Qualification Accredited

Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

GATEWAY SCIENCE CHEMISTRY A

J248

For first teaching in 2016

J248/03 Summer 2019 series

Version 1

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. 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 can be downloaded from OCR.

Paper 3 series overview

J248/03 is the first of two examination units for candidates entered for the Higher Tier of the GCSE examination for Gateway Science Chemistry A. This component assesses teaching topics C1, C2 and C3 and is 50% of the total GCSE. To do well on this paper, candidates need to demonstrate knowledge and understanding of scientific ideas, techniques and procedures across all three 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 and be able to think about how an experimental method could be improved.

J248/03 has an equal emphasis on knowledge and understanding of the assessment outcomes from the specification and application of this knowledge. There are less questions which assess analysis of information and ideas.

Candidates who did well on this paper generally did the following:	**Candidates who did not do well on this paper generally did the following:**
• Constructed and balanced symbol and half equations for familiar and unfamiliar reactions: 19(c)(ii), 19(c)(iii), 20(c)(ii), 22(b)(i). • Performed standard and novel calculations following the required rubric (e.g. clear working, units and, where needed, significant figures) relating to percentage of atoms in an alloy: 16(c)(i), surface area to volume ratio: 17(b), nanoparticles: 17(c)(ii), bond energy: 18(c), pH: 20(c)(i), moles and reacting masses: 22(b)(ii). • Produced a clear, concise and well-structured answer for the Level of Response Question: 21(b). • Applied knowledge and understanding to questions set in a novel context.	• Found it difficult to apply what they had learnt to unfamiliar situations. • Found it difficult to construct and balance ionic and half equations reactions: 19(c)(ii), 19(c)(iii). • Found it difficult to analyse data and then make a judgement, or draw a conclusion, in relation to the data, e.g. 16(b). • Found it difficult to analyse information to develop experimental procedures or to describe improvements to a specific procedure, e.g. 18(a)(iv), 19(b). • Showed imprecise use of scientific terminology, e.g. 18(a)(iii), 18(b), 21(a)(i), 22(a)(ii).

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.

Centres should also encourage candidates to set out their working to calculations clearly. 'Signposting' of calculations was often poor, with numbers written at random in the answer space. This makes it difficult for the examiner to seek out credit-worthy points and/or award marks for errors carried forward. Equally, for candidates, it often leads to them getting 'lost' going through the calculation.

The clarity of handwriting is an issue for some candidates, as is poor use of English and/or scientific terminology when explaining their answers.

There was no evidence that time constraints had led to underperforming. Very few questions were left blank by candidates.

Section A overview

Questions 2, 3, 4, 6, 11, 14 and 15 in this section proved to be good discriminators with many higher ability candidates answering correctly. Questions 1, 5, 7, 8, 9, 12 and 13 were answered well by candidates with many correct answers.

Question 2

2 Carbon dioxide exists as a simple molecule.

Why do simple molecules have low boiling points?

A Simple molecules have weak covalent bonds between atoms.

B Simple molecules have weak intermolecular forces between atoms.

C Simple molecules have weak ionic bonds between the molecules.

D Simple molecules have weak intermolecular forces between the molecules.

Your answer ☐ **[1]**

?	**Misconception**	A and B were common misconceptions in this question.

Question 10

10 Avogadro's constant has a value of 6.02×10^{23}.

How many **oxygen atoms** are in 0.25 moles of oxygen molecules?

A 1.204×10^{24}

B 1.505×10^{23}

C 3.010×10^{23}

D 6.020×10^{23}

Your answer ☐ **[1]**

?	**Misconception**	B was a very common misconception in this question, when candidates calculated the number of oxygen **molecules** rather than the number of oxygen **atoms**.

Section B

Question 16 (a) (i)

16 Lithium is a metal found in Group 1 of the Periodic Table.

(a) (i) Describe the structure and bonding in a metal.

You may include a diagram in your answer.

.... **[2]**

This question required candidates to appreciate that a metal contains positive metal ions in a sea of delocalised electrons. When candidates did not gain credit it was usually because they described the atomic structure of lithium (often also describing how it bonds with other elements), rather than the metallic structure.

Question 16 (a) (ii)

(ii) Lithium is **malleable** even though metallic bonds are strong.

Explain why metals are malleable.

....

.... **[1]**

Good responses to this question described that metals are malleable because the **<u>layers</u>** of particles can slide or move over each other. A common misconception was that metals have weak bonding.

Question 16 (a) (iii)

(iii) Lithium can conduct electricity in the solid and liquid state.

Explain why metals can conduct electricity.

....

....

.... **[2]**

Good responses to this question described that metals contain delocalised electrons.

Question 16 (b)

(b) An alloy is a mixture of a metal with one or more other elements.

When lithium is mixed with aluminium it makes an alloy that can be used in aircraft.

Adding different amounts of lithium to the aluminium changes the properties of the alloy.

Alloy	Percentage of lithium (%)	Density (g/cm^3)	Melting point (°C)	Strength (MPa)
A	2.00	2.58	670	550
B	2.20	2.56	580	555
C	2.45	2.55	655	565

A scientist thinks that alloy **C** is best for making an aircraft.

Is she correct?

Explain your answer using evidence from the table.

....

....

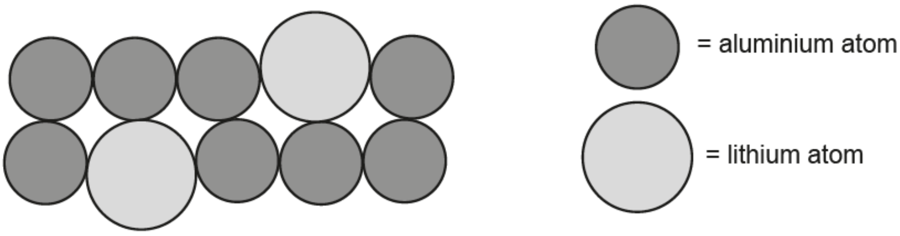
.... **[2]**

This question required candidates to identify **<u>and explain</u>** the properties that make alloy **C** the best choice for making an aircraft. Lower ability candidates often simply stated the properties (low density and high strength) without explaining why these properties were important. When reasons were stated they were often trivial e.g. 'low density because it would be good for the aircraft'. A common misconception was that high melting point was a key property.

Question 16 (c) (i)

(c) The scientist uses the particle model to show the elements present in alloy **B**.

Look at her diagram.



Alloy **B**

not to scale

(i) Calculate the **percentage of lithium atoms** in the diagram of alloy **B**.

Percentage of lithium atoms = ... % **[1]**

Most candidates correctly calculated the percentage of lithium atoms at 20%.

Question 16 (c) (ii)

(ii) Use your answer to part **(c)(i)** to explain if the diagram accurately shows the structure of alloy **B**.

....

....

.... **[1]**

Good responses to this question identified that the percentage of lithium in the alloy is much smaller than in the diagram.

Question 17 (a)

17 A new sun cream has been developed using zinc oxide nanoparticles.

The small particles provide better protection from the sun and they do not leave white marks on the skin.

(a) Explain **one** possible risk of using nanoparticles in sun cream.

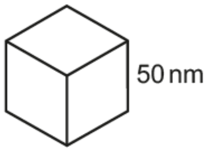
....

.... **[1]**

Good responses to this question either described specific risks of nanoparticles (e.g. can be breathed in or the idea of absorption through skin or into the bloodstream) or stated that we do not yet know the **<u>long-term</u>** risks of nanoparticles. Answers that did not gain credit were often too vague, e.g. the idea that they are not fully understood or there could be side effects or they may be harmful to humans.

Question 17 (b)

(b) A cube-shaped nanoparticle has sides of length 50 nm.



Calculate the surface area to volume ratio for this nanoparticle.

Use the equation: ratio = surface area ÷ volume

Surface area to volume ratio = ... **[4]**

Many candidates calculated the surface area of the cube as 2,500nm^2, failing to multiply this answer by 6. Examiners gave 'error carried forward' so candidates making this mistake were still able to gain 3 marks.

	AfL	It is worth centres stressing to candidates that the award of 'error carried forward' is only possible when an answer is clearly set out.

Question 17 (c) (i)

(c) (i) Scientists compare the size of nanoparticles to the sizes of other small objects.

Look at the table.

Object	**Diameter (nm)**
Gold atom	0.14
Water molecule	0.27
DNA strand	2.5
Zinc oxide nanoparticle	32
Red blood cell	7000
Human hair	100 000

The diameter of a DNA strand is 2.5 nm.

Explain why DNA is a nanoparticle but a water molecule is **not** a nanoparticle.

....

....

.... **[2]**

Good responses to this question stated that nanoparticles have a diameter between 1 – 100nm but a water molecule is too small. Lower ability candidates tended to focus on the fact that DNA is a polymer and water is a simple or small molecule, without reference to the size of nanoparticles. Examiners also saw the idea that water is made of 3 atoms but DNA is made of many atoms.

Question 17 (c) (ii)

(ii) Calculate how many zinc oxide nanoparticles would fit across a human hair.

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

Number of nanoparticles = ... **[2]**

	AfL	Centres should stress to candidates that if they are asked to give their answer to a specific number of significant figures, they can only score full marks by doing so. Many candidates scored only 1 mark for giving the answer 3125.

Question 18 (a) (i)

18 Simple distillation can be used to separate mixtures of liquids.

A scientist is using simple distillation to separate a mixture of alcohols.

Look at the table. It shows the boiling points of three alcohols.

Alcohol	Boiling point (°C)
Methanol	65
Ethanol	78
Propanol	97

(a) (i) Which alcohol will be distilled first?

Tick (✓) **one** box.

Methanol ☐

Ethanol ☐

Propanol ☐

Explain your answer.

....

....

.... **[2]**

Most candidates correctly identified that methanol will be distilled first as it has the lowest boiling point.

Question 18 (a) (ii)

(ii) Simple distillation uses evaporation and condensation to separate mixtures.

$$\text{ethanol (l)} \underset{\text{condensation}}{\overset{\text{evaporation}}{\rightleftharpoons}} \text{ethanol (g)}$$

Describe the change in the **arrangement** of particles as substances evaporate.

....

.... **[1]**

Many candidates described the arrangement of the particles in the gaseous state without any comparison with the liquid state, which was required to gain the mark.

Question 18 (a) (iii)

(iii) Describe the change in the **movement** of particles as substances evaporate.

....

.... **[1]**

As in 18(a)(ii), many candidates described the movement of the particles in the gaseous state without any comparison with the liquid state.

Question 18 (a) (iv)

(iv) The scientist wants to improve the separation of the mixture of alcohols.

Suggest a piece of equipment he could use.

Explain how this will improve the separation of the mixture of alcohols.

....

....

.... **[2]**

This question required candidates to identify the use of a fractionating column and then explain that this would provide a large surface area. Candidates who stated the name of the process (fractional distillation), rather than the piece of equipment as required by the question, did not gain credit. Only the most able candidates were able to explain why a fractionating column is used.

Question 18 (b)

(b) Ethanol can be used as a biofuel. The combustion of ethanol is an **exothermic** reaction.

Explain why combustion is an exothermic reaction.

Use ideas about bond breaking and bond making in your answer.

....

....

.... **[1]**

Good responses to this question described that more energy is given out during bond making than is taken in during bond breaking. When candidates did not gain the mark, it was usually because they gave an answer in terms of the number of bonds broken or made. Many candidates still refer to bond breaking as exothermic and bond making as endothermic. A significant proportion of candidates contradicted themselves within their answers and therefore did not gain credit.

Question 18 (c) (i), (ii) and (iii)

(c) (i) Methanol is another biofuel that can be used in combustion reactions.

$CH_3OH + 2O_2 \rightarrow CO_2 + 2H_2O$

Look at the table. It shows some bond energies.

Bond	**Bond energy (kJ/mol)**
C−H	413
O=O	498
C−O	358
C=O	805
O−H	464

Calculate the energy transferred to break all the bonds in the reactants.

Energy transferred = ... kJ/mol **[2]**

(ii) Calculate the energy transferred when all the bonds form in the products.

Energy transferred = ... kJ/mol **[2]**

(iii) Use your answers to parts **(i)** and **(ii)** to calculate the energy change for this reaction.

Energy change = ... kJ/mol **[1]**

If candidates did not obtain the correct answers to parts (i) and/or (ii), examiners looked to award 'error carried forward' in part (iii). A common error was for candidates to subtract the smaller of their answers in parts (i) and (ii) from the larger, rather than appreciating that the energy change is calculated by 'energy transferred breaking bonds - energy transferred making bonds'.

In part (i) the most common error was to omit the C-O bond energy from the calculation.

In part (ii) the most common error was to use 2 x 358 (i.e. twice the C-O bond energy) rather than 2 x 805 (i.e. twice the C=O bond energy).

Question 19 (a) (i)

19 Metal elements and non-metal elements have different physical properties.

The table shows the physical properties of some elements.

Element	Melting point (°C)	Density (g/cm^3)	Electrical conductivity	Thermal conductivity	Cost
A	high	high	good	good	high
B	low	low	good	poor	high
C	high	low	good	good	low
D	high	high	poor	poor	low

(a) **(i)** Which element, **A**, **B**, **C** or **D**, would be best to use for cables in overhead pylons to transfer electricity?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

Explain your answer.

....

....

.... **[2]**

Element C was usually correctly identified. When candidates did not gain the second mark it was usually because they omitted to refer low density being an important property. Lower ability candidates tended to use imprecise terminology, e.g. 'good conductor' rather than 'good **electrical** conductor' or 'light' instead of 'low density'.

Question 19 (a) (ii)

(ii) What is meant by **physical** property?

....

.... **[1]**

Good responses to this question described a physical property as a feature that can be observed or measured. Credit was also given for a specific example of a physical property, e.g. melting/boiling point or state of matter.

Question 19 (b)

(b) Element **C** burns in oxygen to make white clouds of its oxide.

Describe how you could test the oxide to find out if the element is a metal.

....

....

....

.... **[3]**

Good responses to this question described the idea of making a solution of the oxide, testing the pH and obtaining a pH greater than 7 (or universal indicator/ damp red litmus paper turning blue).

Examiners saw a wide range of incorrect responses including:

- addition of acid, followed by testing for hydrogen gas
- flame test
- electrolysis
- testing electrical conductivity.

Question 19 (c) (i)

(c) (i) Chlorine is a non-metal.

Chlorine has two common **isotopes**.

Look at the information about the common isotopes of chlorine.

35 **Cl** 17	37 **Cl** 17

Complete the table to show the atomic structure for each isotope of chlorine.

Isotope	Number of protons	Number of neutrons	Number of electrons
Chlorine-35	....	....	....
Chlorine-37	....	....	....

[2]

Most candidates were able to correctly deduce the numbers of sub-atomic particles in these two isotopes of chlorine.

Question 19 (c) (ii)

(ii) Chlorine gas, Cl_2, reacts with barium, Ba.

Barium chloride, $BaCl_2$, is made.

Write a **balanced half** equation for **chlorine** in this reaction.

.... **[1]**

Lower ability candidates often gave the reverse equation, i.e. $2Cl^- \rightarrow Cl_2 + 2e^-$.

Other common errors included equations with the following incorrect species: Cl_2^-, Cl^+ or Cl_2^+.

Question 19 (c) (iii)

(iii) Barium chloride solution reacts with sodium sulfate solution, Na_2SO_4.

A white precipitate of barium sulfate, $BaSO_4$, is made.

Write a **balanced ionic** equation to show the formation of barium sulfate.

Include state symbols.

.... **[2]**

Many candidates wrote a balanced **symbol** equation for this reaction rather than a balanced **ionic** equation. Another common error was to omit the state symbols.

Question 20 (a) (i)

20 A teacher investigates neutralisation. She uses hydrochloric acid, HCl, and sodium hydroxide, NaOH.

$HCl + NaOH \rightarrow NaCl + H_2O$

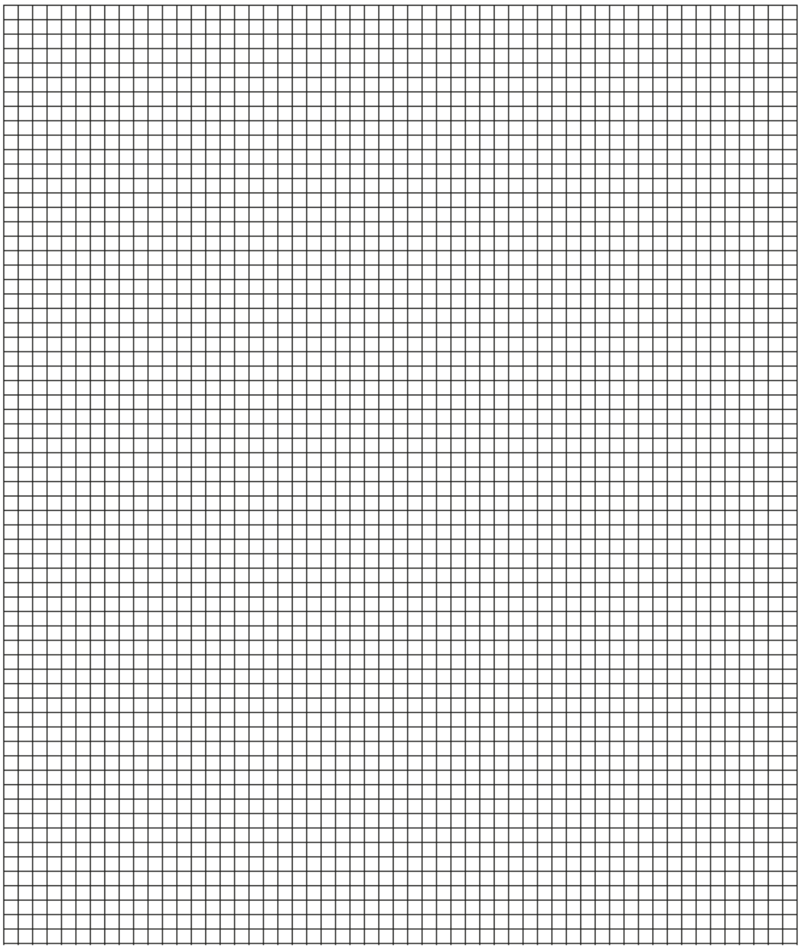
She slowly adds 1.0 cm^3 portions of the hydrochloric acid to 20.0 cm^3 of 1.0 mol/dm^3 sodium hydroxide.

She records the pH until she has added an excess of acid.

Look at her results.

Volume of hydrochloric acid added (cm^3)	pH
0	12.0
1	11.8
2	11.6
3	11.4
4	11.2
5	7.0
6	3.0
7	2.8
8	2.5
9	2.3
10	2.3

(a) (i) Plot a graph of the pH value against the amount of hydrochloric acid added and draw a line of best fit.



[3]

To gain 3 marks on this question candidates were required to:

- correctly label both the x-axis and y-axis
- plot all the points correctly
- draw a line of best fit.

When candidates did not gain full marks it was usually because they omitted the units (cm^3) on the x-axis or drew a straight line through the points.

Question 20 (a) (ii)

(ii) Use your graph to estimate the **volume of hydrochloric acid** when the pH is 10.

Volume of hydrochloric acid = ... cm^3 **[1]**

Most candidates gained this mark. Candidates who did not attempt to draw a line of best fit in part (i) did not gain marks for this question.

Question 20 (a) (iii)

(iii) What happens to the **concentration of hydroxide ions**, OH^-, as the hydrochloric acid is added to the sodium hydroxide?

.... **[1]**

Many candidates correctly deduced that the concentration of hydroxide ions decreases as the hydrochloric acid is added.

Question 20 (a) (iv)

(iv) Acidic solutions contain hydrogen ions, H^+. Alkaline solutions contain hydroxide ions, OH^-.

Write the **balanced ionic** equation for neutralisation.

.... **[1]**

Many candidates were able to write the balanced ionic equation for neutralisation.

Question 20 (b)

(b) Hydrochloric acid, HC*l* (aq), is a strong acid. Ethanoic acid, CH_3COOH (aq), is a weak acid.

Explain the difference between a strong and a weak acid.

....

....

.... **[2]**

Higher ability candidates gave a clear, concise answer to this question stating that strong acids are fully ionised / completely dissociated (in aqueous solution), whereas weak acids are only partially ionised / not completely dissociated. Candidates who tried to expand on the idea of complete / partial ionisation often showed confusion as to what this meant, relating it to H^+ concentration or the number of H^+ lost from the acid. Lower ability candidates often simply referred to pH.

?	**Misconception**	'Strong acids are <u>**almost**</u> fully ionised' was a common misconception.

Exemplar 1

• Strong acid, the H^+ ions fully dissociate / ionise
• Weak acid, the H^+ ions only partly dissociate / ionise
(reversable reaction) **[2]**

This response illustrates a concise response to this question, which was given both marks.

Exemplar 2

strong acids have a high concentration of H^+ ions
weak acids have a low concentration of H^+ ions.
strong acids are fully ionised in solution **[2]**
weak acids are partially ionised in solution.

This response, however, shows confusion and a contradiction in the candidate's understanding of what is meant by a strong and weak acid by relating it to H^+ concentration. This response scored 0 marks.

Question 20 (c) (i)

(c) **(i)** Nitric acid, HNO_3, is another strong acid.

Nitric acid has a pH of 2.

The teacher adds enough water to reduce the concentration of the nitric acid by a factor of 100.

Calculate the new pH of the nitric acid.

pH = ... **[2]**

High ability candidates correctly calculated the new pH as 4.

The most common error was 12, i.e. 2 + 10.

Question 20 (c) (ii)

(ii) Nitric acid, HNO_3, can also neutralise sodium hydroxide, NaOH.

Sodium nitrate, $NaNO_3$, and water are made.

Write a **balanced symbol** equation for this reaction.

.... **[1]**

Most candidates were able to write the balanced symbol equation for the neutralisation of sodium hydroxide by nitric acid.

Question 20 (c) (iii)

(iii) Describe how dry sodium nitrate crystals can be made using this reaction.

....

....

.... **[2]**

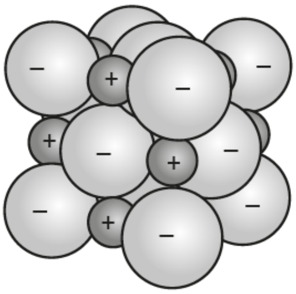
Good responses to this question appreciated that in order to produce **dry** crystals the water should be evaporated and then the solution cooled / left to dry in a warm place. Credit was not given for the idea of **boiling** the solution. Lower ability candidates tended to focus their response on how the reaction was carried out, rather than how **dry** crystals were made.

Question 21 (a) (i)

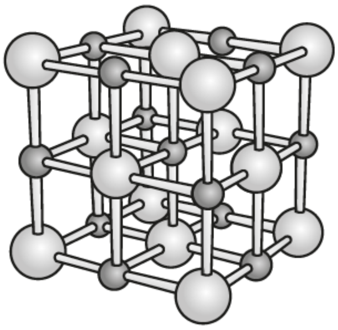
21 Sodium chloride, NaC*l*, is an ionic compound.

Sodium chloride forms a giant ionic lattice that can be represented using different models.

Look at the diagrams. They show two models of sodium chloride.



Space-filling model



Ball-and-stick model

(a) (i) A scientist thinks the ball-and-stick model should be used to model ionic compounds.

Describe **two limitations** of using the ball-and-stick model for ionic compounds.

....

....

.... **[2]**

Good responses to this question usually described that the ball-and-stick model does not show the charges on the ions and the idea that it shows the ions too far apart.

	AfL	Candidates should be encouraged to use precise terminology. In this question credit was given for the idea that the size of the atoms or ions is not accurate or the diagram doesn't show the relative size of the ions. Many candidates, however, simply wrote that the diagram doesn't show the size of the ions. Many candidates also did not seem to understand the word '**<u>limitations'</u>**.

Question 21 (a) (ii)

(ii) Ionic compounds can also be modelled using a dot-and-cross diagram.

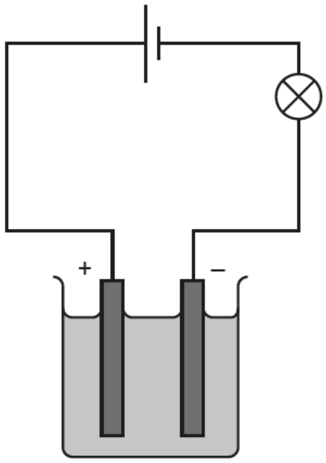
Draw a dot and cross diagram to show the ions in sodium chloride.

[2]

This question required candidates to draw a correct 'dot and cross' diagram, including the charges on the ions. Many excellent diagrams were seen by examiners. Others lost marks as the chloride ion was often drawn as 2.8 rather than 2.8.8. Lower ability candidates tended to draw diagrams showing the sharing of electrons.

Question 21 (b)

(b)* A student investigates the electrolysis of potassium bromide solution.



He notices that different products are formed at each electrode.

Explain the formation of the products during the electrolysis of potassium bromide solution.

....

....

.... **[6]**

This 6-mark, Level of Response, question assessed AO1, AO2 and AO3. At Level 3 (5 - 6 marks) candidates needed to analyse ideas about electrolysis to draw conclusions about the ions contained in potassium bromide solution and describe which ions move to each electrode. They also needed to explain the formation of the products (hydrogen at the cathode and bromine at the anode), including balanced half equations. Some of the responses were excellent, with clear explanations of the products formed at each electrode. The answers of lower ability candidates described the formation of the products in the electrolysis of molten, rather than aqueous, potassium bromide. Where candidates scored Level 2, rather than Level 3, it was usually because they omitted to include balanced half equations in their answer.

Exemplar 3

Because it is a solution, there are H^+ ions and OH^- ions present as well as K^+ and Br^- ions. At the anode which is positive, negative anions (Br^- and OH^-) are attracted but since Br^- is a halide ion, it is discharged and OH^- remains in the solution. $2Br^- \rightarrow Br_2 + 2e^-$, bromine gas is formed. At the cathode which is negative, positive cations (H^+ and K^+) are attracted but only hydrogen is discharged because potassium is more reactive than hydrogen so it remains in the solution. So at the cathode : $2H^+ + 2e^- \rightarrow H_2$ hydrogen gas is formed.

This is a Level 3 (6 mark) response, which has correctly identified the ions contained in potassium bromide solution and described which ions move to each electrode. The candidate has explained the formation of the products (hydrogen at the cathode and bromine at the anode), including balanced half equations.

Question 22 (a) (i)

22 Lead is most commonly extracted from an ore called galena, PbS.

(a) Extracting lead from the galena ore involves two steps.

Step **1**: The galena ore is roasted in air to produce lead oxide, PbO.

Step **2**: The lead oxide is heated in a blast furnace with carbon.

(i) The reaction in step **1** is an **exothermic** reaction.

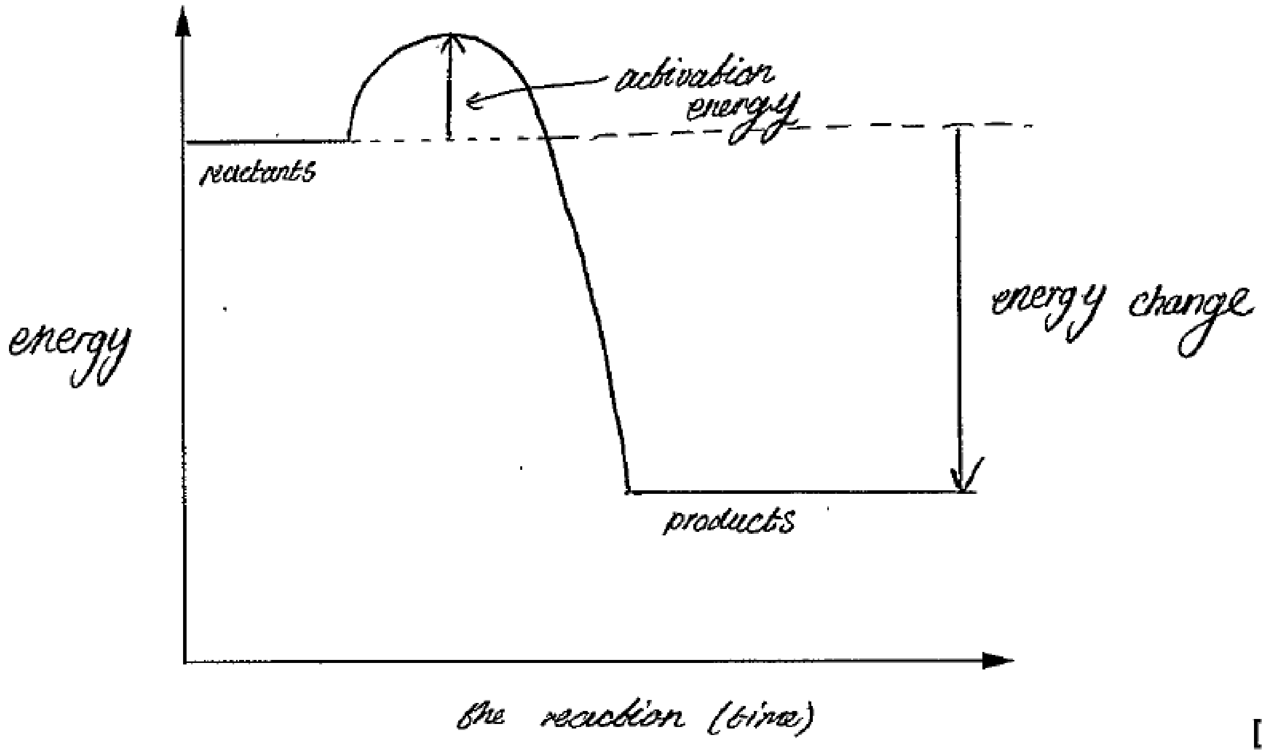
Draw a labelled reaction profile diagram for an exothermic reaction.

Label the **activation energy** and the **energy change** on your diagram.

[4]

Many candidates correctly labelled the reactants and products, with the products shown below the reactants. They also drew the correctly shaped curve. Candidates who did not gain full marks usually omitted the labels on the axes. Fewer candidates than on a similar question 2018 lost marks by indicating the energy change and the activation energy with either a double headed arrow or a line without any arrow.

Exemplar 4



[4]

This response illustrates a correctly drawn and labelled reaction profile. The candidate's response illustrates the comment that examiners only gave credit for correctly drawn single headed arrows, as is the correct convention for reaction profile diagrams.

Question 22 (a) (ii)

(ii) In step **2** the lead oxide is reduced by carbon.

$PbO + C \rightarrow Pb + CO$

Explain, in terms of electron transfer, why carbon is called a **reducing agent** in this reaction.

.... **[1]**

Good responses to this question described that carbon donates / gives / loses electrons. Lower ability candidates gave a response in terms of carbon removing oxygen, which did not address the question.

Question 22 (b) (i)

(b) **(i)** Solid lead reacts with nitric acid, HNO_3.

Lead nitrate, $Pb(NO_3)_2$, nitrogen oxide, NO, and water are made.

Write a **balanced symbol** equation for this reaction.

.... **[2]**

Higher ability candidates were able to write the correct balanced symbol equation for the reaction of lead with nitric acid. One mark was given for the correct reactants and products and 1 mark for the correct balancing. The balancing mark was dependent on the correct formulae, but 1 mark was allowed for a balanced equation with a minor error in subscripts or formulae. Most candidates gained 1 mark for the correct reactants and products but were unable to correctly balance the equation.

Question 22 (b) (ii)

(ii) How many moles of lead nitrate would be produced if 20.7 g of lead reacts with nitric acid?

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

Moles of lead nitrate = ... **[4]**

Higher ability candidates scored 4 marks on this question. 'Error carried forward' was allowed from the candidate's symbol equation in part (i). It is worth centres stressing to candidates that if they are asked to give their answer to a specific number of significant figures, they can only gain full marks by doing so.

Exemplar 5

M_r of lead = 207.2

$\frac{20.7}{207.2}$ = 0.099... mol

Moles of lead = Moles of lead nitrate ~~= 3~~ = 0.0999 mol

Moles of lead nitrate = ~~0.0999~~ 0.10 ~~0.0~~ **[4]**

This response illustrates a clearly set out calculation response, which is easy for the examiner to follow. When candidates write numbers at random in the answer space it is difficult for the examiner to seek out credit-worthy points and/or give marks for errors carried forward.

Supporting you

For further details of this qualification please visit the subject webpage.

Review of results

If any of your students' results are not as expected, you may wish to consider one of our review of results services. For full information about the options available visit the OCR website. If university places are at stake you may wish to consider priority service 2 reviews of marking which have an earlier deadline to ensure your reviews are processed in time for university applications.

activeresults

Review students' exam performance with our free online results analysis tool. Available for GCSE, A Level and Cambridge Nationals.

It allows you to:

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

*To find out which reports are available for a specific subject, please visit ocr.org.uk/administration/support-and-tools/active-results/

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The small print

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