AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.1.1.5

Microscopy

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**8**
Available paper years	**2018–2024**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.1.1.5 Microscopy

Answer 01 · Mark scheme

June 2018 | 8464/B/1F | Original Q6

The full source mark scheme begins on page 22. Follow original question 6 in that document.

4.1.1.5 Microscopy

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	transpiration		1	AO1 4.2.3.2
04.2	guard cell		1	AO1 4.2.3.1 4.2.3.2
04.3	(real length of cell =) $\frac{25}{800}$ 0.03125 31.25 (µm)	an answer of 31.25 (µm) scores 3 marks allow 2 marks for $\frac{25\,000}{800}$ allow 31 or 31.3 allow correct unit conversion of incorrect answer	1 1 1	AO2 4.1.1.5
04.4	temperature of the room		1	AO2 4.2.3.2
04.5	any water / mass lost was from the leaves / plant	allow so no water was lost (directly) from the soil	1	AO3 4.2.3.2
04.6	0.1 g		1	AO2 4.2.3.2
04.7 View with Table 1	511.2 (g)	answer line takes precedence	1	AO2 4.2.3.2
04.8	the higher the temperature the more water lost	cause and effect must be the correct way round	1	AO3 4.2.3.2

4.1.1.5 Microscopy

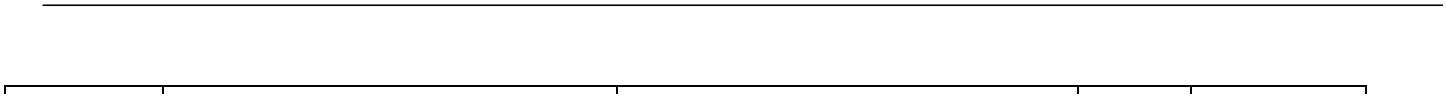
Answer 02 · Mark scheme

04.9	any **two** from: • humidity • air movement • light (intensity) • water availability • rate of photosynthesis	 allow wind allow time of day allow number / size of leaves / allow number of stomata on plant ignore type of plant ignore time plant left for	2	AO1 4.2.3.2
Total			**12**	

4.1.1.5 Microscopy

Answer 02 · Mark scheme

June 2019 | 8464/B/1F | Original Q4



4.1.1.5 Microscopy

Answer 03 · Mark scheme

November 2020 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	amylase	allow phonetic spelling allow carbohydrase do **not** accept amylose	1	AO1 4.2.2.1
06.2	small intestine		1	AO1 4.2.1 4.2.2.1
06.3	any **one** from: • greater magnification • higher resolving power	allow can see (smaller) sub-cellular structures / parts allow can see more detail (inside cells) allow reference to 3-D images	1	AO1 4.1.1.5
06.4	capillary		1	AO2 4.2.2.1 4.2.2.2
06.5	$20 = \frac{\text{image length}}{0.8}$ image length = 0.8 x 20 image length = 16 (mm)		1 1 1	AO2 4.1.1.5 RPA 1
06.6	diffusion		1	AO3 4.1.3.1
06.7	active transport	allow active uptake	1	AO3 4.1.3.3

4.1.1.5 Microscopy

Answer 03 · Mark scheme

November 2020 | 8464/B/1F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	any **one** from: • respiration • to form glycogen • to make amino acids / proteins	allow as an energy source do **not** accept to make / use / create / produce energy allow to make lipid / fat	1	AO1 4.4.2.1 4.4.2.3

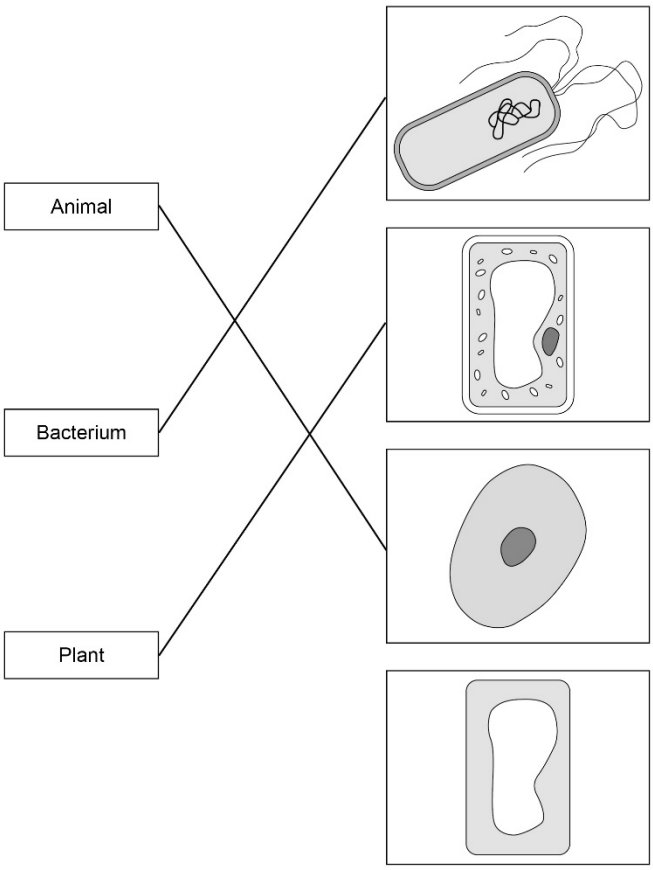
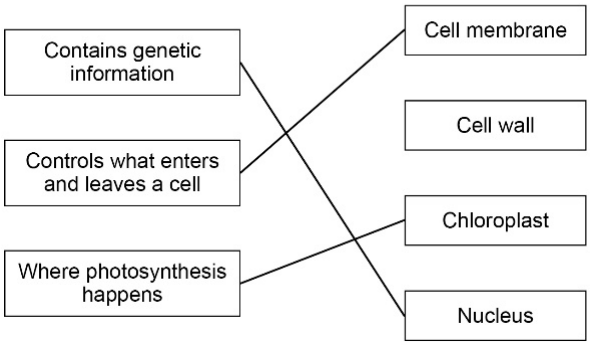
06.9	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO2 4.1.1.3 4.1.3.1 4.1.3.3 4.2.2.1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • have (many) microvilli • (to) increase surface area • wall of villus only one cell thick **or** is thin • capillaries are close to surface • (so) short pathway • good blood supply • (to) transport food molecules away **or** to the body • (and) maintain a diffusion gradient • cells have many mitochondria • (where) respiration takes place • (where) energy is transferred • (as) active transport requires energy • energy is needed to absorb sugar / food / molecules For Level 2 must make links between structure and it's function		

Total		**14**

4.1.1.5 Microscopy

Answer 04 · Mark scheme

November 2021 | 8464/B/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.1.1.1 4.1.1.2
01.2	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.1.1.2 4.1.2.1 4.1.3.1 4.4.1.1

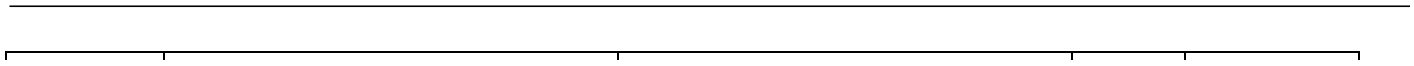
4.1.1.5 Microscopy

01.3	urea glycogen starch cellulose	must be in this order	1 1 1 1	AO1 4.1.1.2 4.4.1.3 4.4.2.3
01.4	any **one** from: • (to cause) movement • to contract / shorten	 allow example of movement ignore to relax / expand ignore references to strength / energy / power	1	AO1 4.1.1.3 4.4.2.2
01.5	(many) mitochondria to transfer / release (a lot of) energy	 allow (mitochondria) for respiration do **not** accept to produce / make / create energy ignore reference to the shape / strength of the cells	1 1	AO2 4.1.1.2 4.1.1.3 4.4.2.1
01.6	$\frac{2}{0.05}$ (×) 40	 do **not** accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			**15**	

4.1.1.5 Microscopy

Answer 04 · Mark scheme

November 2021 | 8464/B/1F | Original Q1



4.1.1.5 Microscopy

Answer 05 · Mark scheme

June 2022 | 8464/B/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	cells contain (many) chloroplasts	allow positioned nearest to the light **or** at the top of the leaf allow cells are closely packed **or** no gaps between cells allow chlorophyll for chloroplast	1	AO1 4.1.1.3 4.2.1 4.2.3.1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	stomata		1	AO1 4.2.3.1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	(real length) $= \frac{28}{400}$ (real length in mm =) 0.07 (real length in µm =) 70	allow answer given for length in mm correctly multiplied by 1000	1 1 1	AO2 4.1.1.1 4.1.1.2 4.1.1.5 RPA1

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	diffusion		1	AO1 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	A Reason any **one** from: • steeper (diffusion) gradient • bigger difference in concentration of carbon dioxide inside and outside the cell	no marks if wrong cell chosen allow higher concentration of carbon dioxide outside the cell than inside the cell allow particles / molecules for carbon dioxide	1 1	AO3 AO2 4.1.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(number / amount of) bubbles time	allow volume of gas / oxygen allow suitable time eg 1 / 5 / 10 minutes	1 1	AO1 4.4.1.2 RPA5

4.1.1.5 Microscopy

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	any **two** from: • temperature (of water) • light intensity **or** distance of light (from pondweed) • concentration of carbon dioxide (in water)	do **not** accept colour of light ignore time allow amount of light ignore light unqualified allow amount / mass of sodium hydrogen carbonate (in water) allow type / size of plant ignore volume of water / solution	2	AO3 4.4.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	y-axis labelled: rate of photosynthesis in arbitrary units		1	AO2 4.4.1.2 RPA5
	suitable scale		1	
	all **bars** plotted correctly	allow ± ½ a small square the bars can be in any order	1	
	all bars labelled correctly		1	

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	blue		1	AO3 4.4.1.2 RPA5

Total Question 2		**17**

4.1.1.5 Microscopy

Answer 06 · Mark scheme

June 2022 | 8464/B/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	both have a cell membrane both have cytoplasm		1 1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	any **one** from: • fever • abdominal / stomach cramps	ignore vomiting / sickness / diarrhoea ignore feel unwell unqualified ignore rashes allow high temperature allow sweating / chills	1	AO1 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	penicillin	allow phonetic spelling	1	AO2 4.3.1.9

4.1.1.5 Microscopy

Answer 06 · Mark scheme

June 2022 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	any **one** from: • only a few bacteria killed so live bacteria continued to reproduce • time delay before antibiotic reached bacteria • time delay before antibiotic could kill bacteria	allow bacteria reproducing when course started allow takes time (for antibiotic) to travel through the body allow takes time (for antibiotic) to work	1	AO3 4.3.1.1 4.3.1.3 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	there were fewer toxins in the body than at day 0		1	AO2 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	to reduce / prevent resistant strains / bacteria developing **or** to reduce / prevent antibiotic resistance (in bacteria)	ignore references to bacteria becoming immune allow because they will get better without taking any antibiotics ignore body will fight the infection unqualified allow some infections are caused by viruses allow because they have been told not to by NHS / NICE	1	AO1 4.3.1.8

4.1.1.5 Microscopy

Answer 06 · Mark scheme

June 2022 | 8464/B/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	B		1	AO2 4.2.2.3 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.8	D		1	AO2 4.2.2.3

Total Question 5		**9**

4.1.1.5 Microscopy

Answer 07 · Mark scheme

June 2023 | 8464/B/1F | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO2 AO1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	AO1
	No relevant content	0	

	Indicative content Method 1 • place ruler on (microscope) stage • focus on (scale on) ruler • measure diameter / width of field of view • in millimetres • replace ruler with slide • focus on cells • use same magnification • estimate / count number of cells that fit (lengthwise) across field of view • (to calculate mean length of onion cells): divide diameter / width of field of view by (estimated) number of cells **or** divide diameter / width of field of view by 3 cells Method 2 • focus on cells • note magnification • take a photograph of the image • calculate a mean: ○ measure length of several cells (3 or more) cells on the photograph ○ add all image lengths together and divide total by number of cells (to calculate mean cell image length) OR ○ measure the length of one cell ○ calculate the real size ○ repeat for other cells (3 or more) ○ calculate the mean real size • (mean) size of real cell = (mean cell) image size / magnification General points • focus under low power first • using focusing knob • then focus at ×100 magnification • reference to how total magnification is calculated • equation: (mean) size of real cell = (mean cell) image size / magnification For **Level 2** attempt at a method to measure cells plus an indication of how to calculate mean length For **Level 3** suitable method and calculation of mean length.		4.1.1.2 4.1.1.5 RPA1

Total Question 7	**6**

4.1.1.5 Microscopy

Answer 08 · Mark scheme

June 2024 | 8464/B/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	**A** – (cell) membrane		1	AO1 4.1.1.1
	B – nucleus		1	4.1.1.2
	C – cytoplasm		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	to control the activities of the whole cell		1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	to release energy in respiration		1	AO1 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4		must be in this order		AO1 4.1.1.2
	stage		1	RPA1
	eyepiece lens	allow eyepiece ignore lens unqualified	1	
	mirror		1	
	objective lens	allow objective ignore lens unqualified	1	

4.1.1.5 Microscopy

Answer 08 · Mark scheme

June 2024 | 8464/B/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	*measurement* 36 (mm)	allow in the range of 35 to 37 (mm)	1	AO2 4.1.1.5
	conversion 36 000 (µm)	allow an answer using student's measurement × 1000	1	
	substitution $\frac{36\,000}{40}$	allow student's converted measurement divided by 40	1	
	magnification 900	do **not** accept if units given	1	

Total Question 1	13

4.1.1.5 Microscopy

AQA

GCSE
COMBINED SCIENCE: TRILOGY

8464/B/1F – BIOLOGY PAPER 1 FOUNDATION TIER

Mark scheme

8464

June 2018

Version/Stage: 1.0 Final

4.1.1.5 Microscopy

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

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MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

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 <u>not</u> 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.

4.1.1.5 Microscopy

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	cell membrane	extra ticks negates marks	1	AO1 4.1.1.2
01.2	engulf pathogens produce antibodies produce antitoxins	extra ticks negates marks	1 1 1	AO1 4.2.2.3 4.3.1.6
01.3	2050 − 100 = 1950	an answer of 1950 scores **2** marks allow **1** mark for a correct subtraction of incorrect values	1 1	AO2 4.3.1.2
01.4	any **one** from: • (more) people vaccinated • (more) people immune • no new measles strain	ignore injections / treatments / medicines unqualified allow vaccine produced allow (more people given) MMR (vaccine) do **not** allow antibiotics ignore less people infected	1	AO2 4.3.1.1 4.3.1.2 4.3.1.7
01.5	any **one** from: • measles is (caused by) a virus • viruses cannot be killed / destroyed by antibiotics	allow measles is not caused by a bacterium allow antibiotics **only** kill / destroy bacteria ignore harmed / treated	1	AO1 4.3.1.1 4.3.1.8 4.3.1.2
01.6	any **one** from: • use of a barrier method of contraception • use of a condom • vaccination / immunisation • avoid sexual intercourse / contact	ignore use of diaphragm ignore use protection / safe sex do **not** accept less sexual intercourse / contact	1	AO1 4.3.1.3

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	any **one** from: • size / shape/ type of paper disc • concentration of antibiotic • volume / amount of antibiotic • (incubation) time • (incubation) temperature	ignore paper disc unqualified allow strength / dosage of antibiotic allow 3 days ignore size of petri dish	1	AO2 4.3.1.8
01.8	to check that the disc / water did not have an effect **or** to make sure it was the antibiotic that had an effect	allow for comparison with the antibiotics allow as a (experimental) control do **not** accept as a control variable	1	AO3 4.3.1.8
01.9	(antibiotic) **A** any **one** from: • (antibiotic **A**) had the larg**est** clear area around it • (antibiotic **A**) killed the **most** bacteria	no marks if wrong antibiotic given	1 1	AO3 4.3.1.8
Total			**13**	

4.1.1.5 Microscopy

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	glucose oxygen	extra ticks negates marks	1 1	AO1 4.4.1.1
02.2	count the number of bubbles produced in 1 minute measure the volume of gas produced in 30 seconds	extra ticks negates marks	1 1	AO3 4.4.1.2
02.3	any **one** from: • to control the temperature • temperature affects the rate of photosynthesis	ignore reference to 'it' allow so pondweed / solution did not warm up allow correct description of effect of temperature on rate allow high temperatures denature enzymes ignore references to limiting factors	1	AO3 4.4.1.2
02.4	52		1	AO2 4.4.1.2
02.5	all points plotted correctly smooth curve drawn through all points	(where a bar chart has been plotted) allow **1** mark for all bars plotted correctly if points are plotted as well as bars, ignore bars allow ± ½ a square allow **1** mark for three points correctly plotted ignore extensions of line / curve unless inconsistent with line / curve drawn	2 1	AO2 4.4.1.2

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	any **one** from: • the nearer the light source to the pondweed the faster the rate of photosynthesis • the greater the light intensity the faster the rate of photosynthesis	allow converse statements for all marking points allow the nearer the light source to the pondweed the faster the bubbles produced allow the greater the light intensity the faster the bubbles produced allow the closer the light source the more the plant photosynthesises ignore more bubbles are produced with no reference to rate allow oxygen for bubbles do **not** accept carbon dioxide	1	AO3 4.4.1.2
Total			**10**	

4.1.1.5 Microscopy

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • water on potato would increase mass • to control amount of water on potato	allow so only the mass of the potato is measured allow to remove water from outside of potato allow liquid / solution / sugar solution for water allow so you get the correct (starting) mass of the potato do **not** accept so that all the pieces of potato weighed the same	1	AO3 4.1.3.2
03.2	increase in mass increase in length	extra ticks negate marks	1 1	AO2 4.1.3.2
03.3	osmosis into lower	in this order only allow diffusion allow inside do **not** accept through allow low / more dilute / dilute	1 1 1	AO1 4.1.3.2 AO2 4.1.3.2 AO2 4.1.3.2
03.4	any **one** from: • the concentration (of sugar solution) in the cells is 0.4 (mol/dm^3) • the concentration (of sugar solution) in the cells is the same as the solution (in the tube)	allow reference to potato instead of cells	1	AO3 4.1.3.2

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	any **two** from: • has (root) hairs • large surface / area • (root) hairs extend into soil • (root) hairs have thin walls	ignore references to active transport and mineral uptake allow root hair cells allow wide surface area allow (root) hairs are long / widespread	2	AO1 4.1.1.3 4.1.3.1 4.1.3.2
Total			**9**	

4.1.1.5 Microscopy

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1		**max 2** marks if written in terms of heart rate		AO2 4.4.2.2
	breathing rate when walking is twice that at rest	allow breathing rate when walking is 12 (breaths / minute) more than at rest	1	
	breathing rate when jogging is 5 times that at rest	allow breathing rate when jogging is 48 (breaths / minute) more than at rest	1	
	breathing rate when jogging is 2.5 times that when walking	allow breathing rate when jogging is 36 (breaths / minute) more than when walking	1	
		allow for **1** mark if no other marks gained: breathing rate at rest is 12 (breaths per minute), breathing rate when walking is 24 (breaths per minute) and breathing rate when jogging is 60 (breaths per minute) **or** breathing rate increases with increasing activity		

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(breathing rate increases)	reference to more / faster required at least once for full marks		AO1 4.4.2.2
	to supply more oxygen / O_2 **or** to supply oxygen / O_2 faster	allow to remove more carbon dioxide / CO_2 **or** to remove carbon dioxide / CO_2 faster do **not** accept incorrectly written formulae	1	
	for (aerobic) respiration **or** to reduce anaerobic respiration **or** to reduce lactic acid build up		1	
	(so) that more energy is transferred / released **or** (because) more energy is required	do **not** accept used / produced / created or energy made	1	
04.3	right ventricle / side of the heart pumps (blood) to the lungs		1	AO1 4.2.2.2
	left ventricle / side of the heart pumps (blood) to the body		1	
		if no other marks scored allow **1** mark for one side pumps blood to the lungs and the other side pumps blood to the body		

4.1.1.5 Microscopy

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any **one** from: • (the left ventricle) has to pump blood further (than the right ventricle) • (the left ventricle) has to pump blood with a greater force (than the right ventricle) • (the left ventricle) has to pump blood at a higher pressure (than the right ventricle)	there must be a comparative statement allow (the left ventricle) has to pump blood all around the body allow (left ventricle) has to pump blood harder	1	AO2 4.2.2.2
04.5	any **one** from: • strengthens heart (muscle) • reduces chance of another heart attack • reduces / controls weight • improves circulation	ignore prevents / no heart attacks allow decreases chance of fatty deposits **or** fat building up (in arteries / blood vessels) allow reduces resting heart rate	1	AO2 4.2.2.2 4.2.2.6
Total			**10**	

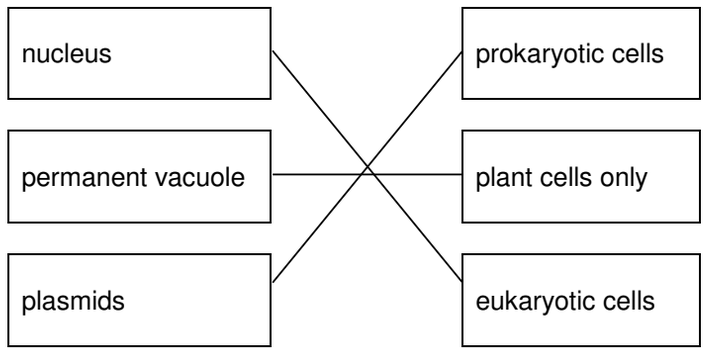
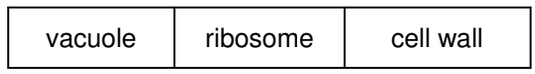
4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	stage 1 → copies of the DNA are made stage 2 → nucleus divides stage 3 → cell divides into two allow **1** mark for 1 or 2 correct credit can be given where students have matched the boxes correctly, for example numbering the boxes		2	AO1 4.1.2.2
05.2	6 picograms		1	AO2 4.1.2.2
05.3	meristem cells in plants can differentiate throughout the life of the plant		1	AO1 4.1.2.3

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	any **two** from: • may cure / treat diseases **or** cure medical conditions **or** produce replacement cells / tissues / organs • cells unlikely to be **rejected** by patient • cells / tissues of any type can be produced • many cells produced • cells produced could be used for research • would reduce waiting time for transplants	ignore references to cost ignore all reference to producing babies / IVF allow example eg diabetes / paralysis allow cells can be stored for future use ignore used in medical treatments ignore patient makes / grows cells / tissues / organs ignore same genetic information ignore differentiated into most types of cells	2	AO3 4.1.2.3 4.1.1.4 4.6.2.4
05.5	any **two** from: • (potential) life is killed / destroyed • shortage of donors / eggs • egg donation / collection has risks • do not yet know risks / side effects of the procedure on the patient • may transfer (viral) infection • poor success rate	ignore references to cost ignore unethical unqualified Ignore reference to religion / beliefs allow embryo is killed ignore embryo is destroyed ignore embryo is a life / becomes a baby ignore long term effects are not well understood allow may cause tumours / cancer allow in terms of viable egg / embryo / cell / tissue / organ production	2	AO3 4.1.2.3 4.1.1.4 4.6.2.4
Total			**8**	

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	 allow **1** mark for one or two correct links		2	AO1 4.1.1.1 4.1.1.2
06.2	 tick box takes precedence if no tick is given, look at both the figure and the circling of words in the table if writing is seen on the figure and in the table both must be correct		1	AO1 4.1.1.2
06.3	turn the (fine focusing) knob until the cells are in focus	allow focus it do **not** accept increase magnification ignore decrease magnification ignore clear ignore references to resolution / illumination ignore zoom in / out	1	AO2 4.1.1.2

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(rotate the) nosepiece / objective lens	allow change the (objective / eyepiece) lens	1	AO2 4.1.1.2
	to a higher power (lens)	allow (to) increase the magnification a comparator is required ignore change / adjust the magnification allow stronger or more powerful lens ignore references to resolution / illumination unqualified ignore zoom in / out ignore references to an electron microscope	1	

4.1.1.5 Microscopy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5		an answer of 400 (×) scores **3** marks		AO2 4.1.1.2
	conversion of units: (112 mm →) 112 000 (µm) **or** (280 µm →) 0.28 (mm)		1	
	(magnification =) $\frac{112}{0.28}$ **or** (magnification =) $\frac{112\,000}{280}$	allow **1** mark for no conversion of units 112 / 280 **or** incorrect value from step 1 correctly substituted	1	
	400 (×)	do **not** accept if units are given	1	
		if no other mark scored allow **1** mark for: magnification = $\frac{\text{size of image}}{\text{size of real object}}$ a triangle with words or letters in is insufficient, as the correct rearrangement is needed		
Total			**9**	

4.1.1.5 Microscopy

MARK SCHEME – GCSE COMBINED SCIENCE: TRILOGY – 8464/B/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	is not caused by a pathogen / infective organism	allow not caused by a microorganism / microbe ignore not caused by infection ignore named pathogen unless bacteria, virus and fungus all mentioned	1	AO1 4.2.2.4 4.2.2.5 4.3.1.1 4.3
	(so) is not passed / spread (from person to person)	allow cannot be spread / caught allow is not infectious / contagious	1	AO2 4.2.2.4 4.2.2.5 4.3.1.1 4.3
07.2		allow 'it' for heart		AO1 4.2.2.4
	reduced / restricted / stopped blood flow	it does not matter where blood flow is restricted to – heart / body	1	
	(so) less oxygen reaches heart (muscle / cells)	must reference heart / it allow no oxygen reaches the heart (muscle / cells)	1	
	(so heart muscle / cells) cannot respire (enough) **or** (so heart muscle / cells) do not release (enough) energy	do **not** accept do not make / produce / create energy ignore references to breathing / suffocation ignore blood clots / blockages	1	

4.1.1.5 Microscopy

Question	Answers	Mark	AO / Spec. Ref.
02.3	**Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2 AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content **medical risk factors:** • high blood pressure • high cholesterol • diabetes • genetic factors • medications **lifestyle risk factors:** • smoking • obesity • lack of exercise • high fat / energy diet • eating insufficient fruit / vegetables • alcohol • high salt intake • exposure to air pollution • certain drugs / correct named drug **examples of links:** • smoking – high bp / cholesterol / fatty deposition • obesity – lack of exercise / high bp / cholesterol / fatty deposition / diabetes • exercise – obesity / bp /diabetes • diet – obesity / cholesterol / diabetes • alcohol – bp / cholesterol • high salt intake - high blood pressure • genetic factors – bp / cholesterol / diabetes / obesity • medication – can affect blood / blood vessels / metabolism the main discriminator is the quality of linking both lifestyle and medical factors are required for **level 3**		4.2.2.2 4.2.2.4 4.2.2.5 4.2.2.6
Total		**11**	

4.1.1.5 Microscopy

Answer 04 · Examiner comments

Question 1 (low & standard demand)

This question was about cells and cell structure. More than half of the students identified the drawings of animal, bacterial and plant cells. Most students could identify the drawing of a bacterial cell. Knowledge of the function of cell structures was variable, but most students knew that the nucleus contains genetic information and many knew that photosynthesis happens in chloroplasts. There was some confusion between the function of the cell membrane and cell wall.

01.3 was about chemicals in cells. Most students knew that cellulose strengthens plant cell walls and many knew that urea is excreted by animals and starch is stored in plant cells. Knowledge of glycogen was set at a higher demand, and few knew that it is stored in animal cells.

In **01.4**, many thought the function of a muscle cell is for strength, which was ignored. A reference to movement or contraction was needed. Approximately a quarter of students scored a mark for saying that muscle cells have many mitochondria, but a weak expression of language in reference to energy meant that very few students gained both marks for **01.5**. Energy being produced, made or created is never credited and students should be encouraged to say that energy is transferred.

Over half of the students gained both marks for calculating the correct magnification. If units were added to the answer this prevented students gaining one mark. Common mistakes included incorrectly substituting into the equation, or multiplying their answer by a factor of 10.

4.1.1.5 Microscopy

Answer 05 · Examiner comments

June 2022 | 8464/B/1F | Original Q2

Question 2 (low & standard demand)

02.1 This question was not answered well. Students did not seem to understand the word adaptation. Some students talked about a protective layer to stop water getting in or out. There were many references to a large surface area, or to the palisade layer being thick or thin. All of these were ignored. A tenth of students scored the mark, usually for saying the layer contained chlorophyll or chloroplasts.

02.2 40% of students thought the small pores on a leaf are called guard cells. A third of students selected the correct answer, stomata.

02.3 More than half of the students scored full marks for calculating the real length of the cell in micrometres. An additional quarter of students scored two marks. This was either for:

- a correct substitution and calculation in mm, or
- a correct substitution and correct conversion of an incorrectly calculated length in mm.

8% of the students scored one mark either for a correct substitution, or for a correct conversion of mm to micrometres.

02.4 39% of students thought carbon dioxide moved in and out of cells by active transport. Slightly fewer selected the correct response, diffusion.

02.5 Very few students scored two marks. A quarter of the students scored a mark for identifying cell A as the cell into which carbon dioxide would move at the fastest rate. For the reason, a definition of diffusion was insufficient; a comparison was required. This would ideally be a comparison between the different cells in Figure 3, although a comparison between the concentration inside and outside the cell was allowed.

02.6 Just under half the students gave the two measurements that would be required to calculate the rate of photosynthesis. 36% of students scored one mark, usually for the number of bubbles produced. References to the distance of the lamp from the pondweed were ignored.

02.7 17% of students scored two marks for two correct control variables. 61% of students scored at least one mark. The most common correct answers were amount of light and the size or type of pondweed.

02.8 Most students could draw a bar chart. 42% of students scored full marks, and an equal proportion scored three marks. A complete label, including units, was needed for the *y*-axis. A suitable scale was 1 cm for every arbitrary unit, although 2 units per cm was allowed. Bars had to be plotted and labelled with the colour of light, not with just a letter.

02.9 The vast majority of students correctly interpreted the results to conclude that blue light would be the best colour of light to grow plants in. The second most common response was green light, selected by less than a tenth of students.

4.1.1.5 Microscopy

Answer 06 · Examiner comments

June 2022 | 8464/B/1F | Original Q5

Question 5 (standard demand)

05.1 A quarter of students scored both marks for identifying the cell membrane and cytoplasm as structures that are found in both bacterial and animal cells. Just over three-quarters scored at least one mark. Two fifths of students incorrectly thought that both types of cell contained a nucleus.

05.2 One symptom of salmonella food poisoning was asked for, with students instructed not to refer to vomiting and diarrhoea. Almost half of the students were awarded the mark, usually for stomach ache or fever. Many described fever as having a high temperature or sweating, which were allowed. A few said 'nausea' which is equivalent to vomiting, and so was ignored. Many references to secondary symptoms of an infection were given, which could have applied to a wide range of infections. For example, tiredness, fatigue, headaches, dizziness, fainting or dehydration. These were all ignored. A primary symptom, such as those given in the specification, was needed.

05.3 36% of students said that penicillin was the first antibiotic developed. A wide range of phonetic spellings were accepted. The most common incorrect answers were the names of well-known painkillers. Quite a lot of students did not attempt the question.

05.4 A fifth of students scored this mark. Most correct responses referred to a time delay before the antibiotics became effective, or started working. A few students said the bacteria would be reproducing or multiplying. There was some confusion with antibodies, and incorrect references to bacteria fighting the antibiotics, or antibiotics fighting bacteria. Some thought that antibiotics make antibodies, whilst others said that the wrong antibiotic had been given.

05.5 Half of the students knew that a child will start to feel better after taking antibiotics for a few days because there will be fewer toxins in the body. Most other students thought the child had become resistant to the bacteria.

Answer 06 · Examiner comments

June 2022 | 8464/B/1F | Original Q5

05.6 15% of students scored the mark, usually for saying overuse of antibiotics could result in antibiotic resistance. Quite a lot of students said the patient or the antibiotic would become resistant, which was incorrect. A common mistake was to confuse immunity with resistance. Many students scored the mark for the idea that the person would get better without taking any antibiotics, which was allowed.

05.7 A third of students thought antibodies are produced by red blood cells, with slightly fewer selecting the correct drawing of the white blood cell. It could be that students were unfamiliar with drawings of blood components.

05.8 A third of students identified platelets as the part of the blood that starts the clotting process. Few selected plasma as their answer.

4.1.1.5 Microscopy

Answer 07 · Examiner comments

June 2023 | 8464/B/1F | Original Q7

Question 7

Question 7 was common to both tiers and was set at standard demand.

The question asked students to describe how a microscope, a transparent ruler and a prepared slide of onion cells could be used to estimate the mean length of onion cells on the slide. Some students described how to prepare the slide, which did not gain credit as the students were told that they were provided with this.
On the Foundation tier most responses were in Level 1. Over half of the students scored at least 1 mark, and a fifth scored 2 or more marks. Some relevant points were given, for example, a correct equation to calculate the actual size of a cell, or a description of how to use a microscope. In order to move into Level 2 an attempt at a method to measure the size of the cells was required, as well as a reference to how to calculate a mean. Very few students on the Foundation tier gave Level 2 responses, and over a tenth did not attempt the question.

4.1.1.5 Microscopy

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.1.1.5 Microscopy

Answer 08 · Examiner comments

June 2024 | 8464/B/1F | Original Q1

Question 1 (low demand)

01.1 Virtually all students labelled the nucleus correctly. Students who gained a second mark usually did so for also correctly labelling the cytoplasm. The most common mistake seen was confusing the cell membrane and cell wall. Several students labelled C as the chloroplast and not the cytoplasm. Half of the students gained all 3 marks.

01.2 The majority (80%) of students gained credit for the function of the nucleus.

01.3 64% of students knew the function of the mitochondria.

01.4 Almost all students achieved at least 2 marks, mostly for the first two marks in the mark scheme. Marking points 3 and 4, however, were mixed up in a variety of ways. 'Focus control' was the most common error for marking point 3, which should have been mirror. Many students were writing ‘focus control’ for the last marking point instead of objective lens. A limited number of students simply stated ‘lens’ instead of eyepiece lens or objective lens for the second statement, and so did not gain the mark.

01.5 Overall the scaffolding of this question did help students to gain marks, and the majority (69%) gained 3 out of the 4 marks available. Many students measured in centimetres instead of millimetres despite the instruction in the question. Many students were unable to correctly convert mm to µm. Some students incorrectly substituted the numbers, although this was the minority. Where students made mistakes, these were wide ranging such as an incorrect conversion from millimetres to micrometres or not dividing by 40 in the substitution section.