Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

GATEWAY SCIENCE CHEMISTRY A

J248

For first teaching in 2016

J248/01 Summer 2023 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 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 OCR.

Paper 1 series overview

Candidates were generally well prepared for this examination; only the more challenging questions were omitted.

In calculations it is advisable for candidates to show their working out, so that where a final answer is incorrect, it may be possible for working and error carried forward marks to be given.

It is advisable for candidates to check their answers against the question paper to make sure they have answered all of what is being asked, e.g. that numerical answers are given to an appropriate number of significant figures or decimal places and that written responses cover all aspects of the question.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• produced a clear, concise, and well-structured answer for the Level of response question, Question 19 (a) • used atomic structure theory: Questions 16 (b), 16 (c) (i) – (c) (iii), 16 (d) • performed calculations relating to – relative formula mass: Questions 7 and 17 (c) (ii), percentage of an isotope: Question 16 (d), R_f values: Question 17 (c) (i), mean mass: Question 21 (b) (i) • used data appropriately: Questions 19 (b) (ii), 20 (c) (i) and 22 (b) (i) • derived a relationship from data: Question 20 (c) (ii) • identified products of reactions and balanced equations: Question 21 (b) (ii) • applied knowledge of bonding: Questions 18 (b), 18 (d) (ii) and 19 (b) (i) – (iii) • named apparatus and experimental techniques: Questions 21 (b) (iii) – (iv) and 22 (a) (i) • suggested improvements to experiments: Questions 20 (e) and 22 (a) (ii).	• tended to repeat the question stem as their answer to a question • gave answers to calculations with no working steps shown • found bonding difficult: Questions 18 (b), 18 (d) (ii) and 19 (b) (i) – (iii) • found conversion of units difficult: Question 18 (d) (i) • found explaining and using ideas of purity difficult: Questions 17 (a) (i) – (ii), 17 (d) • found significant figures and decimal places difficult: Questions 17 (c) (i), 21 (b) (i) • showed imprecise use of scientific terminology.

Section A overview

It was pleasing to see that no candidates omitted any of the multiple choice questions.

Questions on atomic structure (Question 1) experimental observations (Question 7) peer review (Question 8) and reacting masses (Question 10) were particularly well answered.

Questions on Thomson (Question 4), gain of electrons and the Periodic Table (Question 6) and energy profile diagrams proved to be more challenging for candidates.

Question 1

1 Where is most of the mass found in an atom?

A Electrons

B Neutrons

C Nucleus

D Protons

Your answer ☐ **[1]**

Protons was a popular incorrect response.

Question 2

2 Sodium fluoride has the formula NaF. The formula of the sodium ion is Na^+.

What is the formula of the fluoride ion?

A F^+

B F^-

C F^{2+}

D F^{2-}

Your answer ☐ **[1]**

A was the most popular incorrect response.

Question 3

3 Which row of results shows that the pH of a solution is **acidic**?

	pH	Universal indicator colour
A	3	orange
B	10	blue
C	3	blue
D	10	orange

Your answer ☐ **[1]**

The acidic colour of universal indicator was well known; the pH value was less well known, with D being a popular incorrect response.

Question 4

4 Thomson discovered the first sub-atomic particle.

Which sub-atomic particle did Thomson discover?

A Atom

B Electron

C Neutron

D Proton

Your answer ☐ **[1]**

Higher attaining candidates remembered the work of Thompson; A and D were also popular responses.

Question 5

5 What is the relative formula mass of iron chloride, $FeCl_3$?

Relative atomic mass (A_r): Cl = 35.5 Fe = 55.8.

A 91.3

B 126.8

C 162.3

D 202.9

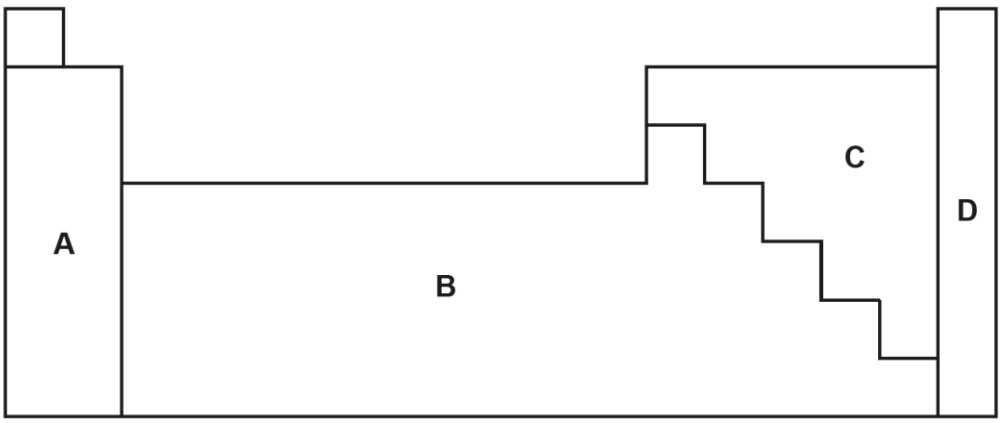
Your answer ☐ **[1]**

Many candidates added the two relative atomic masses together and chose incorrect response A.

Question 6

6 An element **gains** electrons to form a full outer shell.

Which part of the Periodic Table will the element be from?



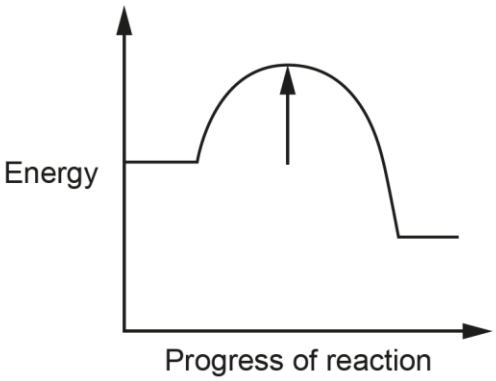
Your answer ☐ **[1]**

Higher attaining candidates appreciated that non-metals gain electrons and that these are found in part C of the Periodic Table. All responses were popular.

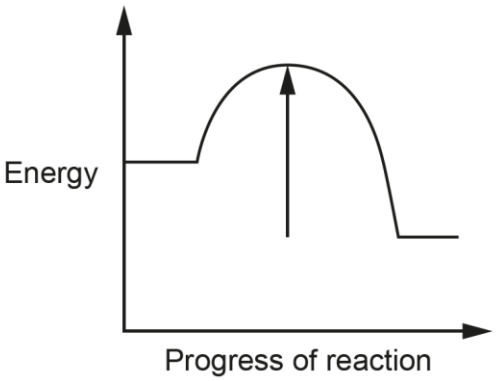
Question 9

9 Which reaction profile has an arrow showing the **activation energy**?

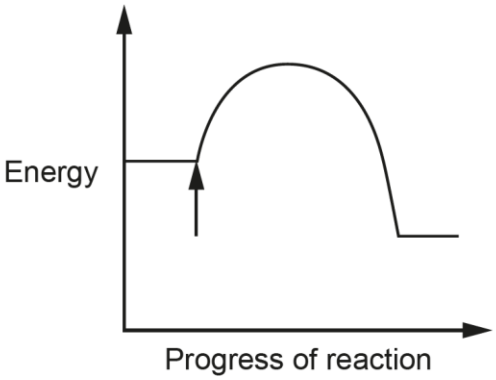
A



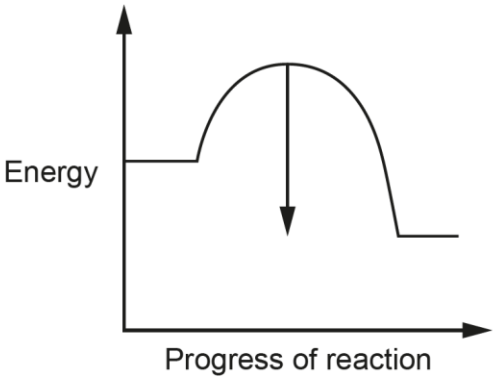
B



C



D



Your answer ☐ **[1]**

Candidates appreciated that the activation energy is represented by an upwards arrow, and B and C were popular incorrect responses.

Question 10

10 63.5 g of copper reacts to make 134.5 g of copper chloride, $CuCl_2$.

$Cu + Cl_2 \rightarrow CuCl_2$

How much copper chloride will be made from 0.635 g of copper?

A 0.01345 g

B 0.1345 g

C 1.345 g

D 13.45 g

Your answer ☐ **[1]**

Some candidates divided by 10 instead of 100, and chose response D.

Question 11

11 Why are nanoparticles useful as catalysts in chemical reactions?

A Nanoparticles are a new technology.

B Nanoparticles have a high surface area to volume ratio.

C Nanoparticles have a large particle size.

D Nanoparticles have a low surface area to volume ratio.

Your answer ☐ **[1]**

The most popular incorrect response was D where the two properties of nanomaterials were reversed.

Question 12

12 The melting point of magnesium chloride is 714 °C.

Which state symbols are used for magnesium chloride at these temperatures?

	State symbol at 25 °C	State symbol at 110 °C
A	g	g
B	s	s
C	s	g
D	g	s

Your answer ☐ **[1]**

A was the most popular incorrect response.

Question 13

13 What changes did Mendeleev make to improve his Periodic Table?

A He arranged elements by mass number.

B He arranged elements by the number of neutrons.

C He put elements with low melting points on the left and high melting points on the right.

D He realised some elements had not yet been discovered so left spaces for them.

Your answer ☐ **[1]**

Many candidates thought the improvement Mendeleev made to his Periodic Table was to arrange the elements in order of mass number and chose response A.

Question 14

14 Nitrogen monoxide, NO, can be oxidised to form nitrogen dioxide, NO_2.

$2NO + O_2 \rightarrow 2NO_2$

What is the oxidising agent in this reaction?

A Nitrogen

B Nitrogen dioxide

C Nitrogen monoxide

D Oxygen

Your answer ☐ **[1]**

A was the most popular incorrect response.

Question 15

15 Hydrochloric acid, HC*l*, reacts with magnesium, Mg.

Magnesium chloride and hydrogen are made.

What is the balanced symbol equation for this reaction?

A $2HCl + Mg \rightarrow MgCl + H_2$

B $2HCl + Mg \rightarrow MgCl + H$

C $2HCl + Mg \rightarrow MgCl_2 + H_2$

D $2HCl + Mg \rightarrow MgCl_2 + H$

Your answer ☐ **[1]**

Many candidates appreciated that the formula for hydrogen is H_2. Response A, where the formula for magnesium chloride is MgC*l*, was popular.

Section B overview

Questions on the particle model (Question 16 (a) (i) and 16 (a) (iii)), atomic structure (Question 16 (b), 16 (c) (i) – (c) (iii) and 16 (d)), chromatography (Question 17 (c) (i) – (ii)), molecular models (Question 18 (a)) and using data (Questions 19 (b) (ii), 20 (c) (i) and 22 (b) (i)) were particularly well answered.

Questions on purity and melting point (Question 17 (a) (ii)), use of bonding models (Question 18 (b)), empirical formulae (Question 18 (c) (i)), units (Question 18 (d) (i)), bonding (Question 18 (d) (ii) – (iii), Qu 19 (b) (i)), balancing equations (Question 21 (b) (ii)), filtration (Question 21 (b) (iii)) and experimental procedures (Question 22 (a) (ii)) proved to be the most difficult for candidates.

A significant number of candidates omitted the more challenging questions, particularly parts of Questions 21 and 22.

There was no evidence that candidates did not have enough time to complete the paper.

Question 16 (a) (ii)

(ii) Oxygen has a melting point of –219 °C and a boiling point of –183 °C.

State a temperature at which oxygen will be a **liquid**.

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

Most candidates gave a negative temperature; -180, -219 and -220 were all popular incorrect responses.

Question 16 (a) (iii)

(iii) Complete the sentences about the particle models.

Use words from the list.

condensing	**freezing**	**less**	**melting**	**more**

A liquid becoming a solid is called ..... . In a solid, the particles move ..... than in a liquid. In a solid, the arrangement of particles is ..... random than in a liquid. **[3]**

Higher scoring candidates chose freezing, less and less. Condensing was seen for the change of state and the particles being more random was also popular.

Question 16 (c) (iii)

(iii) Atoms of each isotope have the same number of electrons.

How many electrons do these atoms have?

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

Higher scoring candidates used the atomic number to represent the number of electrons in the neutral atom. Use of the mass numbers 16 or 18 were also popular.

Question 16 (d)

(d) A sample of air contains all three isotopes of oxygen.
It contains 99.759% of isotope **1** and 0.037% of isotope **2**.

Calculate the percentage of isotope **3** in the sample of air.

Percentage of isotope **3** = ... % **[2]**

Many candidates calculated the percentage correctly. A significant number of candidates either found the difference between the two values given rather than adding them, or added the two values but did not take this sum from 100%.

Calculations

It is really important that candidates show their working out in calculations, otherwise it is impossible to award partial marks for responses where only one step is incorrect.

Question 17 (a) (i)

17 A scientist measures the melting points of three painkillers.

Painkiller	Melting point (°C)
A	136
B	169
C	76

(a) All of the painkillers are **pure** substances.

(i) Explain what is meant by a pure substance.

.....

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

Higher attaining candidates appreciated that a pure substance would contain only one element or compound. Nothing mixed with it, only one substance or a discussion of the melting point being high or low were common responses.

Question 17 (a) (ii)

(ii) How can you tell that the three painkillers are pure from their melting points?

.....

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

Candidates found this challenging. High melting point and low melting point were popular responses.

Misconception

? The melting point of a pure substance was perceived to be either high or low rather than not being over a range of temperatures.

Question 17 (b)

(b) The scientist uses gas chromatography to investigate a **mixture** of painkiller **A** and painkiller **B**.

How many peaks will the scientist see in the gas chromatogram?

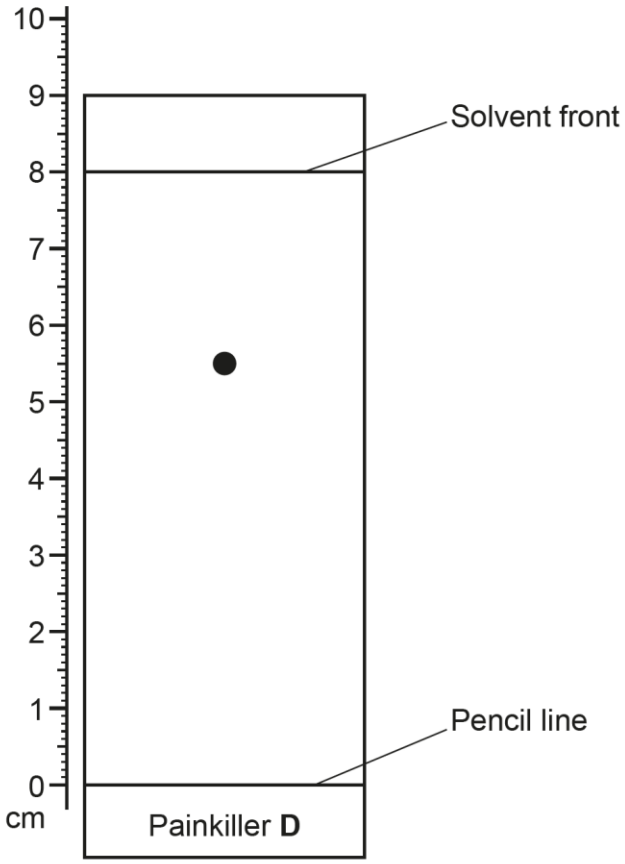
..... **[1]**

Many candidates appreciated that 2 peaks would be seen. 3 and 33 were popular responses.

Question 17 (c) (i)

(c) The scientist then analyses painkiller **D** using thin layer chromatography.

The chromatogram is shown in the diagram.



(i) Calculate the R_f value of painkiller **D**.

Use the formula: $R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$

Give your answer to **2** decimal places.

R_f of painkiller **D** = ... **[3]**

Higher achieving candidates measured the two distances carefully, calculated the value correctly and gave their answer to 2 decimal places. 2.6, 3.5 and 7.9 as measured lengths and the inversion of the division were popular. It was also common to give the unrounded answer,0.6875.

Question 17 (c) (ii)

(ii) Which components are needed for thin layer chromatography?

Put a ring around the **two** correct components.

balance	**Bunsen burner**	**mobile phase**
paper	**stationary phase**	**thermometer**

[2]

Components were well known by the majority of candidates. Stationary phase and paper were quite often the two components ringed.

Question 17 (d)

(d) The scientist thinks that an impure painkiller will **only** have **two** spots on the thin layer chromatogram.

Give **two** reasons why the scientist is **incorrect**.

1 .....

.....

2 .....

.....

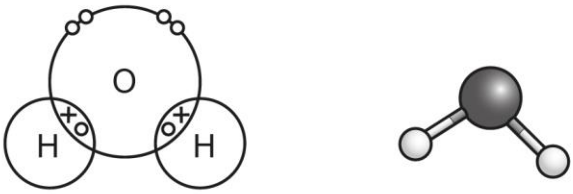
[2]

The highest achieving candidates appreciated that the number of spots would depend on the number of impurities and this could mean more than two spots. Impure containing just one spot was a common response.

Question 18 (b)

(b) A student wants to use a model to show the **location of the electrons** in a water molecule as shown in **Fig. 18.1**.

Fig. 18.1



Model **1**

Model **2**

Explain why the student uses model **1** instead of model **2**.

.....

.....

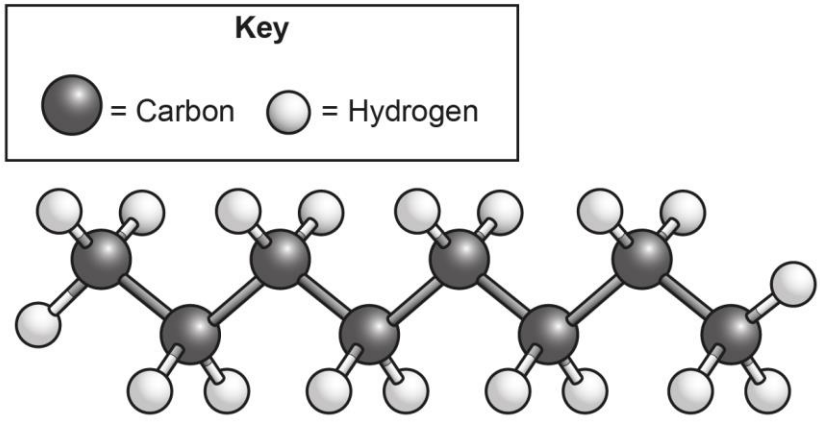
..... **[2]**

The highest attaining candidates appreciated that the shared electrons in the bonds and the non-bonding electrons were both shown in Model 1. Rewriting the question stem was the most common response. Other popular responses included easier to read and understand and it is more detailed.

Question 18 (c) (i)

(c) **Fig. 18.2** shows a model of octane.

Fig. 18.2



(i) What is the **empirical formula** of octane?

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

Popular responses included C_8H_{18}, C_4H_8 and CH_2.

Misconception

Many candidates thought the empirical formula was the molecular formula rather than it being the simplest whole number ratio of the atoms in a molecule.

Question 18 (c) (ii)

(ii) Calculate the **relative formula mass** of octane.

Relative atomic mass (A_r): C = 12.0 H = 1.0.

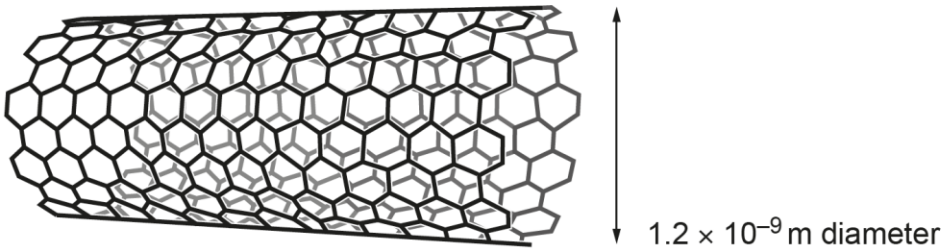
Relative formula mass = ... **[3]**

Higher scoring candidates calculated the relative formula mass correctly. 12 + 1 = 13 and the relative formula mass of the empirical formula were popular responses.

Question 18 (d) (i)

(d) **Fig. 18.3** shows a model of a carbon nanotube.

Fig. 18.3



(i) What is the diameter of the carbon nanotube in **nanometres**?

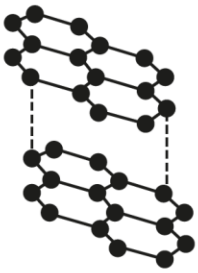
..... **[1]**

The highest attaining candidates understood the unit of nanometres. 1 200 000 000 was a very popular response.

Question 18 (d) (ii)

(ii) **Fig. 18.4** shows a model of the structure and bonding in graphite.

Fig. 18.4



Explain why the carbon nanotube is stronger than graphite.

Use **Fig. 18.3** and **Fig. 18.4**.

.....

.....

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

The highest attaining candidates appreciated that all of the atoms in the nanotube are bonded by strong covalent bonds and that there are weak forces between the layers in graphite. Comparing the bonds as weak in graphite and strong in graphene or rewriting the question stem were popular responses.

Bonding

Covalent bonds are strong. What makes graphene stronger than graphite is that all of the atoms are bonded by these strong bonds in graphene in a network, whereas the strong covalent bonds are only within the layers of graphite and the layers are held together by weak forces which are easily broken. The forces between the layers in graphite are not intermolecular forces.

Question 18 (d) (iii)

(iii) A hydrogen atom has a diameter of 2.4×10^{-10} m.

Calculate how many times larger the carbon nanotube is than the hydrogen atom.

Number of times larger = ... **[2]**

The highest attaining candidates divided the largest diameter by the smallest and gave an answer of 5. The most popular response was 0.2 from an inverted division where the smallest diameter was divided by the largest. Standard form confused many candidates.

Question 19 (a)*

19 The table shows the type of bonding in three substances.

Substance	Type of bonding
Bromine, Br_2	simple molecular (covalent)
Sodium chloride, $NaCl$	ionic
Diamond, C	giant covalent

(a)* Describe and compare the types of bonding in these three substances.

Predict which substance will have the lowest melting point.

.....

.....

.....

.....

.....

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

Level 1 needed a comment about bromine being the lowest melting point or a discussion of the forces in some of the substances. Level 2 needed choosing bromine as the lowest and a discussion of the bonding in more detail. Level 3 needed discussion of intermolecular forces and of energy needed to break bonds/forces.

Sodium chloride was often chosen as having covalent bonding or the lowest melting point. Many candidates discussed bonding between a metal and a non-metal or rewrote the information from the table.

Exemplar 1

Bromine will have a low melting point as simple molecules have weak intermolecular bonds therefore need less energy to break. Sodium chloride have a ionically bonded structure, with electrostatic forces, these take large amounts of force to break, they are made of Metals and non-metals. Diamond have giant covalent lattices and have many bonds which require large amounts of energy, therefore has a high melting point. Therefore I conclude Bromine to have the lowest melting point! [6]

Bromine was chosen as having the lowest melting point with weak intermolecular forces as the reason, linked to less energy to break them. Sodium chloride has electrostatic forces which require large force to break (force was condoned in this context since energy is used when referring to bonds in diamond). Diamond has many covalent bonds which require large amounts of energy (to break), hence high melting point. A response does not need to be perfect in order to score 6 marks. This response has the lowest melting point substance chosen, the bonding discussed, weak intermolecular forces in bromine and the energy required to overcome the bonding for all three substances. This is level 3, 6 marks.

Exemplar 2

Diamond is has a lattice structure which means it has the highest boiling point because of its strong covalent bonds as there is many of them.

Bromine $BrBr$ is a simple covalent which will be weak as there a little bond inbetween it will have a low boiling point.

Sodium chloride $NaCl$ is an ionic which is a metal and a non-metal which has bonded and it will have a high boiling point as it has strong intermolecular forces. [6]

Sodium chloride and diamond have high melting point and bromine low, hence bromine has the lowest melting point. Diamond has many strong bonds. Strong intermolecular forces in sodium chloride was incorrect. This is Level 1, 2 marks.

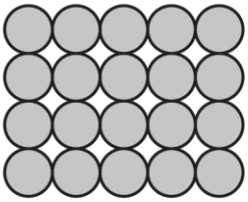
Exemplar 3

Bromine -
has simple bonds which therefore mean they are weaan. Has the lowest melting point.
Sodium chloride -
Has Contains ionic bonding due to the two elements, has stronger bonds. Has low melting point.
Diamond -
giant covalent bonds. Strongest out of the Substances.
High melting point. [6]

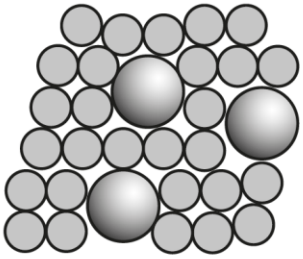
This response has bromine chosen as having the lowest melting point. It also includes sodium chloride and diamond having strong bonds. Weak intermolecular forces are not discussed, nor is the energy required to break the bonds in the three substances. The response suggests that bromine has weak bonds; however the bonds in bromine are strong – it is the forces between the molecules that are weak. This is Level 2, 3 marks.

Question 19 (b) (i)

(b) Titanium is a metal element. Metal **elements** can be mixed with other elements to form metal **alloys**.



Metal element



Metal alloy

(i) Explain why a metal alloy is harder than a metal element.

.....

.....

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

Higher scoring candidates appreciated that the alloy contains different sized atoms. Two elements, so stronger bonds was a common response, as was rewriting the question.

Metals and alloys

In pure metals the rows of atoms are able to slide. Alloys are stronger because the added atoms are a different size to the atoms of the pure metal and so they disrupt the regular pattern and the layers are no longer able to slide as well.

Question 20 (a)

20 A teacher wants to make hydrogen and chlorine using electrolysis.

(a) Some **possible** steps they can use in the electrolysis experiment are listed.

1. Put test tubes over the electrodes to collect gases.
2. Weigh each electrode.
3. Put the electrodes into a solution of sodium chloride.
4. Put on safety goggles.
5. Connect the battery.
6. Put the electrodes into solid sodium chloride.

Put the **four** steps that the teacher should use in the correct order.

[3]

Most candidates appreciated that putting on safety goggles was the first step, with higher scoring candidates connecting the battery as the final step. All orders of all responses were seen.

Question 20 (b)

(b) Chlorine is in Period 3 and Group 7 of the Periodic Table.

Which statements about chlorine are **correct**?

Tick (✓) **two** boxes.

- Chlorine forms negative ions. ☐
- Chlorine has 3 electrons in its outer shell. ☐
- Chlorine has 7 electron shells. ☐
- Chlorine has 7 electrons. ☐
- Chlorine is a metal. ☐
- Chlorine is a non-metal. ☐

[2]

Many candidates knew that either chlorine is a non-metal or that chorine forms negative ions. Chlorine has 3 shells and chlorine has 7 electrons were popular responses.

Question 20 (c) (ii)

(ii) Describe the relationship between the amount of copper made and the amount of oxygen made.

.....

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

Higher achieving candidates successfully described the relationship. There is more copper than iron or there is less oxygen than copper were popular incorrect responses.

Question 20 (d)

(d) Copper sulfate solution is an electrolyte.

What type of compound is an electrolyte?

Tick (✓) **one** box.

Covalent ☐

Ionic ☐

Molecular ☐

[1]

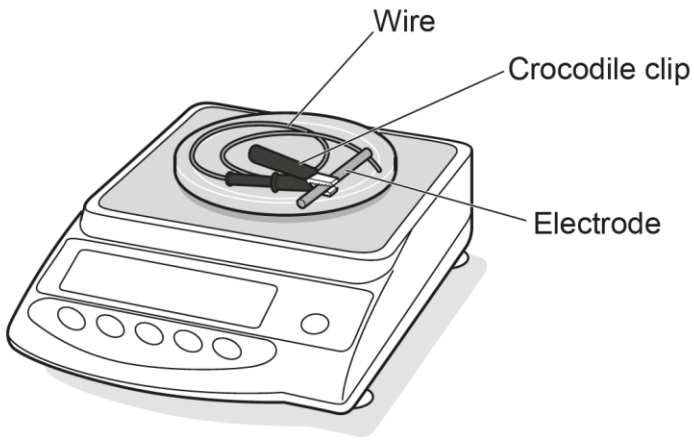
Covalent was a popular response.

Question 20 (e)

(e) Another teacher repeats the electrolysis experiment.

They record the mass of the electrode at the start of the experiment.

At the end of the experiment, they remove the electrode from the solution and record the mass **immediately** as shown in the diagram.



They notice that the mass is **higher** than they expect.

Suggest **two** changes the teacher could make to get a more accurate mass.

1 .....

.....

2 .....

.....

[2]

Many candidates appreciated that the wire and crocodile clip should be removed, often giving these as two separate reasons rather than one. Repeating the process, using better scales, weigh before and after and leave for a longer time were all popular responses. The higher attaining candidates appreciated that the electrode needed to be dried.

Question 21 (a)

21 A scientist is studying acids and alkalis.

(a) Which statement about acids and alkalis is **correct**?

Tick (✓) **one** box.

A reaction between an acid and an alkali is neutralisation. ☐

Acids form OH^- ions in solution. ☐

Alkalis have a pH of less than 7. ☐

Sodium hydroxide, NaOH, is an example of an acid. ☐

[1]

Neutralisation was well known. Acids forming OH^- ions in solution and alkalis have a pH of less than 7 were popular responses.

Question 21 (b) (i)

(b) The scientist reacts sulfuric acid with insoluble magnesium carbonate, $MgCO_3$.

They repeat the experiment two more times.

The table shows their results.

	Experiment 1	**Experiment 2**	**Experiment 3**
Mass of magnesium sulfate, $MgSO_4$, produced (g)	4.37	4.31	4.38
Mass of magnesium carbonate, $MgCO_3$, remaining (g)	1.33	1.38	1.32

(i) Calculate the mean mass of magnesium sulfate, $MgSO_4$, made.

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

Mean mass of magnesium sulfate = ... g **[3]**

The majority of candidates calculated the mean correctly and quoted their answer to 3 significant figures. Not dividing the sum by 3 or using all of the numbers in the table were common responses. Omitting 4.31 as an anomaly was also popular. Where a number is only different from the other values by a few percent (e.g. less than 2% here), it should not be considered an anomaly.

Question 21 (b) (ii)

(ii) Complete the **balanced symbol** equation for the reaction.

Include state symbols.

H_2SO_4 (aq) + $MgCO_3$(s) → $MgSO_4$(aq) + ... (.....) + ... (.....) **[2]**

The highest attaining candidates either gave the correct formulae or the correct state symbols. CO_3 and H_2 were very common.

Question 21 (b) (iii)

(iii) How does the scientist remove the unreacted solid magnesium carbonate, $MgCO_3$(s)?

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

Higher attaining candidates appreciated the use of filtration. Using tweezers or a sieve were popular responses.

Question 21 (b) (iv)

(iv) How does the scientist obtain **pure dry** magnesium sulfate crystals from magnesium sulfate solution?

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

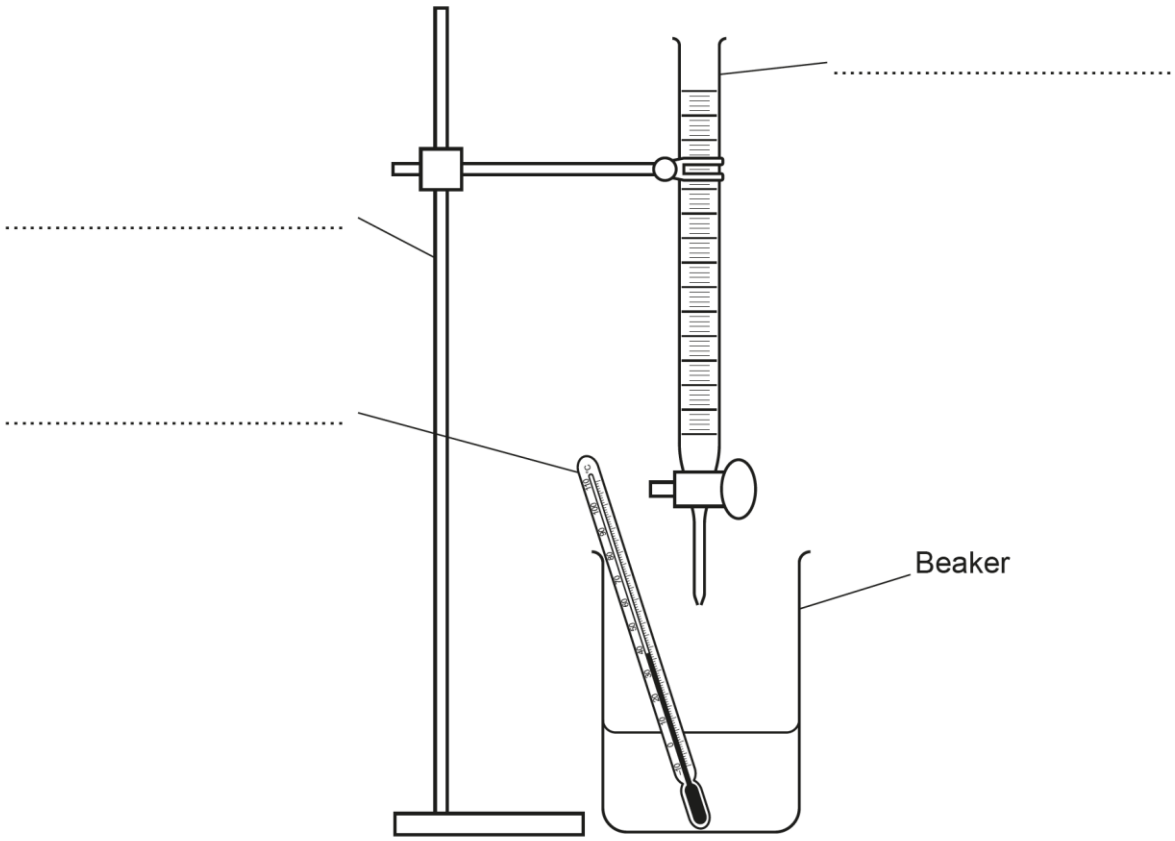
Crystallisation was quite well known. Filtration and melting were popular responses.

Question 22 (a) (i)

22 (a) A student does an experiment to find out the temperature change of the reaction between an acid and an alkali.

The diagram shows the student's experiment.

(i) Label the equipment in the diagram.



[3]

Clamp stand and thermometer were well known by the majority of candidates. Pipette, measuring tube, drip tube, measuring cylinder and syringe were often used to name the burette.

Question 22 (a) (ii)

(ii) Suggest **one** change the student can make so that the temperature change is measured more accurately. Use the diagram.

.....

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

Higher attaining candidates either added a lid or insulation. Putting the thermometer upright, taking the temperature at the beginning and at the end, repeating the experiment and moving the burette down were popular responses.

Question 22 (b) (i)

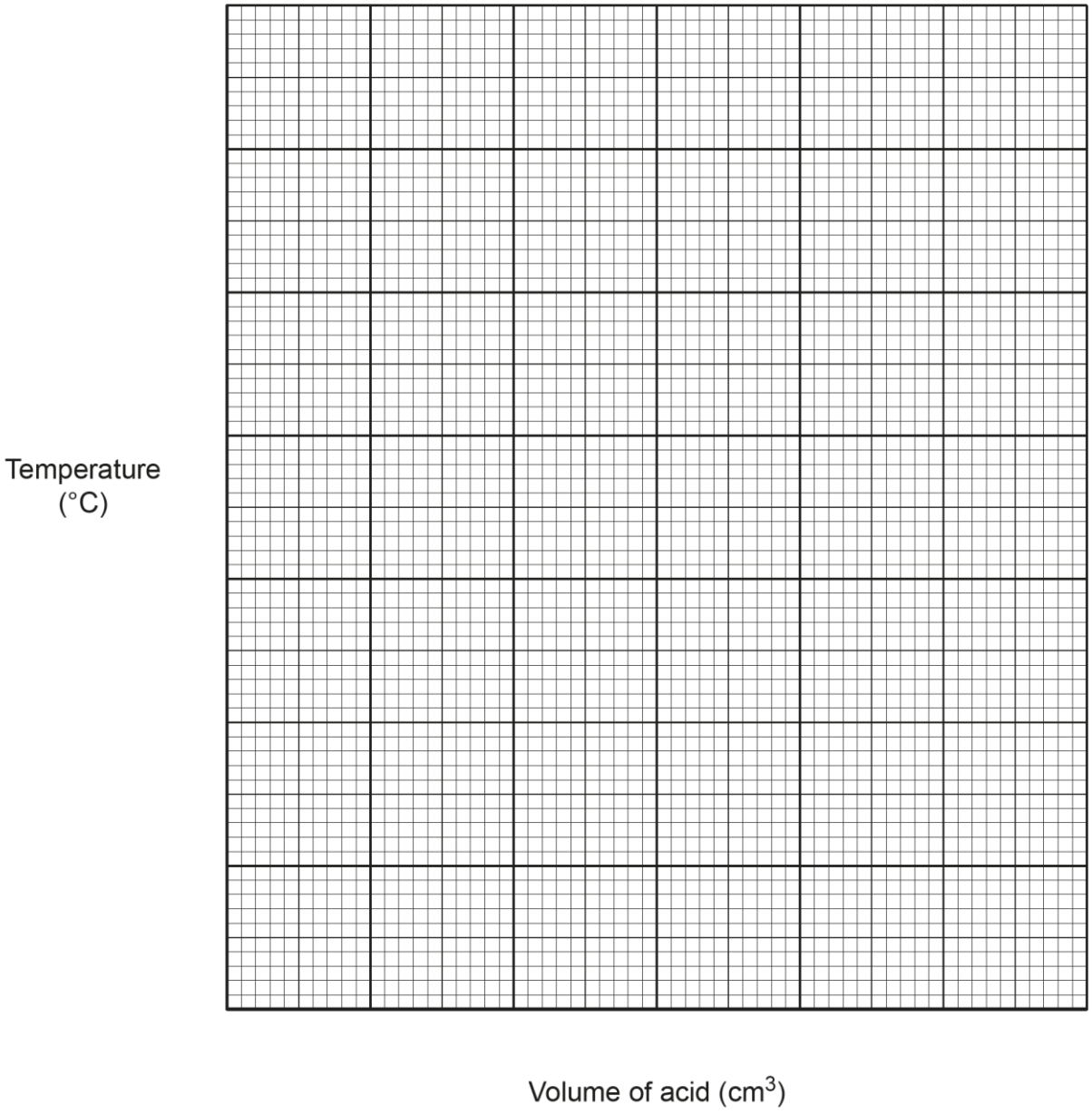
(b) The student adds the acid, 5 cm^3 at a time, to the alkali in the beaker.

The student records the temperature of the solution after each addition of acid.

The table shows their results.

Volume of acid (cm^3)	Temperature (°C)
0	18
5	20
10	23
15	26
20	27
25	26
30	24

(i) Plot the results from the table on the grid.



[2]

The majority of candidates gave a linear scale and plotted the points correctly. The point at 20 cm^3 plotted at 28°C was common. Where candidates had a scale with 2 small squares to every cm^3 it was common for the points to be plotted using 1 small square to every cm^3.

Question 22 (b) (ii)

(ii) Describe what happens to the temperature measured as the acid is added.

.....

.....

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

The majority of candidates discussed the temperature increasing. Identifying a drop in temperature without indicating when this occurred was popular.

Question 22 (b) (iii)

(iii) The reaction is exothermic.

Explain how you can tell this from the student's results.

.....

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

Higher attaining candidates cited the increase in temperature. Citing the increase and decrease in temperature or discussing heat being released were popular.

Question 22 (c)

(c) The activation energy for the student's reaction is 132 kJ / mol.

Complete the sentence to state the meaning of activation energy.

Activation energy is the minimum .....

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

Activation energy was well known. Energy given out during a reaction and energy of reaction were popular responses.

Supporting you

Teach Cambridge

Make sure you visit our secure website **Teach Cambridge** to find the full range of resources and support for the subjects you teach. This includes secure materials such as set assignments and exemplars, online and on-demand training.

Don't have access? If your school or college teaches any OCR qualifications, please contact your exams officer. You can forward them this link to help get you started.

Reviews of marking

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.

Access to Scripts

For the June 2023 series, Exams Officers will be able to download copies of your candidates' completed papers or 'scripts' for all of our General Qualifications including Entry Level, GCSE and AS/A Level. Your centre can use these scripts to decide whether to request a review of marking and to support teaching and learning.

Our free, on-demand service, Access to Scripts is available via our single sign-on service, My Cambridge. Step-by-step instructions are on our website.

Keep up-to-date

We send a monthly bulletin 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 for your subject on **Teach Cambridge**. You'll also find links to our online courses on NEA marking and support.

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.

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
facebook.com/ocrexams
twitter.com/ocrexams
instagram.com/ocrexaminations
linkedin.com/company/ocr
youtube.com/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