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<td>23</td>
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</table>
Introduction

These exemplar answers have been chosen from the summer 2018 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but do illustrate how the mark scheme has been applied.

Please always refer to the specification https://www.ocr.org.uk/qualifications/gcse/gateway-science-suite-combined-science-a-j250-from-2016/ for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2018 Examiners’ report or Report to Centres available from Interchange https://interchange.ocr.org.uk/Home.mvc/ Index

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2019. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.
Question 2

Exemplar 1  

Which statement about catalysts is correct?  

A. A catalyst decreases the rate of many different reactions.  
B. A catalyst for one reaction will be the catalyst for many different reactions.  
C. A catalyst has no effect on the rate of the reaction.  
D. A catalyst usually increases the rate of a reaction.  

Your answer: [D]  

Examiner commentary  
A catalyst increases the rate of a reaction, correct response D. Mark is credited.  
A catalyst increases the rate of a reaction, response C is incorrect; response A is incorrect, an inhibitor decreases the rate of reaction.  
A catalyst is specific to a reaction or a very small number of reactions, response B is incorrect.

Question 3

Exemplar 1  

Look at the table.  

<table>
<thead>
<tr>
<th>State at room temperature</th>
<th>Electronic structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Gas</td>
</tr>
<tr>
<td>B</td>
<td>Gas</td>
</tr>
<tr>
<td>C</td>
<td>Liquid</td>
</tr>
<tr>
<td>D</td>
<td>Solid</td>
</tr>
</tbody>
</table>

Which row in the table has the correct information about chlorine?  

Your answer: [B]  

Examiner commentary  
Chlorine is a gas with electronic structure 2.8.7, response B is correct. Mark is not credited.  
Whilst many candidates knew the electronic structure of chlorine, many thought it to be a liquid.
9 The graph shows how the masses of three atmospheric pollutants have changed in one city since 1990.

The atmospheric pollutants are:

- Oxides of nitrogen, NO_x
- Ammonia, NH_3
- Sulfur dioxide, SO_2

In which year was 280 tonnes of oxides of nitrogen present in the atmosphere?

A 1990

B 2000

C 2005

D 2010

Your answer C

Examiner commentary

C is the correct response, mark is credited.

The candidate initially put A into the answer box, this has been deleted and replaced by C which is clearly the intended answer.

The candidate has also shown their working on the graph. Finding 280 tonnes on the vertical axis and finding the year when NOx has this value.

Response A shows 280 tonnes of ammonia in 1990.
11 A student investigates the rate of reaction between marble chips and hydrochloric acid. Both experiments use 50 cm$^3$ of hydrochloric acid and an excess of marble chips. He measures the total mass of carbon dioxide given off for different sizes of marble chips. Look at his results.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Total mass of carbon dioxide given off (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large marble chips</td>
</tr>
<tr>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>12</td>
<td>1.2</td>
</tr>
<tr>
<td>16</td>
<td>1.5</td>
</tr>
<tr>
<td>20</td>
<td>1.7</td>
</tr>
<tr>
<td>24</td>
<td>1.7</td>
</tr>
</tbody>
</table>

(i) Plot the results for the small marble chips. [2]

(ii) Draw a line of best fit. [1]
Question 11(a) (i) Examiner commentary

6 points are plotted correctly, credited 2 marks.
Candidates found the y-axis quite tricky, 4 minutes was often plotted at 0.65 and 16 minutes at 1.60.

Question 11(a) (ii) Examiner commentary

There is a smooth curve passing through all of the points. The slight thickening of the line between 15 and 20 minutes is just condoned as there are not two separate lines there. The mark is just credited. Candidates must be careful when drawing lines of best fit that they do not feather the line.

Question 11 (b) (i)

Exemplar 1

(b) Look at the line for the large marble chips.
(i) How long does it take for the reaction to finish?

Answer = ........................................ minutes [1]

Examiner commentary

20 minutes is credited 1 mark.
24 was a common response, where candidates gave the last reading instead of the reading when the reaction is finished.

Question 11 (b) (ii)

Exemplar 1

(ii) What mass of carbon dioxide is given off after 15 minutes?

1.45 g [1]

Examiner commentary

1.45 is credited 1 mark. 1.7 was a common incorrect response due to misreading the scale on the axis.
Question 11 (c)

Exemplar 1

2 marks

(c) The reaction is faster with small marble chips.

Write down two ways that the graph shows this is correct.

1. Steeper line at start shows quicker rate of reaction.

2. Reaction finishes quicker. Finishes at 16 minutes instead of 20, like the large chips.

Examiner commentary

Steeper line is credited marking point one. Finishes at 16 minutes instead of 20 minutes is credited marking point two. This shows that the candidate has recognised how the graph shows that the reaction is finished.

Exemplar 2

1 mark

(c) The reaction is faster with small marble chips.

Write down two ways that the graph shows this is correct.

1. The line for the small marble chips is steeper.

2. The line is before above the line for large marble chips, which shows it was faster reacting faster.

Examiner commentary

Steeper line is credited the first marking point.

The line being above the line for the large marble chips line is insufficient as the line is the same after 20 minutes, a qualifying comment such as until the reaction is finished would be creditworthy.
Exemplar Candidate Work

Question 11 (d)

Exemplar 1

(d) Both small and large marble chips give off the same mass of carbon dioxide at the end of the experiments.

Suggest why.

Because both are limited by the amount of acid [1]

Examiner commentary

Whilst both experiments are limited by the amount of hydrochloric acid used this does not account for mass of carbon dioxide being the same in each case, since they could each be limited by a different amount of hydrochloric acid which would produce different masses of carbon dioxide. The candidate needed to say that the same volume of hydrochloric acid is used in each experiment.

Question 11 (e)

Exemplar 1

(e) A balance was used to measure the amount of carbon dioxide given off.

Write down the name of a different piece of equipment that could be used to measure the amount of carbon dioxide produced.

Scales / measuring cylinder [1]

Examiner commentary

Measuring cylinder is credited the mark.

The candidates are told in the question stem that a balance is used and so scales in the answer is ignored since it is another name for balance.
Question 12 (b)

Exemplar 1

12 Crude oil can be separated into useful substances called fractions.

Examiner commentary

Methane is an acceptable alternative for LPG, marking point one is credited.

Bitsmen is clearly a misspelling of bitumen, marking point two is credited.
### Question 12 (c) (i)

**Exemplar 1**

1 mark

(c) Here are the boiling ranges for petrol and diesel.

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Approximate boiling range (°C)</th>
<th>Number of carbons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td>30–80</td>
<td>5–10</td>
</tr>
<tr>
<td>Diesel</td>
<td>205–290</td>
<td>13–17</td>
</tr>
</tbody>
</table>

(i) How do the sizes of molecules in petrol and diesel differ?

**Examiner commentary**

The data in the table has been interpreted correctly, diesel has larger molecules is credited the mark.

**Exemplar 2**

0 marks

(c) Here are the boiling ranges for petrol and diesel.

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Approximate boiling range (°C)</th>
<th>Number of carbons</th>
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</tr>
<tr>
<td>Diesel</td>
<td>205–290</td>
<td>13–17</td>
</tr>
</tbody>
</table>

(i) How do the sizes of molecules in petrol and diesel differ?

**Examiner commentary**

The candidate has quoted the headings from the table and has not interpreted the data within the table, no mark is credited.
Question 12 (c) (ii)

Exemplar 1 3 marks

(ii) Explain why the boiling range for petrol is different from the boiling range for diesel.

Because petrol hasn’t got many intermolecular forces.
Number of carbon chains is lower.
Easier to break intermolecular forces.
Cuts so it has a lower boiling range... [3]

Examiner commentary

This answer gained marks for ‘Intermolecular forces are present,’ ‘intermolecular forces in petrol are easier to break’ and hence ‘petrol has a lower boiling range.’ Hence the answer gained all 3 marks.

Exemplar 2 1 mark

(ii) Explain why the boiling range for petrol is different from the boiling range for diesel.

In different fractions... Diesel has a higher number of carbons, needs more energy to break bonds than petrol... [3]

Examiner commentary

Having ascertained the relative sizes of the molecules in 12ci, candidates needed to consider intermolecular forces, their strength, the energy needed to break them and their effect on boiling point.

There is no mention of intermolecular forces in the answer or their strength and there is no reference to boiling temperature in this answer.

The idea that more energy is required to break bonds is present, this is an allowed error carried forward from the absence of intermolecular forces so is credited a mark. This mark would not have been credited had the candidate specified that these bonds are within the molecule or between the atoms.

The vast majority of candidates did not discuss intermolecular forces in their answer. Some linked the sizes of the molecules to boiling faster or slower or discussed the number of molecules or the ease of boiling or ease of burning.
Question 12 (d)

Exemplar 1

(d) Not enough petrol is made from crude oil to meet world demand.

Oil refiners make more petrol using a process called cracking.

Describe how cracking makes more petrol from other hydrocarbons.

Include the conditions needed.

Examiner commentary

This answer gained marks for ‘splitting up large hydrocarbons into smaller ones’ and the need for ‘extreme heat’ which indicated the need for a high temperature. To gain the third mark, the answer needed to include a description of the bonds breaking during this splitting or that a catalyst is used.

Some candidates discussed fracking instead of cracking.

Question 13

Exemplar 1

13 Complete the sentences about how the Earth's atmosphere has evolved.

Choose words from the list.

argon  condensed
melted  nitrogen
oxygen  sunlight
thunderstorms  volcanoes

The earliest atmosphere was made up of ammonia, carbon dioxide and water vapour.

These gases were released by volcanoes.

The water vapour .................................................. to form the oceans.

Ammonia was converted by bacteria in the soil to make ..................................................

The earliest plants photosynthesised.

They absorbed carbon dioxide and released .................................................. gas.

Examiner commentary

This answer showed good knowledge of how the Earth's atmosphere evolved with all four responses being correct, volcanoes, condensed, nitrogen and oxygen.
Question 14 (a)

Exemplar 1

14 A student investigates the reactivity of some metals with metal salts.

The diagram shows one of the experiments that he does.

He repeats the experiment using other metals and solutions.

Look at his results.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Silver</th>
<th>Zinc</th>
<th>Magnesium</th>
<th>Copper</th>
<th>Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper sulfate</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc sulfate</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Silver nitrate</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Magnesium sulfate</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>Iron sulfate</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

✓ = Metal reacts
x = Metal does not react

(a) Use the results to place the metals in order of reactivity.

Most reactive metal

Magnesium

Zinc

Iron

Copper

Least reactive metal

Silver

Explain your reasoning.

Because the most reactive metal, magnesium has reacted with the most solutions and the least reactive metal, silver has reacted with no solutions, zinc reacted with 3 solutions, iron with 2 and copper with 1. [4]
Examiner commentary

The four metals are in the correct order of reactivity.

The data has been used correctly to explain this order; most reactive magnesium reacts with the most solutions, least reactive silver reacts with the least solutions.

Some candidates put the solutions in order rather than the metals, so losing two marks. However, if this choice is explained using the data it is possible to gain the other two marks as an error carried forward.

Question 14 (b)

Exemplar 1 1 mark

(b) Write a word equation for the reaction between copper and silver nitrate solution:

\[ \text{Copper} + \text{silver nitrate} \rightarrow \text{silver} + \text{copper nitrate}. \]

Examiner commentary

The word equation is correct, mark is credited.
Question 15 (a)

Exemplar 1

16

1 mark

15 Look at the graphs.

Graph 1 shows how the Earth’s temperature has changed between 1880 and 2010.

Graph 2 shows how the amount of carbon dioxide in the air has changed between 1880 and 2010.

(a) In graph 1, how much has the Earth’s temperature increased between 1880 and 2000?

Answer = 6 °C [1]

Examiner commentary

The candidate has misread the scale, 6 has been given instead of 0.6, so no mark was gained. This was seen on several occasions with candidates misread the scale. Teachers should allow candidates to practise reading different scales.
**Question 15 (b)**

**Exemplar 1**

(b) In graph 2, what is the difference between the amount of carbon dioxide in the air between 1880 and 2000?

Answer = \[17.5\] parts per million \([1]\)

**Examiner commentary**

175 is the correct response, mark is credited.

An answer in the range 165 - 185 is creditworthy.

**Question 15 (c)**

**Exemplar 1**

(c) Some scientists believe that graph 1 and graph 2 show that increased levels of carbon dioxide have increased the Earth’s temperature.

Other scientists believe that it is just a natural cycle of change.

Quote data from the graphs which support both of those arguments.

Evidence to support increased temperature of Earth: The temperature rises as the carbon dioxide does. Temp increased from 1880 to 2000 by 0.6°C and so did carbon dioxide levels by 175 parts per million.

Evidence to support a natural cycle: The temperature fluctuates even though the carbon dioxide levels continuously rise at a steady rate. The temperature constantly dips.

**Examiner commentary**

The candidate has appreciated that the overall trend on both graphs is an increase, as carbon dioxide levels have increased so has the temperature of the Earth.

The evidence to support a natural cycle is that whilst the carbon dioxide levels are rising steadily the temperature of the earth fluctuates up and down.

Many candidates only discussed one of the graphs in each part and so did not gain any credit.
Question 16

Exemplar 1

6 marks

16* Look at the information about three elements X, Y and Z in the Periodic Table.

<table>
<thead>
<tr>
<th>Element</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomic number</td>
<td>Less than 11</td>
<td>11</td>
<td>More than 11</td>
</tr>
<tr>
<td>Melting point (°C)</td>
<td>181</td>
<td>98</td>
<td>64</td>
</tr>
<tr>
<td>Number of electrons in outer shell</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Density (g/cm³)</td>
<td>0.53</td>
<td>0.97</td>
<td>0.89</td>
</tr>
<tr>
<td>Reaction with water</td>
<td>Reacts quickly making hydrogen</td>
<td>Reacts vigorously making hydrogen</td>
<td>Reacts explosively making hydrogen</td>
</tr>
<tr>
<td>Action of heat on the carbonates of X, Y and Z</td>
<td>Breaks down and makes carbon dioxide</td>
<td>No reaction</td>
<td>No reaction</td>
</tr>
<tr>
<td>Formula of chloride</td>
<td>XCl</td>
<td>YCl</td>
<td>ZCl</td>
</tr>
<tr>
<td>Melting point of chloride (°C)</td>
<td>614</td>
<td>801</td>
<td>773</td>
</tr>
</tbody>
</table>

Student A thinks that elements X, Y and Z are in the same Group of the Periodic Table.

Student B thinks they are in different Groups of the Periodic Table.

Analyse and explain the information in the table that supports both Student A’s and Student B’s conclusions.

Who do you think is correct?

I think Student A is correct because the number of electrons outside are the same and they all have the same reaction to water.

Student A is most likely right but Student B could also be right because the action of heat on the carbonates are different and the melting points of the chlorides do not go up or down in a specific order so there is the possibility that Student B is correct. However, I do believe Student A has made the better answer.

Examiner commentary

This is a concise Level 3 answer.

The candidate has given two pieces of evidence in support of Student A (1 electron in outer shell and all react to form hydrogen) which is a detailed explanation.

There are two pieces of evidence in support of Student B (different reactions of the carbonates and no trend in melting point of the chlorides) which is a detailed explanation.

There is a conclusion.

This is Level 3, 6 marks are credited.
16* Look at the information about three elements X, Y and Z in the Periodic Table.

<table>
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<tr>
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<th>X</th>
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<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
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Student A thinks that elements X, Y and Z are in the same Group of the Periodic Table.

Student B thinks they are in different Groups of the Periodic Table.

Analyse and explain the information in the table that supports both Student A’s and Student B’s conclusions.

Who do you think is correct?

I think Student A is correct because Student B gives reasons that the elements all have one electron in their outer shell, which shows that they could all be in Group 1. The atomic numbers can be different and still be in the same group. All 3 elements react to make hydrogen and get more reactive due to the lower melting points. Student B may think this because of the action of heat on the carbonates, as one element reacts and the others don’t. Another reason he may think this is because of the difference in density, as one is much lower than the others.

Examiner commentary

The candidate has given two pieces of evidence in support of Student A (1 electron in outer shell and all react to form hydrogen) which is a detailed explanation.

There is one piece of evidence in support of Student B (different reactions of the carbonates) which explains the evidence.

There is a conclusion.

This is clearly Level 3, but lacks some of the detail, 5 marks are credited.
Exemplar 3

16* Look at the information about three elements X, Y and Z in the Periodic Table.

<table>
<thead>
<tr>
<th>Element</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomic number</td>
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</table>

- Student A thinks that elements X, Y and Z are in the same Group of the Periodic Table.
- Student B thinks they are in different Groups of the Periodic Table.

Examiner commentary

The candidate has given two pieces of evidence in support of Student A (1 electron in outer shell and all react to form hydrogen) which is a detailed explanation. There is no credit for identifying sodium alone, all three should be identified to gain credit.

There is one piece of evidence in support of Student B (different reactions of the carbonates) which explains the evidence.

The candidate states that the melting points show no trend but this is not specific enough as it is the melting points of the chlorides that show no trend.

This is Level 2, 4 marks are credited.
Exemplar 4

16* Look at the information about three elements X, Y and Z in the Periodic Table.

<table>
<thead>
<tr>
<th>Element</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Density (g/cm³)</td>
<td>0.53</td>
<td>0.97</td>
<td>0.89</td>
</tr>
<tr>
<td>Reaction with water</td>
<td>Reacts quickly making hydrogen</td>
<td>Reacts vigorously making hydrogen</td>
<td>Reacts explosively making hydrogen</td>
</tr>
<tr>
<td>Action of heat on the carbonates of X, Y and Z</td>
<td>Breaks down and makes carbon dioxide</td>
<td>No reaction</td>
<td>No reaction</td>
</tr>
<tr>
<td>Formula of chloride</td>
<td>XCl</td>
<td>YCl</td>
<td>ZCl</td>
</tr>
<tr>
<td>Melting point of chloride (°C)</td>
<td>614</td>
<td>801</td>
<td>773</td>
</tr>
</tbody>
</table>

Student A thinks that elements X, Y and Z are in the same Group of the Periodic Table.

Student B thinks they are in different Groups of the Periodic Table.

Analyse and explain the information in the table that supports both Student A’s and Student B’s conclusions.

Who do you think is correct?

I think that Student A is correct, because they all have the same number of electrons in their outer shell, meaning they are in the same group. They are also correct because their results for everything in the table are almost very close in each other. They are near on each other in the periodic table. They may not be in the same, because even element is very different from each other.

Examiner commentary

The candidate has given one piece of evidence in support of Student A (same number of electrons in outer shell) and reached a conclusion (Student A is correct).

This is Level 1, 2 marks are credited.
Question 17 (b)

Exemplar 1

2 marks

A company wants to make a glass to hold a cold drink. They are considering materials A and B.

Look at the life cycle assessments for a glass made out of materials A and B.

<table>
<thead>
<tr>
<th>Process</th>
<th>Material A</th>
<th></th>
<th>Material B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy used (MJ)</td>
<td>Greenhouse gases made (g of CO₂)</td>
<td>Energy used (MJ)</td>
<td>Greenhouse gases made (g of CO₂)</td>
</tr>
<tr>
<td>Extracting the raw materials</td>
<td>5.0</td>
<td>2.2</td>
<td>3.8</td>
<td>1.4</td>
</tr>
<tr>
<td>Manufacturing of the glass from the raw materials</td>
<td>0.4</td>
<td>0.3</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Transporting the glasses to the shops</td>
<td>1.5</td>
<td>1.0</td>
<td>3.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Process W</td>
<td>2.0</td>
<td>0.6</td>
<td>5.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Write down the name of process W.

Recycling .................................................... [1]

Examiner commentary

Recycling is an acceptable alternative for disposal or end of life management, the mark is credited.
Question 17 (c)

Exemplar 1

1 mark

(c) It costs more to transport glasses made from material B.

Suggest a reason why.

Because it has...more energy used and greenhouse gases...[1]

made

Examiner commentary

More energy being used is a correct alternative, the mark is credited.

Question 17 (d)

Exemplar 1

2 marks

(d) Which material should the company choose?

Justify your answer.

Material A...as it...uses less energy and makes less greenhouse...[✓]...gases...which will create a more positive impact on the...[✓]...environment...than...material B...[2]

Examiner commentary

The candidates has chosen A and given two correct reasons, less energy used and less Greenhouse gases made. Two marks are credited.

If B had been chosen, 1 mark could have been available for a correct justification of the choice.
Question 18

Exemplar 1

18 A student investigates the rate of reaction between magnesium and hydrochloric acid. The reaction gives off hydrogen gas.

The student wants to investigate how changing the concentration of the hydrochloric acid affects the rate of reaction.

Look at her plan.

**First experiment**

I will put 0.5 g of magnesium ribbon into the flask.
I will add 50 cm³ of hydrochloric acid.
I will measure how fast the gas is given off.

**Second experiment**

I will put another 0.5 g of magnesium ribbon into the flask.
I will add 100 cm³ of the same hydrochloric acid.
I will measure how fast the gas is given off.

Another student thinks that the plan will not work and he does not understand exactly what he has to do.

Suggest how the plan for this investigation can be improved.

...write more detailed instructions for... Add the hydrochloric acid before... you add the ribbon of magnesium... write about what you will use to measure how fast the gas is given off and agree upon a certain time for how long you are going to measure the experiment... make sure that someone else is measuring how fast the gas is given off so they can start it the second... you put the ribbon in the flask...
Examiner commentary

The mark for this answer was given for saying the method should include how you would measure how fast the gas is given off.
The rest of the answer does not talk about improvements to the written methods.
The other marks could have been scored by saying the methods should include:
1. The equipment used to measure the gas e.g. gas syringe.
2. What is going to be measured e.g. volume of gas given off in a fixed time.
3. That both experiments should use the same volume and temperature of acid.
4. The method should include changing the concentration of the acid not the volume.

Candidates found improving the plan very difficult and tended to either repeat the details given in the question stem or give vague broad answers.

Question 19 (a)

Exemplar 1 1 mark

The table shows some hydrocarbons from crude oil.

<table>
<thead>
<tr>
<th>Name</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane</td>
<td>CH₄</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
</tr>
<tr>
<td>Butane</td>
<td>C₄H₁₀</td>
</tr>
</tbody>
</table>

(a) Nonane is another hydrocarbon from crude oil. It contains 9 carbon atoms. Predict the formula of nonane.

\[
\begin{align*}
& 3 \times 2 = 6 \\
& 6 + 2 = 8 \\
& 4 \times 2 = 8 \\
& 8 + 2 = 10 \\
& \text{Right choice} \\
& 9 \times 2 = 18 \\
& 18 + 2 = 20 \\
& C₉H₂₀
\end{align*}
\]

Examiner commentary

The formula is correct, the mark is credited. The candidate has used the space around the question to do some working to work out the formula with 9 carbon atoms by using the other formulas.

Many candidates found this question difficult.
Question 19 (b)

Exemplar 1

(b) Write down the name of this homologous series of hydrocarbons.

Alkanes

[1]

Examiner commentary

Alkanes is correct, the mark is credited. Many candidates did not know the meaning of homologous series, so did not get the question correct. They gave answers such as hydrocarbon or a name of a compound e.g. ethane.
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