Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

GATEWAY SCIENCE CHEMISTRY A

J248

For first teaching in 2016

J248/02 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 2 series overview

J248/02 is the second of two foundation tier papers for Chemistry A (Gateway Science). It assesses topics C4-C7, and assumes some knowledge of topics C1-C3.

The overall standard was similar to that in the 2022 examination and there was no evidence that candidates were short of time. However, as last year, examiners were worried by a significant number of candidates who failed to attempt questions which required more than a one word answer. In previous years even the lowest scoring candidates have been willing to tackle questions which they see as difficult, and consequently have picked up useful marks for showing even partial understanding. This trend was especially marked with lower scoring candidates, who were also missing out multiple choice questions in some instances.

The examination is a time of considerable stress, and it is easy to misunderstand precisely what the question is asking. It is always a good strategy to underline key words in the command line(s) of the question.

Hopefully, centres will be able to support candidates to have more confidence in their knowledge in the next series by using resources that are available on ExamBuilder and Teach Cambridge. For example, the candidate exemplars may be able to show how even 1 or 2 marks on longer response questions can make all the difference. The multiple choice topic quizzes could also be used to help train candidates to eliminate the obviously incorrect responses to improve chances of success.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• identified the key words in each question part • realised that information which they recalled might not always quite fit the demands of the question, and so were prepared to modify their response in the light of this • could decide which information might be significant and which not, especially in tables • in calculation questions, showed their working. Many candidates get the answers to calculations wrong, and their working is their only way of gaining credit. Candidates are not penalised for incorrect working.	• left questions, including multiple choice questions, blank, guaranteeing a mark of 0 • had difficulty in basic mathematical manipulations • gave explanations which, while relevant to the question, lacked sufficient detail, e.g. 'pollution' or 'harmful'.

Section A overview

Section A is made up of objective questions, and almost all candidates very sensibly attempted all the questions.

Question 1

1 A student does a flame test with a sample of potassium chloride.

Which colour is the flame?

A Lilac

B Green-blue

C Red

D Yellow

Your answer ☐ **[1]**

This question was well answered, with the most common alternative being B, Green-blue.

Question 2

2 What is the test for chlorine gas?

A Damp universal indicator paper turns red then white

B Decolourises bromine water

C Limewater turns milky

D Relights a glowing splint

Your answer ☐ **[1]**

High scoring candidates recognised the test for chlorine gas.

Question 3

3 Why do marble chips react faster with **warm** hydrochloric acid than with cold hydrochloric acid?

A The warm hydrochloric acid acts as a catalyst.

B The warm hydrochloric acid has more crowded particles.

C The warm hydrochloric acid has particles with more energy.

D The warm hydrochloric acid has particles that move slower.

Your answer ☐ **[1]**

Nearly two-thirds of candidates gained this mark. That particles had more energy when warm was well understood.

Question 4

4 Which conditions are needed for the rusting of iron to happen?

A Air and no water

B Air and oil

C Air and salt

D Air and water

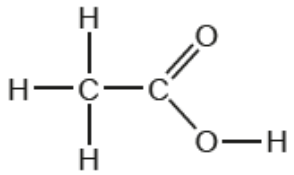
Your answer ☐ **[1]**

Almost all candidates knew that both air and water are necessary.

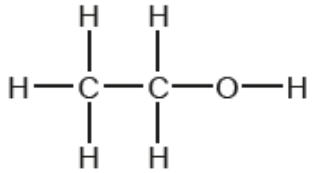
Question 5

5 What is the displayed formula of **ethanol**?

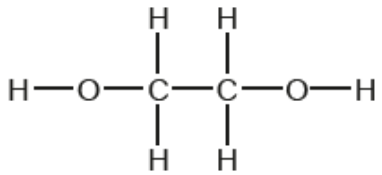
A



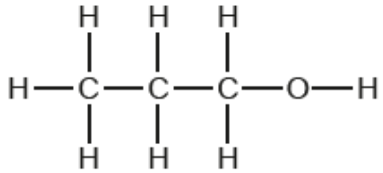
B



C



D



Your answer ☐ **[1]**

The formula for ethanol was recognised by half the candidates, with D being the most common alternative.

Question 6

6 Tap water is treated to make it safe to drink.

Which substance is added to the tap water to kill bacteria and microbes?

A Aluminium sulfate

B Carbon dioxide

C Chlorine

D Iodine

Your answer ☐ **[1]**

A good majority of candidates knew that chlorine is used to treat tap water.

Question 7

7 Methane is a hydrocarbon.

Which substance **cannot** be produced when methane burns in air?

A Carbon

B Carbon dioxide

C Hydrogen

D Water

Your answer ☐ **[1]**

The vast majority of candidates assumed that water was the substance that cannot be produced during combustion.

Assessment for learning

Remember that the first line of questions like these usually contains a very important clue, in this case that methane is a hydrocarbon. If candidates highlight or mark any important facts in the introductory line it helps focus on what the question is asking.

Question 8

8 Brass is an alloy used to make musical instruments.

What are the main metals in brass?

A Aluminium and copper

B Copper and tin

C Copper and zinc

D Lead and tin

Your answer ☐ **[1]**

A and B were the most popular choices, in roughly equal numbers.

Question 9

9 What was the main gas in the Earth's early atmosphere?

A Ammonia

B Carbon dioxide

C Nitrogen

D Oxygen

Your answer ☐ **[1]**

A and C were the most popular choices.

Question 10

10 Bromine reacts with sodium iodide.

What is the **balanced symbol** equation for the reaction?

A $Br + NaI \rightarrow NaBr + I$

B $Br_2 + NaI \rightarrow NaBr + I_2$

C $Br_2 + 2NaI \rightarrow 2NaBr + I_2$

D $Br_2 + NaI_2 \rightarrow NaBr_2 + I_2$

Your answer ☐ **[1]**

High scoring candidates correctly chose option C, with B the second most popular choice.

Question 11

11 Ammonia is made in the Haber process.

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

What happens when this reaction reaches equilibrium?

A The backward reaction happens at a faster rate than the forward reaction.

B The forward and backward reactions happen at the same rate.

C The forward and backward reactions stop happening.

D The forward reaction happens at a faster rate than the backwards reaction.

Your answer ☐ **[1]**

High scoring candidates knew that the forward and backward rates are the same, with option C being second most popular.

Question 12

12 Iron objects can be protected from rusting by coating them with a layer of zinc.

What is this process called?

A Galvanising

B Insulating

C Oxidation

D Reduction

Your answer ☐ **[1]**

Galvanising was recognised by most candidates. A good two-thirds of candidates successfully answered this question.

Question 13

13 Calcium carbonate, $CaCO_3$, thermally decomposes to make calcium oxide, CaO, and carbon dioxide.

$CaCO_3 \rightarrow CaO + CO_2$

5.0 g of calcium carbonate makes 2.8 g of calcium oxide.

How much carbon dioxide is made?

A 2.2 g

B 2.8 g

C 4.4 g

D 7.8 g

Your answer ☐ **[1]**

Most candidates showed clear appreciation of conservation of matter and scored well on this question.

Question 14

14 Crude oil is a resource that is being made extremely slowly.

Which word describes a resource that is being made extremely slowly?

A Finite

B Hydrocarbon

C Non-renewable

D Petrochemical

Your answer ☐ **[1]**

Answers were almost evenly split between A, C and D.

Question 15

15 The Group 7 element fluorine is a gas at room temperature and pressure.

The Group 7 elements show a trend in boiling points going down the group.

Which row shows the boiling points of the Group 7 elements?

	Boiling Point (°C)			
	Fluorine	**Chlorine**	**Bromine**	**Iodine**
A	–188	59	184	–15
B	–188	–34	59	184
C	188	184	59	–15
D	–15	184	188	59

Your answer ☐ **[1]**

High scoring candidates often, but by no means always, chose the correct option, B. A lot of candidates went for the reverse pattern, C.

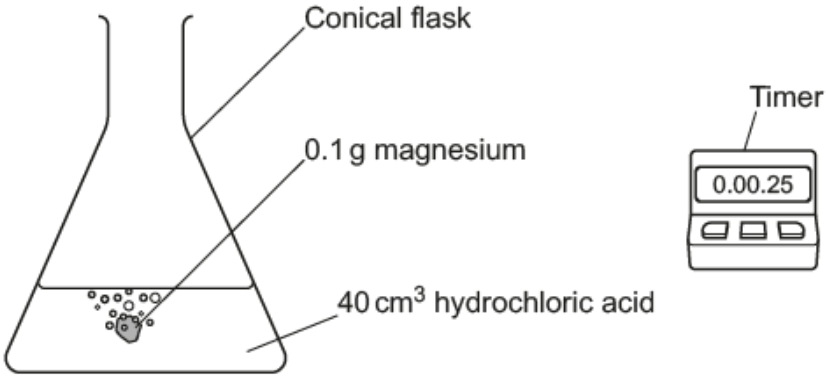
Section B overview

Section B contains a mixture of objective style questions and those requiring a longer response.

Question 16 (a)

16 A teacher investigates the reaction between hydrochloric acid and magnesium.

The diagram shows the teacher's experiment.



- The teacher uses five different concentrations of hydrochloric acid.
- Each time they react the hydrochloric acid with 0.1 g of magnesium ribbon.
- They repeat the experiment with 0.1 g of magnesium powder.

The table shows the teacher's results.

	Time for magnesium to react (s)	
Concentration of hydrochloric acid (mol/dm^3)	**Magnesium ribbon**	**Magnesium powder**
0.5	201	117
1.0	158	89
1.5	77	48
2.0	51	24
2.5	37	16

(a) The teacher says that the reaction is faster with magnesium powder than with magnesium ribbon.

Use the results to explain why the teacher is **correct**.

.....

.....

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

Many candidates successfully discussed differences in times, and high scoring candidates went on to link these differences to particular concentrations of acid to gain the second mark.

Some responses missed the instruction to 'use the results', and instead discussed the effect of surface area on rate without making any reference to the times, or described how the increase in concentration of acid affected reaction times without referring to the ribbon and the powder.

Low scoring candidates often showed their understanding of the question but unfortunately their responses did not take their explanation any further than the information given in the question itself. For example, writing 'the table shows the powder is faster' rather than showing how the table does this.

Assessment for learning

Try to say more than the question is already telling you. The question itself will give you a clue of how to do it.

Question 16 (b) (i)

(b) (i) Describe how the rate of reaction changes when the concentration of the hydrochloric acid **increases**.

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

A significant number of candidates did not attempt this part. High and medium scoring candidates realised that the rate would increase, but a significant minority appeared to confuse rate with time and suggested it would decrease.

Misconception

Candidates often suggested that an increase in rate was caused by an increase in time.

Question 16 (b) (ii)

(ii) Explain your answer to **(i)** using ideas about particles.

.....

.....

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

Most candidates appreciated that there would be more particles in the same space, gaining the first mark. However, arguing that this would lead to more collisions was not enough to gain the second mark. Higher scoring candidates discussed the effect on collision frequency.

There was a significant number who argued that the increase in concentration would mean the particles moved faster and had more energy, and another group who suggested that increased concentration would slow the reaction down.

A small group assumed that higher concentrations slowed reactions, either because there were more particles to react or because they became more crowded so couldn't move around as easily.

Misconception

Increase in concentration does NOT affect particle speed. The only factor which affects particle speed is temperature.

Misconception

Increasing the number of collisions is an insufficient explanation of an increase in rate, it should be increased chance/frequency of collision.

Question 16 (c)

(c) The teacher used 0.1 g of magnesium.

0.1 g of magnesium reacts with hydrochloric acid to make 0.008 g of hydrogen gas.

A student suggests that the rate of reaction could be investigated by measuring the loss in mass during the reaction.

Suggest why this method would **not** work well.

.....

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

While this question was found to be very challenging, and few candidates realised that it would be difficult to measure such a small mass change, all the responses showed thought on the part of candidates.

Most candidates appeared to visualise the problem as how to weigh the gas evolved rather than how to measure the change in mass during the reaction, so there were often suggestions along the lines of 'you can't catch all the gas'.

Other responses showed more basic misunderstandings such as 'you can't use mass to find rate' or 'we only know the mass loss, not the time it took'.

General responses such as 'it won't be accurate' did not gain credit as examiners were looking for the reason the inaccuracy might be there.

Question 16 (d)

(d) Describe the test for hydrogen gas.

.....

.....

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

Most candidates had clearly experienced the test for hydrogen and were able to discuss the 'squeaky pop test'. The most common alternatives were 'relights a glowing splint', 'use litmus', 'turns limewater milky', and 'flame test'.

Question 16 (e)

(e) In another experiment, the teacher reacts 0.1 g of zinc with excess hydrochloric acid.

$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$

Calculate the **mass** of hydrogen gas made.

Relative atomic mass (A_r): H = 1.0 Zn = 65.4

Mass of hydrogen gas = ... g **[3]**

This question proved to be tricky for many, though most candidates were prepared to show their working and so examiners could give them credit for at least calculating the relative molar mass of hydrogen.

Question 17 (a)

17 The table shows information about the physical properties of four elements, **W**, **X**, **Y** and **Z**.

	W	**X**	**Y**	**Z**
Density (g/cm^3)	0.97	7.87	0.003	1.74
Melting point (°C)	98	1538	–102	650
Conducts electricity?	✓	✓	✗	✓

(a) Which element is a non-metal?

Give a reason for your answer.

Element .....

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

Almost all candidates identified Y as the non-metal for the first mark, and well over half of them gave electrical conductivity as the most appropriate reason. Candidates who gained 1 mark often listed all properties for Y, rather than selecting the relevant one.

Question 17 (b)

(b) One of the elements is sodium in Group 1.

Which element is sodium?

Give a reason for your answer.

Element .....

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

This was slightly less well answered with some candidates suggesting Y for both parts.

Question 17 (c) (i)

(c) One of the elements is a transition metal.

(i) Compare the physical and chemical properties of Group 1 metals and transition metals. Use the information in the table, and your own knowledge.

.....

.....

.....

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

A large number of candidates did not attempt this question, so were unable to gain any marks.

The question asked candidates to compare, so it was essential that they discussed both transition metals as well as Group 1. Many suggested that Group 1 metals have higher boiling points and don't conduct electricity.

Question 17 (c) (ii)

(ii) Transition metals can be used as catalysts.

What is meant by a catalyst?

.....

.....

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

Most candidates knew that catalysts speed up reactions, and higher scoring candidates went on to say that they are not used up.

Assessment for learning

There are almost always 2 marks available for a catalyst definition, one for 'speeds up the reaction' and the other for 'and are not used up/are recoverable'.

Question 17 (d)

(d) Iron is a transition metal.

The list shows the reactivity series of some metals. The element carbon is also included.

Sodium
Calcium
Magnesium
Carbon
Zinc
Iron
Copper

Most reactive

Least reactive

Iron can be extracted from the compound iron oxide.

How is iron extracted from iron oxide? Explain your answer.
Use the information in the list.

.....

.....

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

Candidates very sensibly took their cue from the question and discussed reactivity, but the actual use of carbon was not widely known. A sizeable minority of candidates discussed electrolysis.

Question 17 (e) (i)

(e) Iron reacts with dilute sulfuric acid, H_2SO_4.

Iron sulfate, $FeSO_4$, and hydrogen gas, H_2, are made.

(i) Write the **balanced symbol** equation for this reaction.

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

This part was answered well, with both high scoring and medium scoring candidates understanding how to write a simple equation.

Question 17 (e) (ii)

(ii) A student reacts 2.8 g of iron with dilute sulfuric acid.

The student makes 5.4 g of iron sulfate.

They predicted that they should have made 7.6 g of iron sulfate.

Calculate their **percentage yield**.

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

Percentage yield of iron sulfate = ... % **[3]**

Answers to this question showed an unusual distribution. Candidates either scored all 3 marks, or appeared to get totally confused over what to do, though still picked up 1 mark for the number of decimal places in their answer.

Question 18 (a)

18 Propane, C_3H_8, is an alkane.

Propane undergoes complete combustion in oxygen. Carbon dioxide and water are made.

(a) Write the **balanced symbol** equation for the complete combustion of propane.

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

Many candidates gained the first mark by using the correct formulae, and the highest scoring candidates went on to balance the equation correctly. One of the more common formula mistakes was to use atomic oxygen.

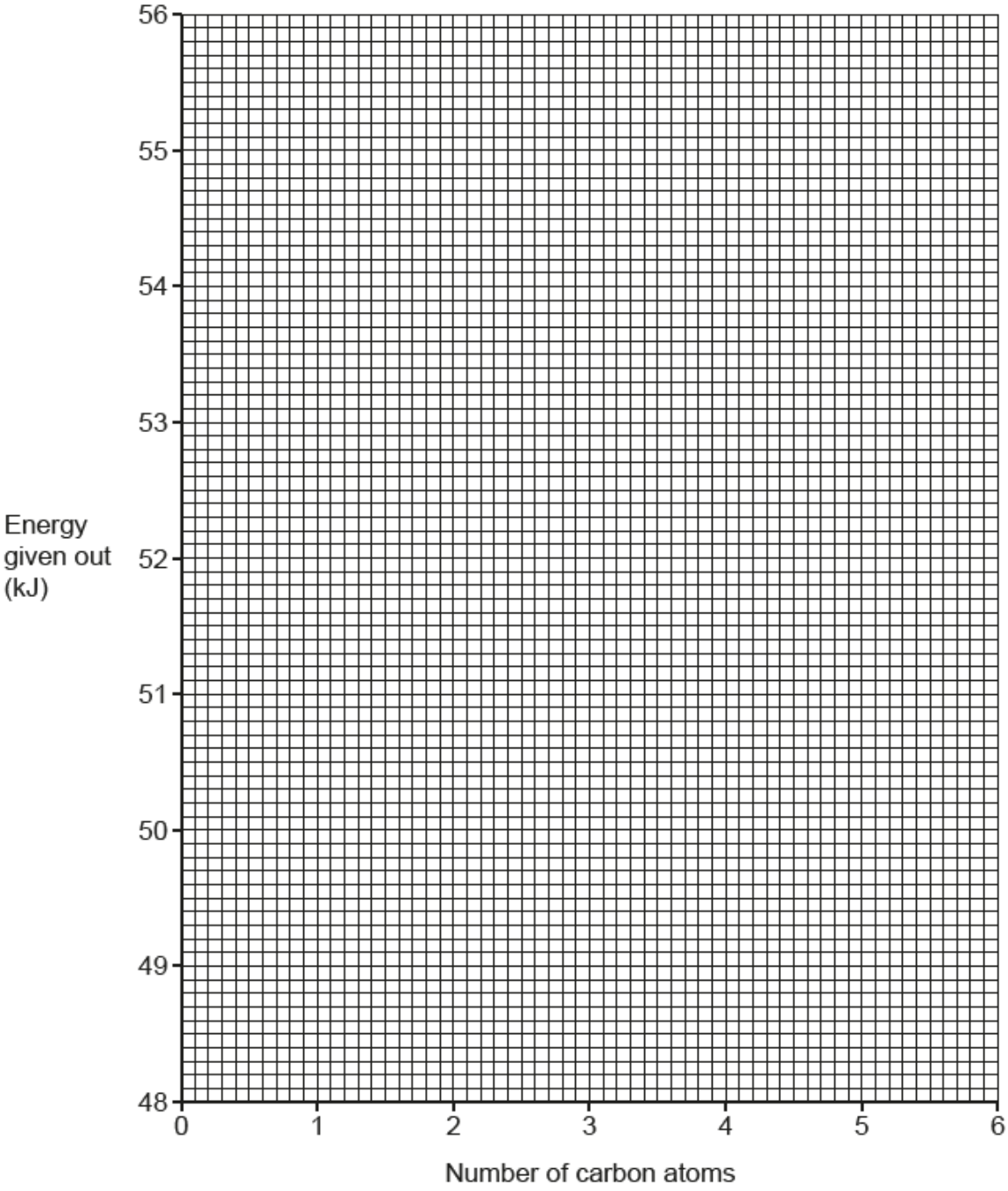
Question 18 (b) (i), (ii) & (iii)

(b) The table shows the energy given out when 1 g of different alkanes burn.

Alkane	Number of carbon atoms	Energy given out (kJ)
methane	1	55.6
ethane	2	52.6
propane	3	50.4
butane	4	
pentane	5	48.7
hexane	6	48.4

(i) Plot a graph of the data from the table. **[2]**

(ii) Draw a curve of best fit on your graph. **[1]**



(iii) The energy given out when 1 g of butane burns is missing from the table.

Use the graph to estimate the energy given out by butane.

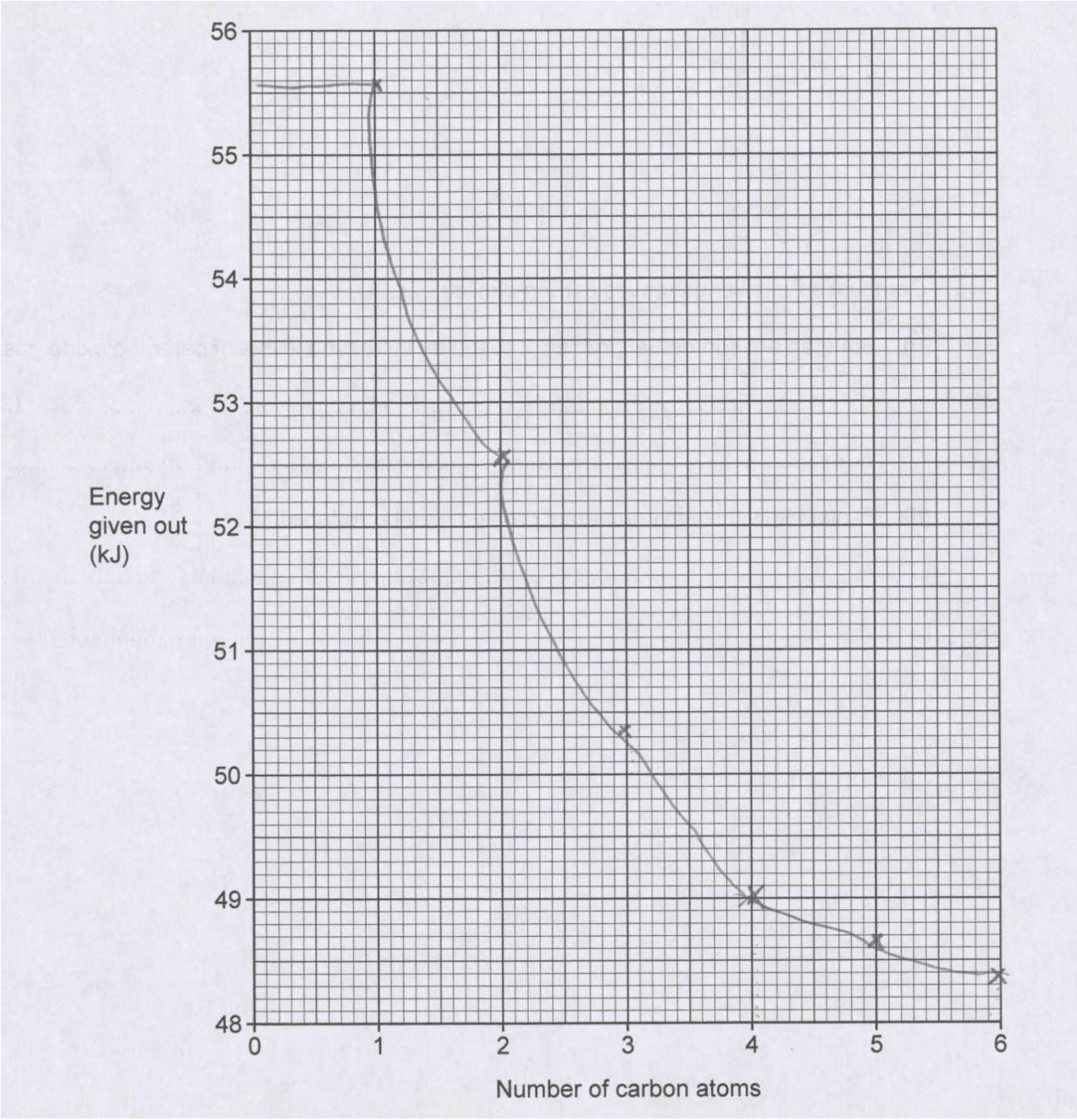
Energy given out by butane = ... kJ **[1]**

The points on the graph were accurately plotted, any mistakes usually being by exactly half a kilojoule.

Good curves of best fit were drawn, with most going through all the points and avoiding the corners of the graph paper. The curve was challenging freehand, especially for left-handed candidates, so allowance was made for wavy lines that followed the points. As usual, lines drawn from point to point with a ruler did not gain credit.

The estimates were almost universally accurate.

Exemplar 1



Some candidates got both marks for accurately plotting the points but were uncertain of what to do at the ends of the graph. In this case it is also one of the few graphs where the rest of the line is not drawn well.

OCR support

Our candidate exemplars are really useful resources for teacher development but also for supporting students. For example, this one from the Maths series (June 2022) indicates how different responses for a graph question gained their marks.

Question 18 (b) (iv)

(iv) What name is given to the type of reaction that **gives out energy**?

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

A large number of candidates knew that this was an exothermic reaction, with a few suggesting endothermic. A small minority appeared not to have come across either term.

Question 18 (c)

(c) Complete the **displayed formula** of propane, C_3H_8.

[1]

Examiners were pleased to see that most candidates drew the formula correctly; well over two-thirds of candidates.

Question 18 (d) (i)

(d) Combustion of alkanes makes carbon dioxide gas.

(i) State an environmental problem caused by increased levels of carbon dioxide gas.

.....

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

The greenhouse effect/global warming was well known by all but the lowest scoring candidates, with candidates either naming it or describing problems resulting from it. Those who did not get credit usually talked about the ozone layer or 'air pollution' in general.

Question 18 (d) (ii)

(ii) Explain how this environmental problem can be reduced.

.....

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

This part was less well answered. A significant number of candidates suggested decreasing the use of carbon dioxide, indicating some level of confusion over what was happening.

Exemplar 2

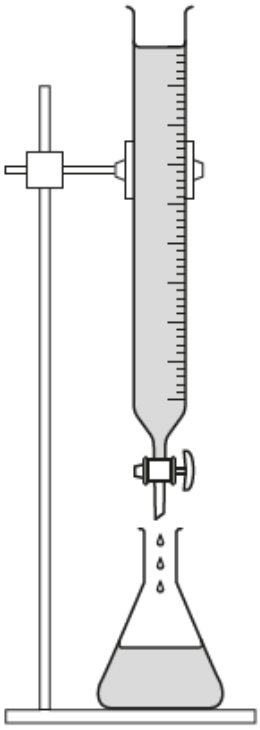
Plastic needs to be stopped being chucked into landfill and the oceans

Here the candidate has picked up on the words 'environmental problem' but unfortunately has lost the thread of the question so is discussing the wrong problem.

Question 19 (a)

19 A student plans a titration experiment.

The diagram shows some of the apparatus they use.



(a) The student writes their method.

A Add a few drops of methyl orange indicator.

B Fill the burette with dilute hydrochloric acid. Record the initial reading on the burette.

C Empty the sodium hydroxide solution from the pipette into a conical flask.

D Stop adding the dilute hydrochloric acid when the indicator just changes colour.

E Repeat these steps until you have two concordant results.

F Use a pipette filler to fill a glass pipette with 25.0 cm^3 of sodium hydroxide solution.

G Add the dilute hydrochloric acid to the sodium hydroxide solution while swirling the conical flask.

The steps in the method are **not** in the correct order.

Write the letters in the boxes to show the correct order of the steps. The first and last steps have been filled in for you.

B						E

[4]

High scoring candidates were able to sequence all five stages correctly, and many got three in a correct sequence. One of the main stumbling blocks came at stage A, when to add the indicator.

Question 19 (b) (ii)

(ii) Water is a waste product in this reaction.

Calculate the **atom economy** for the reaction.

Relative atomic mass (A_r): H = 1.0 O = 16.0 Na = 23.0 C*l* = 35.5

Atom economy = ... % **[3]**

Most candidates seemed uncertain how to approach this calculation. Examiners were often able to award credit for working out suitable relative molar masses even if the rest of the calculation was flawed.

Question 20 (a)

20 Crude oil is separated into different fractions by fractional distillation.

Table 20.1 shows information about three of the molecules that are found in three different fractions.

Table 20.1

Molecule	Formula	Boiling point (°C)
nonane	C_9H_{20}	151
heptadecane	$C_{17}H_{36}$	302
octacosane	$C_{28}H_{58}$	436

(a) Which of these three molecules would be separated **highest** up the fractionating column?

Explain your answer using ideas about molecular size and boiling point.

Molecule .....

Reason .....

.....

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

The most common suggestion was octacosane, accompanied by the statement that boiling point increases as you go up the column. Such candidates were still able to gain some credit for linking boiling point to molecular size.

Question 20 (b) (i)

(b) Cracking breaks down large molecules produced in fractional distillation into more useful molecules.

The equation shows the cracking of octacosane.

$$C_{28}H_{58} \longrightarrow C_{12}H_{26} + 8C_2H_4$$

octacosane dodecane molecule **X**

(i) State the name of molecule **X**, C_2H_4.

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

Very few candidates could name molecule X as ethene. Ethane was probably the most popular answer, which included a lot of wild guesses.

One of the more frequent suggestions was 'carbon hydroxide'.

Question 20 (b) (ii)

(ii) Molecule **X** has the general formula C_nH_{2n}.

Octacosane and dodecane are both alkanes and have a different general formula.

State the general formula of the alkanes.

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

While the concept of a general formula was something that most had great difficulty with, high scoring candidates were able to distinguish themselves.

Question 20 (c) (i)

(c) **Table 20.2** shows the percentage supply and percentage demand for some of the different fractions obtained from crude oil.

Table 20.2

Fraction	Percentage supply (%)	Percentage demand (%)
LPG	2	4
petrol	5	23
naphtha	8	
kerosene	12	7
diesel oil	17	23
fuel oil	56	38

(i) Calculate the percentage demand for naphtha.

Percentage demand for naphtha = ... % **[1]**

A significant number of candidates did not attempt this question and, of those who did, few appreciated that the percentages should have added up to 100%.

Assessment for learning

Lists of percentages often add up to 100.

Question 20 (c) (ii)

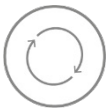
(ii) Suggest why fuel oil, rather than diesel oil, is cracked to obtain petrol.

.....

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

Many candidates saw that fuel oil was in greatest supply, and the most successful realised that the crucial factor was that, in this case, the supply was greater than the demand. Almost no candidates identified the unsatisfied demand for diesel as a reason why diesel is not cracked to petrol.

Assessment for learning



The numbers in a table are never meaningless. If you can spot what the table is trying to tell you, you've cracked it!

Question 21*

21* A life-cycle assessment looks at the potential environmental impact at each stage of the life of a product.

Cat food is sold in plastic packets or metal cans.

The table shows information about these two containers.

	Plastic packet	Metal can
Raw Materials	Crude oil	Aluminium ore
Manufacture	Fractional distillation Cracking Polymerisation	Aluminium ore is mined Aluminium is extracted by electrolysis
Using the product	Usually single use	Usually single use but easily repurposed or upcycled
Disposal of the product	Harder to recycle Not biodegradable so takes up space in landfill 90% energy saved by recycling	Easier to recycle Not biodegradable so takes up space in landfill 95% energy saved by recycling

Evaluate which type of container has the smallest environmental impact over its lifetime.
Use the information in the table, and your own scientific knowledge.

.....

.....

.....

.....

.....

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

Candidates responded well to this question and often summarised the table quite articulately. Those who added their own scientific knowledge to their arguments often went on to score Level 3.

While the vast majority argued that the aluminium cans would be more environmentally friendly, a few candidates made a very clear case for the plastic packaging option. Often this was because they discussed the environmental impact of mining. Such candidates received full credit.

Exemplar 3

Overall the container that has the smallest enviour-mental impact is the metal can, as it does not use crude oil for it's raw materials. Aluminum are is more useful. The aluminum is extracted by electrolysis when manufactoring. It is usally singe used but easily repurposed or upcycled. Also when disoping the product 95% of energy is saved by recycling. It is also eaiser to recycle. Wheras, the plastic packet uses crude oil which is not healthy for the enviourment. It's also harder to recycle. less of the energy is saved by recycling (90%). **[6]**

This candidate has discussed most of the major sections of the table and given an excellent response. At present it is a very good Level 2, gaining 4 marks. Had the candidate added some of their own knowledge that is not in the table, it would have been a strong Level 3.

Question 22 (a) (i)

22 A student investigates two solutions, **A** and **B**.

They know that
- one solution contains a halide ion
- the other solution contains a different anion.

They test 2 cm^3 of each solution for the halide ion using this method:

- Add a few drops of dilute hydrochloric acid and shake.
- Add a few drops of silver nitrate solution.
- Record the colour of the precipitate.

(a) The teacher says that the student should have used a different acid instead of dilute hydrochloric acid.

(i) State the name of the acid the student should have used.

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

This question was common to the higher tier paper, and the first four parts were found to be very challenging, with high scoring candidates scoring only marginally better than everyone else. A large number of candidates did not attempt any of these first four parts.

Some of the more frequent answers to part (a) (i) were sulfuric acid, sodium chloride, sodium hydroxide, and even hydrochloric acid.

Question 22 (a) (ii)

(ii) Explain why using dilute hydrochloric acid would affect the results of this test.

.....

.....

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

Most candidates thought the dilution was the significant factor, others that it would affect the colour of the precipitate.

Question 22 (b)

(b) The student repeats the test for halide ions using the correct acid and silver nitrate solution.

They also test each solution using a few drops of dilute hydrochloric acid followed by a few drops of barium chloride solution.

The table shows their results.

Solution	Observation with silver nitrate solution	Observation with barium chloride solution
A	cream precipitate	no change
B	no change	white precipitate

State the name of the anion in each solution.

Solution **A** .....

Solution **B** ..... **[2]**

Few understood the term 'anion', and often gave a metal. Others suggested 'cream precipitate' and 'white precipitate'.

Question 22 (c)

(c) Solution **A** also contains copper ions, Cu^{2+}.

Copper ions react with hydroxide ions, OH^-, to make a precipitate of copper(II) hydroxide.

Write the **balanced ionic** equation for this reaction. Include the state symbols.

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

There were many brave suggestions, and candidates often saw that there would be two lots of OH^- in the formula of copper hydroxide, but no-one thought to use brackets to show this and so were unable to gain credit. There were some examples of CuO_2H_2.

Question 22 (d)

(d) Barium chloride solid is toxic if swallowed and harmful if inhaled.

Barium chloride solutions with concentrations of 21 g/dm^3 are suitable for experiments in school.

Calculate the mass of barium chloride that should be dissolved in 25 cm^3 of water to make a solution with a concentration of 21 g/dm^3.

Use the equation:

$$\text{concentration} = \frac{\text{mass}}{\text{volume}}$$

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

Mass of barium chloride = ... g **[3]**

While very few arrived at the correct answer, many candidates gained partial credit for their working.

Question 23 (a)

23 The table shows information about three different polymers, **A**, **B** and **C**.

Tensile strength is the amount of load a material can take before it breaks.

	Melting point (°C)	Softening temperature (°C)	Stiffness (MPa)	Tensile strength (MPa)
A	130	72	980	15
B	240	95	3200	65
C	250	75	2400	50

(a) A company wants to use a polymer to make a disposable cup for hot drinks.

Suggest and explain which polymer, **A**, **B or C**, the company should use.

Polymer .....

Reason .....

.....

.....

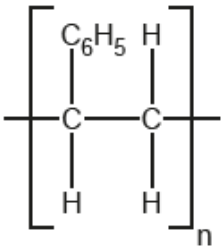
..... **[3]**

This question was common to the higher tier paper.

Part (a) was well answered, with higher scoring candidates discussing the property and linking it to the problem of this particular cup.

Question 23 (b)

(b) This is the repeating unit in polymer **B**.



Draw the structure of the **monomer** from which polymer **B** is made.

[2]

This part had the highest omit rate on the whole paper. While higher scoring candidates copied the repeating unit from the diagram, they were still unable to gain credit as they did not put in the double bond.

Question 23 (c)

(c) Some substances are naturally occurring polymers.

Draw lines to connect each **monomer** with its naturally occurring **polymer**.

Monomer	Polymer
amino acids	DNA
nucleotides	proteins
sugars	starch

[2]

This was very well answered by almost all candidates. The most common partially correct response was to link nucleotides to DNA, sugars to proteins, amino acids to starch.

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