	Mass
A	positive	contains little of the mass of the atom
B	positive	contains most of the mass of the atom
C	negative	contains little of the mass of the atom
D	neutral	contains most of the mass of the atom

Your answer ☐ **[1]**

Less than half of candidates correctly answered B, with D being the most common incorrect response.

Section B overview

Section B, worth 50 marks, consists of short answer questions and an extended 6-mark Level of Response question. These questions are designed to test Assessment Objectives 1, 2 and 3 (AO1, AO2 and AO3). Question 15 overlaps with the higher tier paper.

It was pleasing to see more candidates attempting the Level of Response question (Question 13 (e)), than have done so in previous years.

Candidates found the questions on energy changes, electrolysis and reactions of acids most challenging.

It is important that candidates understand the command words and what is expected when a particular command word is used. In some cases, explanations were given when descriptions were needed and so not all marks could be awarded.

Candidates should be reminded to show their working in calculations rather than just writing the final answer from their calculator. They may be able to access some marks for their working even if their final answer is not correct. Evidence from the calculation methods used by some candidates indicated that they did not have a calculator with them.

Question 11 (a)

11 This question is about metals.

(a) Where are metals found in the Periodic Table?

Use the Periodic Table.

Tick (✓) **one** box.

On the left. ☐

On the left and right. ☐

On the right. ☐

[1]

Over half of candidates knew that the metals were on the left of the Periodic Table; the majority of the others selected 'on the left and right'.

Question 11 (b)

(b) Which metal is found in Group 2 and Period 3 of the Periodic Table?

Use the Periodic Table.

Tick (✓) **one** box.

Aluminium ☐

Copper ☐

Magnesium ☐

[1]

Most candidates could interpret this correctly to choose magnesium, but others confused the terms Group and Period and selected aluminium.

Question 11 (c)

(c) The table shows the properties of four elements.

Element	Appearance at room temperature	Melting point (°C)	Electrical conductivity
A	black solid	114	low
B	brown solid	2076	low
C	orange-red solid	1358	high
D	yellow solid	388	low

Which element **A**, **B**, **C** or **D**, is a metal?

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

The majority of candidates knew that high conductivity is a key property of metals so selected C. Others focused on high melting point so selected B instead.

Question 11 (d) (i)

(d) The properties of a metal are changed by mixing it with small amounts of another element.

(i) What is a mixture of a metal and small amounts of another element called?

Tick (✓) **one** box.

A compound ☐

An alloy ☐

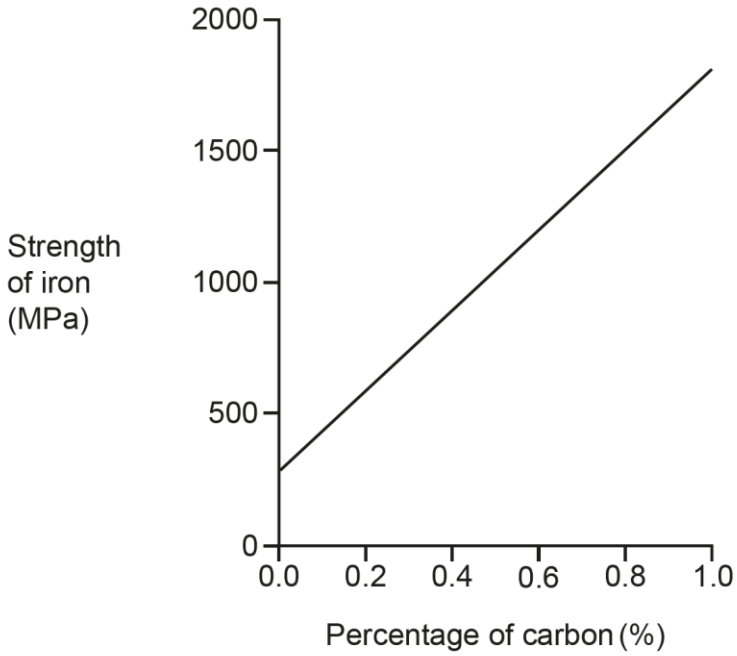
An element ☐

[1]

The term alloy does not appear to be well known, with the majority selecting compound.

Question 11 (d) (ii)

(ii) The graph shows how the strength of iron changes with the percentage of carbon it contains.



How does the strength of iron change as the percentage of carbon changes?

.....

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

This was mostly well answered. Some candidates did not score the mark as they did not link increasing strength of iron to increasing percentage of carbon, but just to the percentage of carbon changing. Answers such as 'it increases' could not be given a mark.

Others answered in terms of why the strength changes instead of how it changes. However, even good science in this kind of response cannot be given a mark as it does not answer the question.

Question 12 (a)

12 A student investigates some exothermic and endothermic reactions.

They measure the temperature change in two reactions.

The table shows their results.

Reaction	Start temperature (°C)	End temperature (°C)	Temperature change (°C)
1	.....	12	–4
2	18	39	+21

(a) Complete the table by writing in the start temperature for Reaction **1**. **[1]**

Most candidates correctly answered 16. The most common incorrect answer was 8, but other responses included 4, –16, 18 and 32.

Question 12 (b)

(b) State **and** explain which reaction is exothermic and which is endothermic.

Reaction **1** .....

.....

Reaction **2** .....

.....

[2]

The majority of candidates confused endothermic and exothermic so gained no marks. Very few scored both marks. Where one mark was scored it was generally for identifying Reaction 1 as endothermic and 2 as exothermic, but with missing or incorrect reasons. It was common to see a correct explanation in terms of temperature change but contradicted by an incorrect energy change.

Many candidates thought that Reaction 1 was exothermic as it had released energy and become colder, and Reaction 2 was endothermic as it had absorbed energy and become hotter.

Where candidates scored 2 marks their responses were more often about temperature changes than energy transfer.

Misconception

Two different types of misconception were commonly seen:

1. A reaction is exothermic when the temperature increases, because it is taking in heat/energy. A reaction is endothermic when the temperature decreases, because it is releasing heat/energy.

2. Exothermic reactions release heat/energy, thereby becoming colder. Endothermic reactions absorb heat/energy thereby becoming hotter.

Exemplar 1

(b) State **and** explain which reaction is exothermic and which is endothermic.

Reaction **1** Reaction 1 is Exothermic because it let out energy into it's Surrandings So it got Colder.

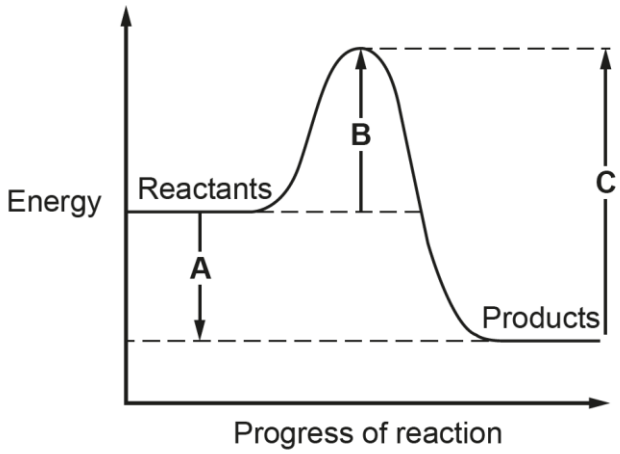
Reaction **2** Reacion 2 is Endothermic because it took in heat energy from it's Surrandings So it ~~goth~~ got hotter.

[2]

This candidate did not score any marks as exothermic and endothermic are in the wrong places. Although they know that exothermic reactions give out energy, they think this makes the temperature decrease. Similarly, they know that endothermic reactions take in energy, but they do not understand that this makes the surroundings cooler.

Question 12 (c) (i)

(c) The diagram shows a reaction profile for an **exothermic** reaction.



(i) Which energy change, **A**, **B** or **C**, is the activation energy?

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

Many candidates correctly identified the activation energy as B, with A being a common incorrect answer.

Question 12 (c) (ii)

(ii) Which energy change, **A**, **B** or **C**, is the energy change for the reaction?

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

Few candidates knew that the overall energy change was A with many selecting C instead.

Question 13 (a) (i)

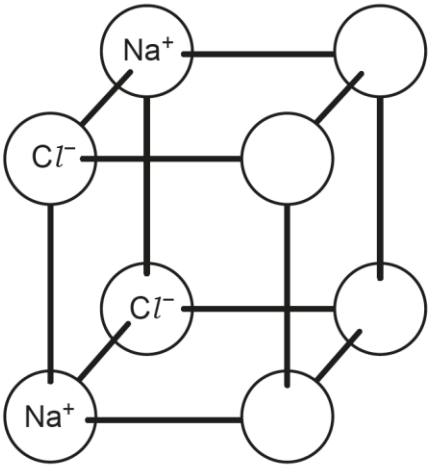
13 Sodium chloride is an ionic compound.

(a) Sodium chloride is made from sodium ions, Na^+, and chloride ions, Cl^-.

(i) **Fig. 13.1** shows a model for the ionic lattice of sodium chloride.

Complete **Fig. 13.1** by writing in the missing sodium ions, Na^+, and chloride ions, Cl^-. **[1]**

Fig. 13.1



A significant number omitted to answer this question, perhaps not realising that they needed to write on the diagram. However, over half of candidates completed the diagram correctly; the most common error was to transpose the Na^+ and Cl^- ions.

Question 13 (a) (ii)

(ii) What is the formula of sodium chloride?

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

A wide variety of incorrect formulae were seen including Na_2Cl, $NaCl_2$ or $Na^+ + Cl^-$. Many misunderstood what was required here, attempting to write an equation rather than a formula. Both word and symbol equations were seen, and where $NaCl$ was seen as the product this was credited. Many included charges in their formula; this was not creditworthy. Others included a factor of 4, e.g. $Na^{4+}Cl^{4-}$ or Na_4Cl_4 reflecting the fact that eight ions were shown in the diagram.

Candidates should be reminded that the symbols are written as Na and Cl, not NA and CL.

Question 13 (b)

(b) Sodium chloride can be split up into its elements using electrolysis.

During electrolysis, sodium chloride must be heated until it is a liquid.

The table shows the melting point and boiling point of sodium chloride.

Melting point (°C)	Boiling point (°C)
801	1465

Suggest a temperature that sodium chloride should be heated to so it is a liquid.

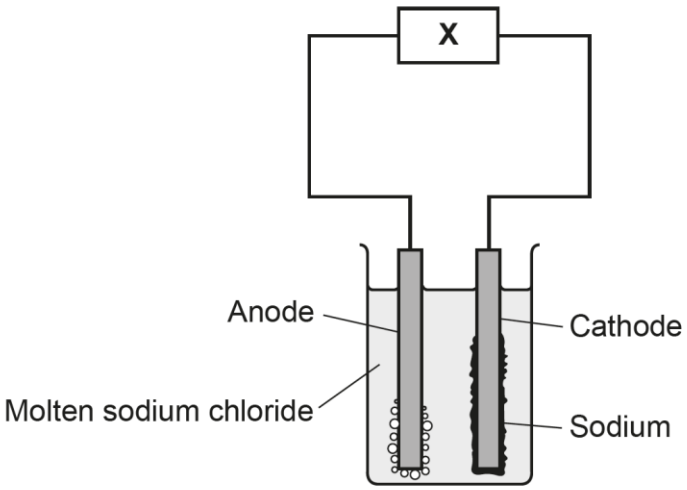
..... **[1]**

The majority gave a correct answer with 801 being most popular, followed by 1133 (the mid-point). Common incorrect answers were 1465 and 664 (1465 minus 801).

Question 13 (c) (i)

(c) **Fig. 13.2** shows a diagram for the electrolysis of molten sodium chloride.

Fig. 13.2



(i) What is the name of the piece of equipment, **X**?

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

Almost half of candidates answered correctly, mostly with battery, but some wrote power pack or cell. However, many did not realise a power source was required and gave answers including electrode, bulb, wire, circuit, voltmeter and resistor. A significant number did not give a response.

Question 13 (c) (ii)

(ii) Name the gas produced at the anode.

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

Few candidates could identify chlorine. A wide range of gases were suggested, with hydrogen being common. Also a variety of non-gaseous chemicals were seen, e.g. (molten) sodium chloride.

Question 13 (c) (iii)

(iii) A student thinks that the electrodes (anode and cathode) should be inert and made from graphite.

Complete the sentences to explain why the student is **correct**.

Put a (ring) around each correct option.

Graphite is **reactive / unreactive**. It is an **electrical conductor / electrical insulator**. **[1]**

Few candidates scored this mark. The majority got one of the two responses correct, with all permutations of responses seen fairly equally.

Question 13 (d)

(d) Sodium chloride contains 39% sodium.

Calculate the mass of sodium that is produced from the electrolysis of 160 kg of sodium chloride.

Give your answer to **2** significant figures.

Mass of sodium = ... kg **[3]**

This question was a good discriminator with many higher achieving candidates scoring all 3 marks. A lot of final answers were not given to 2 significant figures; answers expressed to 2 decimal places were common.

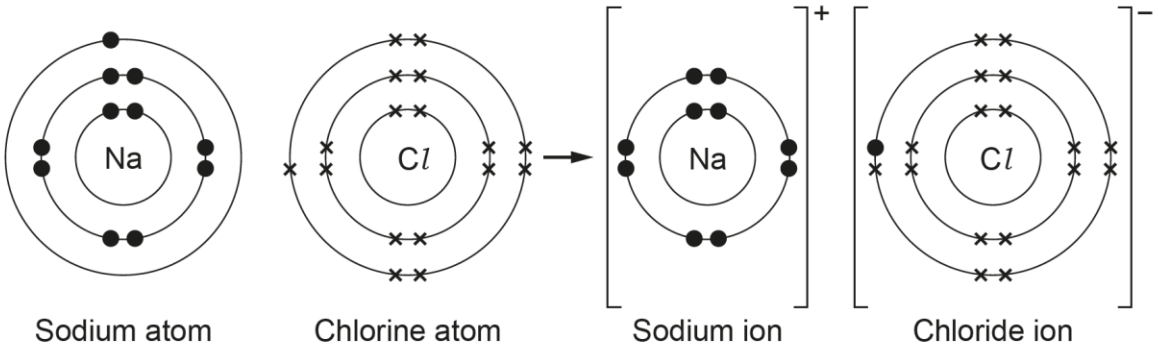
It was pleasing to see many candidates showing their working, as those who manipulated the numbers incorrectly were still able to gain some credit. However, those who just wrote the answer from their calculator, without showing any working, could not access any ECF marks if they had made an error in their method.

Some did not realise that this was just a percentage question, so attempted to use relative atomic masses of sodium and/or chlorine.

Question 13 (e)*

(e)* **Fig. 13.3** shows the dot and cross diagram for sodium chloride.

Fig. 13.3



Explain how sodium and chlorine atoms form sodium and chloride ions.

Use information:

- from **Fig. 13.3**
- your knowledge of chemical bonding
- ideas about the electron arrangement in the atoms and ions.

.....

.....

.....

.....

.....

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

This question was a good discriminator with the full range of marks awarded. Over two-thirds of candidates achieved some marks, despite a significant omit rate, but few achieved Level 3. Most of those who attempted the question had the idea of loss or gain of electrons and the idea that full outer shells were needed. However, some candidates incorrectly referred to gaining/losing of ions, atoms or occasionally protons rather than electrons.

Many mentioned covalent bonding or sharing electrons. Of those, some candidates contradicted an otherwise correct discussion of electron transfer.

Electron arrangements were rarely seen. Some answers focused on the number of shells or that the outer shell of sodium disappeared, rather than the electron. Many mentioned a spare or extra electron, rather than an outer electron.

A common omission was the magnitude of the charges on the ions, e.g. just writing that sodium is positive rather than Na^+. Higher achieving candidates stated chlorine when talking about atoms and chloride when talking about ions and/or gave the 1+ and 1- charges. Others confused the naming of atoms and ions, e.g. sodium donates a single electron to a chloride ion.

Some lower achieving candidates simply attempted to describe what was happening in Fig. 13.3, e.g. chloride has gained a dot, brackets are drawn round the atoms and a + or – is added.

Misconception

Many candidates think that atoms are unstable (because they don't have a full outer shell) and that ions are stable.

Exemplar 2

The sodium atom has one electron on its outer shell and the chlorine atom has seven, the sodium atom gives the chlorine atom its spare electron from its outer shell. This makes chlorine's outer shell full, because the chlorine atom has gained an electron, it is now negative and because the sodium atom lost an electron, it is now positive. They have turned into ions because they have shared electrons.

This response is worth Level 2, 4 marks. There is a clear explanation, in terms of sodium atoms and chlorine atoms, of how atoms form ions. Although there are no electron arrangements the candidate has explained that the sodium atom has 1 electron on its outer shell, and the chlorine atom has 7. The sodium atom has given its 1 electron to chlorine so that chlorine now has a full outer shell, but it is not explicitly stated that sodium now has a full outer shell. They have clearly explained that chlorine is now negative as it has gained an electron and sodium is now positive because it has lost an electron. However, they have not referred to them as chloride ions and sodium ions.

Parts of their response contain enough detail for Level 3, e.g. the idea that 1 electron is transferred from the sodium atom to the chlorine atom, the idea that both ions now have a full outer shell (or electron arrangements of 2,8 for the sodium ion and 2,8,8 for the chloride ion could have been used). However, the reference to shared electrons prevents this candidate accessing Level 3. In addition, to access Level 3 a detailed explanation must refer explicitly to sodium ions and chloride ions, and preferably also to the magnitude of their charges i.e. Na^+ and Cl^-..

Question 14 (a)

14 Atoms are made up of protons, neutrons and electrons.

(a) The table shows the relative mass and relative charge for a proton and electron.

	Relative mass	Relative charge
Proton	1	+1
Neutron	.....	.....
Electron	0.0005	–1

Complete the table to show the relative mass and relative charge of a neutron.

Use numbers from the list.

–1	**0.0005**	**0**	**1**	**+1**

[2]

This question was a good discriminator with higher achieving candidates scoring both marks. More got the charge correct than the mass, but common errors were to write +1 or –1 for the mass, or to transpose the answers for mass and charge.

Question 14 (b)

(b) The mass of a proton is 1.67×10^{-27} kg.

An electron is 0.0005 times lighter than a proton.

Calculate the mass of an electron in kg.

Give your answer in **standard form**.

Mass of an electron = ... kg **[2]**

Few candidates scored both marks; many did not appear to have any idea how to calculate this, or even to understand what was meant by standard form. The most common answer for 1 mark was 3.34×10^{-24} obtained by dividing by 0.0005 instead of multiplying. A common incorrect answer was 5×10^{-4}. Some attempted to subtract 0.005 from 1.67×10^{-27}, or to increase/decrease the power of -27 by 4 or 5, e.g. 1.67×10^{-22}.

Question 14 (c)

(c) The symbol for an atom of nitrogen is:

$$\begin{matrix} 7 \\ \mathbf{N} \\ 14 \end{matrix}$$

The table shows the number of protons in this atom of nitrogen.

Number of protons	Number of neutrons	Number of electrons
7	.....	.....

Complete the table by writing in the number of neutrons and number of electrons. **[2]**

This was another good discriminator with nearly half of candidates scoring both marks. Lower achieving candidates gave a range of incorrect numbers for both neutrons and electrons including 0, 14 and 21.

Question 14 (d) (i)

(d) Nitrogen reacts with hydrogen to form ammonia, NH_3.

(i) This is the equation for the reaction.

$N_2(g) + ...H_2(g) \rightarrow 2NH_3(s)$

What is the missing number that **balances** the equation?

Tick (✓) **one** box.

2 ☐

3 ☐

4 ☐

[1]

Less than half of candidates correctly selected 3, with the most popular answer being 2. Those candidates that showed some working seemed more likely to obtain the correct answer.

Question 14 (d) (ii)

(ii) Calculate the relative formula mass, M_r, of ammonia, NH_3.

Relative atomic masses (A_r): H = 1 N = 14

Relative formula mass of ammonia = ... **[1]**

Few candidates were able to calculate the relative formula mass and there was high omit rate on this question. Common incorrect answers included 13, 15, 42 and 45 (from (14+1) x 3). A few seemed to think the 3 meant they had to cube the number(s).

Question 14 (e)

(e) A student thinks that the empirical formula of ammonia is NH_3.

Explain why the student is **correct**.

Tick (✓) **one** box.

Ammonia contains only two elements. ☐

Ammonia is a compound of nitrogen. ☐

NH_3 gives the simplest ratio of the atoms. ☐

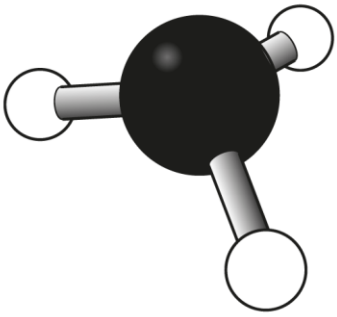
[1]

Empirical formula is not well understood, and few answered correctly. The most common incorrect answer was 'ammonia contains only two elements'.

Question 14 (f)

(f) **Fig. 14.1** shows the ball and stick model for a molecule of ammonia.

Fig. 14.1



Which statements about a ball and stick model are **true**, and which are **false**?

Tick (✓) **one** box in **each** row.

	True	False
It shows how the atoms are arranged in space.		
It shows the exact length of the covalent bonds.		
It shows the numbers of atoms of each element.		

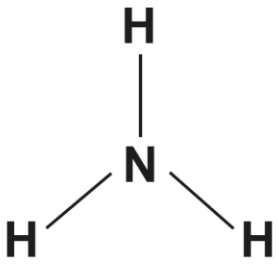
[2]

This question was well answered. Most candidates scored at least one mark for getting 1 or 2 responses correct. Almost half got all 3 correct to score both marks.

Question 14 (g)

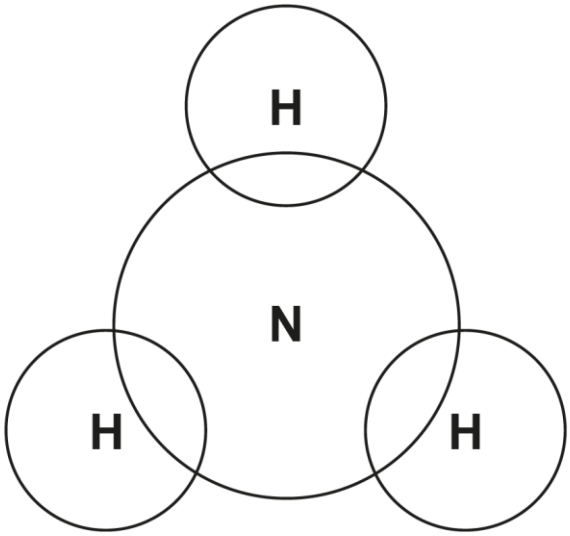
(g) **Fig. 14.2** shows the structure of a molecule of ammonia.

Fig. 14.2



Complete the dot and cross diagram for a molecule of ammonia.

Only show the outer shell electrons.



[2]

This was a good discriminator with very few candidates gaining 2 marks. Less than half of candidates scored 1 mark, and this was generally for just one shared pair of electrons. Few seemed to know how many electrons that were required for each element. This was a challenging question for foundation tier candidates.

Question 15 (a) (i)

15 A student investigates the reaction of magnesium carbonate and dilute sulfuric acid.

(a) The student wants to measure the pH of the dilute sulfuric acid.

(i) Suggest the pH of dilute sulfuric acid.

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

Questions 15a(i) was a good discriminator. Around half of candidates correctly selected a value less than 7. Many chose 7, but a variety of other incorrect numbers were seen. Those who stated a range of values were usually within the correct range.

Question 15 (a) (ii)

(ii) Name an indicator that the student could use to measure the pH of dilute sulfuric acid.

State the colour of the indicator after it has been added to the dilute sulfuric acid.

Name of indicator .....

Colour .....

[2]

This question also discriminated well. Many candidates were able to name an appropriate colour for the indicator. We accepted red, pink, orange, yellow and combinations of those colours. However, a range of other colours were seen including black. Fewer candidates realised that universal indicator was required in order to determine pH; common suggestions were litmus or iodine.

Question 15 (a) (iii)

(iii) Name a piece of equipment the student could use to measure the pH more accurately.

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

Very few candidates could name a pH meter or pH probe even though its use does appear on the specification. Suggestions included various named indicators, pH stick/measurer/tester, thermometer and ruler. A common incorrect response was pH scale. A significant number of candidates did not attempt this question.

Question 15 (b)

(b) When magnesium carbonate reacts with dilute sulfuric acid, it forms a salt, water and carbon dioxide.

What is the name of the salt?

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

Very few candidates could name magnesium sulfate and there was a high omit rate. Common incorrect answers included types of salt: table salt, sea salt, rock salt. Sodium or sodium salts were quite common and magnesium sulfide was seen occasionally. A wide range of chemicals were suggested but the majority did not include magnesium or sulfate/sulfur.

Question 15 (c)

(c) The student adds an **excess** of magnesium carbonate to dilute sulfuric acid until **no more of it reacts**.

magnesium carbonate(s) + sulfuric acid(aq) → salt(aq) + water(l) + carbon dioxide(g)

Magnesium carbonate is a white powder that is insoluble in water.

A colourless solution of the salt is formed.

Describe **two** observations the student would see as the reaction is happening.

1 .....

.....

2 .....

.....

[2]

Less than half of candidates scored a mark, which was almost invariably for bubbling/fizzing. Almost none scored 2 marks and there was a significant omit rate. The practical observation of the white powder disappearing was confused with the process of dissolving which the mark scheme did not credit; this was a difficult distinction for candidates to appreciate. Most wrote about dissolving, a colourless solution being formed or about the idea that solid would be left at the bottom (as they were told that the magnesium carbonate was added until it was in excess). Other incorrect suggestions included temperature or colour changes.

Question 15 (d)

(d) The student separates the salt from the solution formed at the end of the reaction.

> **Step 1:** They remove the excess magnesium carbonate.
>
> **Step 2:** They remove the water from the salt solution.

State the names of the separation techniques used in Step 1 and Step 2.

Step 1 .....

Step 2 .....

[2]

Many higher achieving candidates scored both marks. Others knew the correct techniques but wrote them in the wrong order so gained no marks. Incorrect suggestions included boiling, chromatography, fractional distillation and various responses that were not separation techniques. Some candidates attempted to describe the process instead of naming it.

Question 15 (e) (i)

(e) The student measures the mass of the salt obtained when different masses of magnesium carbonate are added to the same volume of dilute sulfuric acid.

The table shows their results.

Mass of magnesium carbonate (g)	Mass of the salt (g)
1.0	1.4
2.0	2.9
3.0	4.3
4.0	5.7
5.0	7.1
6.0	7.1
7.0	7.1

(i) Describe the relationship between the mass of magnesium carbonate and the mass of the salt.

.....

.....

.....

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

Questions 15 (e) (i) and (ii) were good discriminators. Many candidates could explain that as the mass of magnesium carbonate increases the mass of salt increases, although some referred to magnesium instead of the carbonate. Some did not gain the mark as they referred to changes rather than increases, e.g. as magnesium carbonate changes, the amount of salt increases.

Higher achieving candidates were often able to gain both marks. Lower achieving candidates frequently just stated that the mass of salt was always higher than that of magnesium carbonate.

Exemplar 3

Describe the relationship between the mass of magnesium carbonate and the mass of the salt.

There is more salt that there is magnesium carbonate, which ~~see~~ shows there is more product than what they put in. The ~~m~~ increase in magnesium Carbonate cause the increase in salt. **[2]**

It is good to see that this candidate has underlined key parts of the question to try to clarify what is required.

Their first point about a greater mass of salt than magnesium carbonate was frequently seen but is not creditworthy. They go on to give a valid relationship: the idea that an increase in magnesium carbonate shows an increase in salt.

Question 15 (e) (ii)

(ii) A student thinks that when 6.0 g of magnesium carbonate has been added it is in excess.

Explain why the student is **correct**.

.....

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

Almost half of candidates realised that no more salt/product was formed after 5g had been added. Others did not gain the mark as they wrote about the reaction finishing, the acid having been used up or just repeated the stem of the question by saying it is in excess.

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