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# GCSE

# COMBINED SCIENCE: TRILOGY

# 8464/C/2F

Chemistry Paper 2F

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## Mark scheme

Specimen (set 2)

Version: 1.0

### Keep secure

Please be aware that not all schools and colleges will be using these tests at the same time.

Help us to maintain the security of these papers by ensuring they are not distributed on social media or other platforms.

## Important – please note

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers.

It must be stressed that a mark scheme is a working document. This mark scheme has **not** been through the full standardisation process. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way.

Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

The Information to Examiners is included as a guide to how the mark scheme will function as an operational document.

The layout has been kept consistent so that future operational mark schemes do not appear different from these test materials.

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening and underlining

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.
- 2.4** Any wording that is underlined is essential for the marking point to be awarded.

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as \* in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

#### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

#### 3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

#### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

### 3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

### 3.10 Do not accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

## 4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

### **Step 1: Determine a level**

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

### **Step 2: Determine a mark**

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
01.1	formulation		1	AO1 5.8.1.2 Low
01.2	1/10		1	AO2 5.8.1.2 Low
01.3	make them palatable		1	AO3 5.8.1.2 Low
01.4	neutralisation		1	AO1 5.4.2.2 Low
01.5	carbon dioxide		1	AO1 5.8.2.3 Low
01.6	water has a boiling point of 100 °C  water has a melting point lower than room temperature		1  1	AO1 5.2.2.4 Low
01.7	CaCl <sub>2</sub>		1	AO1 5.1.1.1 Low
01.8	crushed  melted	must be in this order	1  1	AO1 5.10.2.2 Low Standard
<b>Total</b>			<b>10</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	0.1%		1	AO2 5.9.1.1 Low
02.2	bar correctly drawn to $\pm \frac{1}{2}$ square		1	AO2 5.9.1.1 Low
02.3	argon		1	AO2 5.1.1.1 Low
02.4	increased  data values to justify		1  1	AO2 5.9.1.3 Low Standard
02.5	electricity and industry are equal  electricity and industry are highest  transport is lowest  electricity or industry is double transport		1  1  1  1	AO2 AO3 5.9.2.2 Low Standard
02.6	use of renewable energy sources <b>or</b> specific example		1	AO1 5.9.2.4 Low
02.7	limited investment in renewable technology <b>or</b> disagreement between countries	accept specific reason which relates to response to <b>02.6</b> , eg insufficient sunlight	1	AO1 5.9.2.4 Low
<b>Total</b>			<b>11</b>	



Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	sodium chloride		1	AO2 5.1.1.1 5.6.1.1 Low
03.2	points correctly plotted correct line of best fit	allow <b>1</b> mark if 4 correct do <b>not</b> accept straight line	2 1	AO2 5.6.1.1 Low
03.3	0.38–0.50	allow for <b>1</b> mark for working shown on graph on <b>Figure 6</b>	2	AO2 5.6.1.2 Low
03.4	$\geq 5$ seconds and $< 8$ seconds		1	AO2 5.6.1.2 Low
<b>Total</b>			<b>7</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	2.38	if answer incorrect, allow <b>1</b> mark for 2.37 to full calculator display <b>or</b> for $(4.82 + 2.16 + 0.15) / 3$	2	AO2 5.7.1.1 Low
04.2	different types of biomass / plankton	allow they are mixtures	1	AO2 5.7.1.1 Standard
04.3	a molecule		1	AO1 5.2.1.4 Low
04.4	alkanes		1	AO1 5.7.1.1 Low
04.5	<b>B</b>		1	AO1 5.7.1.3 Low
04.6	<b>B</b>		1	AO1 5.7.1.3 Low
04.7	any <b>two</b> from: <ul style="list-style-type: none"> <li>• cracking uses a catalyst, fractional distillation doesn't</li> <li>• cracking breaks up molecules, fractional distillation separates them</li> <li>• cracking is a chemical process, fractional distillation is a physical process</li> </ul>		2	AO1 5.7.1.2 5.7.1.4 Low Standard
04.8	poly(ethene)		1	AO1 5.2.1.4 5.7.1.4 Low

04.9	(A=) reuse		1	AO1 5.10.2.2 Low
	(B=) recycle		1	

<b>Total</b>			<b>12</b>	
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand																
05.1	potato  effective, but manageable and safe	  allow 1 for manganese dioxide is effective	1  1	AO3. 5.6.1.4 Low																
05.2	75 cm <sup>3</sup>		1	AO2 5.6.1.4 Low																
05.3	headings: time, volume  units: s or seconds, cm <sup>3</sup>  correct values for times, including 0  correct values for volumes	<table border="1"> <thead> <tr> <th>Time in seconds</th> <th>Volume in cm<sup>3</sup></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> </tr> <tr> <td>20</td> <td>23</td> </tr> <tr> <td>40</td> <td>42</td> </tr> <tr> <td>60</td> <td>59</td> </tr> <tr> <td>80</td> <td>72</td> </tr> <tr> <td>100</td> <td>80</td> </tr> <tr> <td>120</td> <td>88</td> </tr> </tbody> </table>	Time in seconds	Volume in cm <sup>3</sup>	0	0	20	23	40	42	60	59	80	72	100	80	120	88	1  1  1  1	AO2 5.6.1.4 Low Standard
Time in seconds	Volume in cm <sup>3</sup>																			
0	0																			
20	23																			
40	42																			
60	59																			
80	72																			
100	80																			
120	88																			
05.4	any <b>one</b> from: <ul style="list-style-type: none"> <li>gas escaped</li> <li>leak</li> <li>slow to put on bung</li> <li>systematic error</li> </ul>		1	AO3 5.6.1.4 Low																
05.5	any <b>two</b> from: <ul style="list-style-type: none"> <li>concentration of peroxide</li> <li>volume of peroxide</li> <li>temperature</li> <li>mass of catalyst</li> <li>surface area of catalyst</li> </ul>		2	AO2 5.6.1.4 Low																
<b>Total</b>			<b>10</b>																	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	more than 1 dot in a vertical line		1	AO2 5.8.1.3 Standard
06.2	correct equation and substitution 7/39	accept $R_f = \text{distance moved by spot C} / \text{distance moved by solvent}$	1	AO1 AO2 5.8.1.3 Standard
	calculation and answer 0.1795		1	
	answer to 2 significant figures 0.18		1	
06.3	<b>Level 3:</b> The plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO1 AO3 5.8.1.3 Standard
	<b>Level 2:</b> The plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.		3–4	
	<b>Level 1:</b> The plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	<b>Indicative content</b>			
	<ul style="list-style-type: none"> <li>put dots of known colours, and a dot of the ink on a pencil line on the chromatography paper.</li> <li>place the bottom of the paper in water, making sure the start line is above the water</li> <li>leave for solvent to rise up through paper.</li> <li>when solvent near top of paper, remove and leave to dry.</li> <li>compare positions of dots for known colours with those from ink</li> </ul>			
<b>Total</b>			<b>10</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$		1	AO1 5.3.1.1 5.7.1.3 Standard
07.2	toxic	accept causes death	1	AO1 5.9.2.3 Standard
	acid rain or respiratory problems		1	
	global dimming	accept respiratory problems / asthma	1	
07.3	<b>Level 3:</b> A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.		5–6	AO3 5.7.1.2 5.9.2.2 5.9.3.1 5.9.3.2 Standard
	<b>Level 2:</b> Some logically linked reasons are given. There may also be a simple judgement.		3–4	
	<b>Level 1:</b> Relevant points are made. They are not logically linked.		1–2	
	No relevant content		0	
	<b>Indicative content</b>			
	<ul style="list-style-type: none"> <li>methane is the best fuel because it gives more energy per gram than coal, and gives less carbon dioxide per kJ of energy produced</li> <li>petrol is best because it being a liquid it is easier to handle than gas or coal - although the energy content is lower than the others, it gives out less carbon dioxide than coal</li> <li>methane has more energy per gram than coal</li> <li>coal produces most carbon dioxide</li> <li>coal can produce sulfur dioxide</li> </ul>			
<b>Total</b>			<b>10</b>	