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# GCSE

# Combined Science: Synergy

8465/1F – Paper 1 – Life and Environmental Sciences – Foundation Tier  
Mark scheme

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8465

June 2018

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Version/Stage: 1.1 Final

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. 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. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. 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.

Further copies of this mark scheme are available from [aqa.org.uk](http://aqa.org.uk)

## 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 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.
01.1	DNA	allow deoxyribonucleic acid allow lower case letters	1	AO1 4.4.3.1
01.2	gametes		1	AO1 4.4.3.1
01.3	meiosis		1	AO1 4.4.3.1
01.4	20		1	AO2 4.1.3.5
01.5	dominant		1	AO1 4.4.3.3
01.6	Bb or bB		1	AO2 4.4.3.3
01.7	bb circled	allow ecf from question 01.6	1	AO3 4.4.3.3
01.8	1 in 4 / 25% / 1:3 / 0.25 / ¼	allow ecf from question 01.6 do <b>not</b> accept 1:4	1	AO2 4.4.3.3
<b>Total</b>			<b>8</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.												
02.1	<table border="1"> <thead> <tr> <th>name of particle</th> <th>relative mass</th> <th>charge</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td>(1)</td> <td>(+1)</td> </tr> <tr> <td>neutron</td> <td>1</td> <td>0</td> </tr> <tr> <td>electron</td> <td>(very small)</td> <td>-1</td> </tr> </tbody> </table>	name of particle	relative mass	charge	proton	(1)	(+1)	neutron	1	0	electron	(very small)	-1	allow words instead of numbers  allow neutral <b>or</b> no charge	1 + 1 1	AO1 4.1.2.3
	name of particle	relative mass	charge													
	proton	(1)	(+1)													
	neutron	1	0													
electron	(very small)	-1														
02.2	(protons) 3  (neutrons) 4  (electrons) 3	allow words instead of numbers	1  1  1	AO2 4.1.2.3												
02.3	<table border="0"> <thead> <tr> <th>Description of atomic model</th> <th>Stage in the development of the atomic model</th> </tr> </thead> <tbody> <tr> <td> <table border="1"> <tr> <td>A ball of positive charge with electrons embedded in it</td> <td> <table border="1"> <tr> <td>Dalton atoms</td> </tr> <tr> <td>Neutrons discovered</td> </tr> <tr> <td>Nucleus of atoms discovered</td> </tr> <tr> <td>Plum pudding model</td> </tr> </table> </td> </tr> <tr> <td> <table border="1"> <tr> <td>Spherical atoms</td> </tr> </table> </td> <td></td> </tr> </table></td></tr></tbody> </table>	Description of atomic model	Stage in the development of the atomic model	<table border="1"> <tr> <td>A ball of positive charge with electrons embedded in it</td> <td> <table border="1"> <tr> <td>Dalton atoms</td> </tr> <tr> <td>Neutrons discovered</td> </tr> <tr> <td>Nucleus of atoms discovered</td> </tr> <tr> <td>Plum pudding model</td> </tr> </table> </td> </tr> <tr> <td> <table border="1"> <tr> <td>Spherical atoms</td> </tr> </table> </td> <td></td> </tr> </table>	A ball of positive charge with electrons embedded in it	<table border="1"> <tr> <td>Dalton atoms</td> </tr> <tr> <td>Neutrons discovered</td> </tr> <tr> <td>Nucleus of atoms discovered</td> </tr> <tr> <td>Plum pudding model</td> </tr> </table>	Dalton atoms	Neutrons discovered	Nucleus of atoms discovered	Plum pudding model	<table border="1"> <tr> <td>Spherical atoms</td> </tr> </table>	Spherical atoms			1  1	AO1 4.1.2.1
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<b>Total</b>		<b>8</b>														



Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	CO <sub>2</sub>		1	AO2 4.4.1.5
03.2	carbon dioxide	ignore formulae ignore carbon oxide do <b>not</b> accept carbon monoxide	1	AO2 4.4.1.5
03.3	46.2 (kg)	allow 46 (kg)	1	AO2 4.4.1.1
03.4	(fossil / hydrocarbon) fuels burn / combust  in a limited supply of oxygen / air	an answer of incomplete combustion gains <b>2</b> marks  allow named fossil fuels  allow lack of oxygen / air	1  1	AO1 4.4.1.6
03.5	red blood cells		1	AO1 4.2.1.4
03.6	cell death  decreased respiration rate		1  1	AO2 4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	any <b>one</b> from: <ul style="list-style-type: none"> <li>• damages buildings / bridges / statues</li> <li>• harms / kills plants / trees</li> <li>• harms living organisms in ponds / rivers / lakes</li> </ul>	ignore breathing problems  allow damages iron / metal / limestone structures  allow harms aquatic organisms	1	AO1 4.4.1.6
<b>Total</b>			<b>9</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	stoma / stomata	ignore pore	1	AO1 4.2.2.3
04.2	guard (cell)		1	AO1 4.2.2.3
04.3	osmosis  transpiration	in this order only	1  1	AO1 4.2.2.3
04.4	increasing temperature  increasing wind speed		1  1	AO1 4.2.2.3
04.5	any <b>one</b> from: <ul style="list-style-type: none"> <li>• for photosynthesis</li> <li>• to bring mineral (ions) into / up the plant</li> <li>• translocation</li> </ul>	allow correctly named ions eg nitrates allow to cool the plant	1	AO2 4.2.2.3
04.6	any <b>one</b> from: <ul style="list-style-type: none"> <li>• decreased transpiration</li> <li>• less water lost</li> </ul>	allow no transpiration allow no water lost	1	AO2 4.2.2.3
04.7	$\frac{12}{800}$ 0.015 (millimetres)  15 (micrometres)	an answer of 15 (micrometres) scores <b>3</b> marks   allow <b>1</b> mark for incorrect width × 1000	1  1  1	AO2 4.1.3.1
<b>Total</b>			<b>11</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any <b>one</b> from: <ul style="list-style-type: none"> <li>• temperature</li> <li>• water</li> </ul>	allow ions / salt / pH allow oxygen / carbon dioxide	1	AO1 4.3.1.4
05.2	7 (mmol/dm <sup>3</sup> )	allow 6.75 to 7.25 (mmol/dm <sup>3</sup> )	1	AO2 4.3.1.5
05.3	1 (pm)	allow 12.30 to 1.10 (pm)	1	AO3 4.3.1.5
05.4	insulin		1	AO1 4.3.1.5
05.5	glucose moved from blood into (liver / muscle) cells  to be stored as glycogen	allow insulin transported in the blood and glucose moved into (liver / muscle) cells  allow to be converted into glycogen	1  1	AO1 4.3.1.5
05.6	the person injected too much hormone		1	AO2 4.3.1.5
05.7	decrease  (because) glucose is used in respiration	allow increase only if linked to glucagon released for <b>2</b> marks	1  1	AO2 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>05.8</b>	(blood glucose concentration would) not increase as much	allow (blood glucose concentration would) return to normal faster	1	AO2 4.3.1.5
<b>Total</b>			<b>10</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	community		1	AO1 4.4.2.1
06.2	any <b>one</b> from: <ul style="list-style-type: none"> <li>• fish</li> <li>• squid</li> </ul>		1	AO2 4.4.2.1
06.3	producer		1	AO1 4.4.2.1
06.4	photosynthesis needs light		1	AO1 4.2.2.5 4.4.2.2
	(nearer the surface there is) more light	allow converse  allow explanations in terms of temperature for <b>2</b> marks	1	AO2 4.4.2.1
06.5	any <b>one</b> from: <ul style="list-style-type: none"> <li>• mates</li> <li>• territory</li> </ul>	allow space	1	AO1 4.4.2.2
06.6	more predation / eaten		1	AO2 4.4.2.1
	by (toothed) whales	allow <b>2</b> marks for squid (population) increases so fish (population) decreases so less food for leopard seals	1	
<b>Total</b>			<b>8</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	a type of electromagnetic radiation		1	AO1 4.3.2.2
07.2	a thick sheet of lead		1	AO1 4.3.2.4
07.3	to decrease the rate of decay of the food		1	AO2 4.4.1.2
	to prevent food poisoning		1	AO2 4.4.1.2 4.3.3.2
07.4	gamma rays cause mutations		1	AO2 4.3.2.6
07.5	decrease the distance between the food and the radioactive source		1	AO1 4.3.2.5
	increase the time for which the food is close to the radioactive source		1	
07.6	(because) the source of radiation is not in the food	allow source of radiation is / remains outside food	1	AO1 4.3.2.5
<b>Total</b>			<b>8</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(wear safety) goggles	allow (wear) <u>safety</u> glasses allow (wear) eye protection allow keep ethanol away from flame or in a water bath allow use tweezers or a glass rod to remove leaf from ethanol / water  ignore gloves	1	AO1 4.2.1.5
08.2	iodine solution		1	AO1 4.2.1.5
08.3	blue-black		1	AO1 4.2.1.5
08.4	separate  mobile	in this order only	1  1	AO1 4.2.2.4
08.5	$\frac{17}{110}$  = 0.15	an answer of 0.15 scores <b>2</b> marks  allow 0.154545 or correctly rounded answer  allow an answer from an incorrect calculation correctly given to 2 significant figures	1  1	AO2 4.2.2.4
08.6	carotene		1	AO3 4.2.2.4
<b>Total</b>			<b>8</b>	



Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>09.1</b>	any <b>two</b> from: <ul style="list-style-type: none"><li>• amino acids</li><li>• glycerol</li><li>• fatty acids</li></ul>	do <b>not</b> accept fat  allow salt / minerals allow vitamins	2	AO1 4.2.1.5
<b>09.2</b>	11.79 (g)	allow 11.8 (g) <b>or</b> 12 (g)	1	AO2 4.2.1.5

Question	Answers	Mark	AO/ Spec. Ref
09.3	<b>Level 3:</b> Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	<b>Level 2:</b> Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO1
	<b>Level 1:</b> Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	<b>No relevant content</b>	0	
	<b>Indicative content</b> <ul style="list-style-type: none"> <li>• carbon dioxide enters the leaf through stomata</li> <li>• glucose / sugars produced by photosynthesis (in leaves)</li> <li>• some detail of photosynthesis</li> <li>• transport / translocation (of glucose / sugars)</li> <li>• in phloem</li> <li>• glucose is converted to starch</li> <li>• (starch is a) long chain of glucose / sugar molecules</li> <li>• starch as storage (of glucose / sugars)</li> </ul>		4.2.1.5 4.2.2.5 4.2.2.7
<b>Total</b>		<b>9</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>10.1</b>	x-axis labelled <b>and</b> suitable scale		1	AO2 4.1.1.4
	points plotted correctly	allow 5 correctly plotted for <b>2</b> marks, 3–4 correctly plotted for <b>1</b> mark allow $\pm \frac{1}{2}$ square	2	
	line of best fit		1	
<b>10.2</b>		an answer of 0.075 ( $^{\circ}\text{C/s}$ ) scores <b>2</b> marks		AO2 4.1.1.4
	$\frac{4.5}{60}$ 0.075 ( $^{\circ}\text{C/s}$ )	allow ecf from line of best fit in question <b>10.1</b>	1 1	
<b>10.3</b>		an answer of 15.525 (kJ) <b>or</b> 15.53 (kJ) <b>or</b> 15.5 (kJ) scores <b>4</b> marks		AO2 4.1.1.4
		an answer of 15 525 (kJ) scores <b>3</b> marks		
	$\Delta\theta = 11.5$ ( $^{\circ}\text{C}$ )	a calculation using an incorrect temperature scores <b>max 3</b> marks	1	
	$\Delta E = 1.50 \times 900 \times 11.5$		1	
	$\Delta E = 15\,525$ (J)		1	
	$\Delta E = 15.525$ (kJ)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
<b>10.4</b>	any <b>two</b> from: <ul style="list-style-type: none"> <li>• mass of block</li> <li>• size / dimensions of block</li> <li>• material of block</li> <li>• current through heater</li> <li>• thickness of insulation</li> <li>• material of insulation</li> <li>• time interval</li> <li>• starting temperature (of block / heater)</li> </ul>	allow same block for <b>1</b> mark  allow power of heater  allow same insulation for <b>1</b> mark	2	AO1 4.1.1.4
<b>Total</b>			<b>12</b>	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11.1	<p><b>Method of contraception</b></p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>How the method works</b></p> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100%;">diaphragm</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">intrauterine device</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">oral contraceptive</div> </div> </div> <div style="width: 45%;"> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 100%;">prevents embryo implanting</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">prevents release of the egg</div> <div style="border: 1px solid black; padding: 5px; width: 100%;">prevents sperm reaching the egg</div> </div> </div> </div> <p style="text-align: center; margin-top: 20px;"><b>2 marks for all 3 correct</b> allow <b>1</b> mark for 1 or 2 correct</p>		2	AO1 4.3.1.7
11.2	<p>to test for safety / toxicity <b>or</b> to test for dangerous / harmful side effects</p>	<p>ignore to test for side effects unqualified</p>	1	AO1 4.3.3.7

Question	Answers	Mark	AO / Spec. Ref
11.3	<b>Level 3:</b> A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3
	<b>Level 2:</b> Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3
	<b>Level 1:</b> Relevant points are made. They are not logically linked.	1–2	AO2
	<b>No relevant content</b>	0	
	<p><b>Indicative content</b></p> <p>allow converse where applicable</p> <ul style="list-style-type: none"> <li>• condom effectiveness is lower than oral contraceptive and patch</li> <li>• hormone patch slightly more effective than oral contraceptive</li> <li>• all are highly effective</li> <li>• condoms more easily accessible</li> <li>• condoms have no serious side effects, oral contraceptive and patch have possible side effects</li> <li>• only condoms protect against STIs / STDs or named STIs / STDs</li> <li>• side effects don't affect all women</li> <li>• could forget to take oral contraceptive, but patch is applied for long time</li> <li>• could forget to replace patch</li> <li>• patch is visible</li> </ul> <p>ignore costs ignore how the contraceptive works</p>		4.3.1.7 4.3.3.2
<b>Total</b>		<b>9</b>	