AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.2.2

Mitosis and the cell cycle

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**14**
Available paper years	**2008–2025**

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.

4.1.2.2 Mitosis and the cell cycle

Answer 01 · Mark scheme

January 2008 | BLY2F | Original Q3 | Legacy

Question 3

	answers	extra information	mark
(a)	characteristics		1
(b)	genes		1
(c)	chromosomes		1
(d)	mitosis		1
(e)	asexual		1
total			5

4.1.2.2 Mitosis and the cell cycle

Answer 01 · Mark scheme

January 2008 | BLY2F | Original Q3 | Legacy

BLY2F

4.1.2.2 Mitosis and the cell cycle

Answer 02 · Mark scheme

June 2009 | BLY2F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	chromosomes		1
5(b)	diagram showing four separate chromosomes two long and two short (as in diagram 1)	allow each chromosome shown as two joined chromatids do **not** allow if chromosomes touching each other	1
5(c)(i)	any **two** from: • can grow into any type of tissue / named tissue • used in medical research • used to treat human diseases • large numbers can be grown		2
5(c)(ii)	any **two** from: • expensive • grow out of control / ref cancers • may be rejected • need for drugs (for rest of life)		2
Total			**6**

4.1.2.2 Mitosis and the cell cycle

Answer 02 · Mark scheme

June 2009 | BLY2F | Original Q5 | Legacy

BLY2F

4.1.2.2 Mitosis and the cell cycle

Answer 03 · Mark scheme

January 2013 | BL2FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	DNA		1
2(b)	X and Y		1
2(c)(i)	46 chromosomes		1
2(c)(ii)	half the number		1
2(d)	meiosis		1
Total			5

4.1.2.2 Mitosis and the cell cycle

Answer 03 · Mark scheme

January 2013 | BL2FP | Original Q2 | Legacy

BL2FP

4.1.2.2 Mitosis and the cell cycle

Answer 04 · Mark scheme

June 2013 | BL2FP | Original Q3 | Legacy

Question 3

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>3(a)(i)</td><td>
<table>
<tr><th>Feature</th><th>Mitosis only</th><th>Meiosis only</th></tr>
<tr><td>Produces new cells during growth and repair</td><td>✓</td><td></td></tr>
<tr><td>Produces gametes (sex cells)</td><td></td><td>✓</td></tr>
<tr><td>Produces genetically identical cells</td><td>✓</td><td></td></tr>
</table>
All 3 correct = 2 marks
2 correct = 1 mark
0 or 1 correct = 0 marks
</td><td></td><td>2</td></tr>
<tr><td>3(a)(ii)</td><td>(a man) testis / testes
(a woman) ovary / ovaries</td><td>accept testicle(s)
do not accept ‘ova’ / ovule</td><td>1
1</td></tr>
<tr><td>3(b)(i)</td><td>XY / YX
or
X and Y</td><td></td><td>1</td></tr>
<tr><td>3(b)(ii)</td><td>XX
or
X and X or 2 X’s</td><td>accept X</td><td>1</td></tr>
<tr><td>3(c)</td><td>½ / 0.5 / 50% / 1:1 / 1 in 2</td><td>do not accept 1:2 / 50/50
allow 50:50
allow 2 in 4</td><td>1</td></tr>
<tr><td>Total</td><td></td><td></td><td>7</td></tr>
</table>

4.1.2.2 Mitosis and the cell cycle

Answer 05 · Mark scheme June 2015 | BL2FP | Original Q9 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)(i)	in the chromosome(s) in the nucleus	ignore genes / alleles allow nuclei allow mitochondria	1 1	AO1 2.7.2f, 2.7.1b
9(a)(ii)	the DNA / chromosomes / genes are replicated / copied / multiplied / doubled / duplicated	allow DNA is cloned ignore same DNA / chromosomes / genes if unqualified	1	AO1 2.7.1a,c,n
9(b)(i)	1 / one		1	AO2 2.7.2c,e, 2.7.3a,c
9(b)(ii)	2 / two		1	AO2 2.7.2c,d, 2.7.3a,b
9(c)	**B**		1	AO3 2.7.2i
Total			**6**	

4.1.2.2 Mitosis and the cell cycle

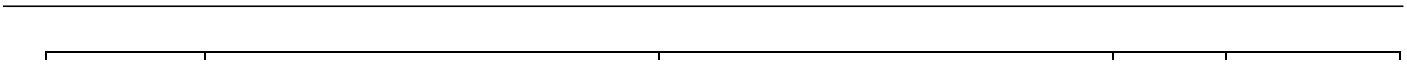
Answer 06 · Mark scheme June 2018 | 8461/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	nucleus		1	AO1 4.1.2.1
01.2	gene(s)	allow allele(s)	1	AO1 4.6.1.4
01.3	copying of chromosomes		1	AO2 4.1.2.2
01.4	mitochondria		1	AO1 4.1.1.2
01.5	60 – 45 **or** 120 – 105 15 (minutes)	an answer of 15 (minutes) scores **2** marks	1 1	AO2 4.1.2.2
01.6	C		1	AO2 4.1.2.2
01.7	8		1	AO2 4.1.2.2
01.8	to repair tissues		1	AO1 4.1.2.2
Total			**9**	

4.1.2.2 Mitosis and the cell cycle

Answer 06 · Mark scheme

June 2018 | 8461/1F | Original Q1



4.1.2.2 Mitosis and the cell cycle

Answer 07 · Mark scheme June 2019 | 8461/1F | Original Q2

02.1	the movement of particles from a high concentration to a low concentration		1	4.1.3.1 AO1
02.2	(gills) have (many) projections (for) large(r) surface / area **or** (gills) are on the outside of the body (1) for good access to water (1)	allow description of projections allow have lots of / five gills	1 1	4.1.3.1 AO2
02.3	differentiation		1	4.1.2.3 AO1
02.4	mitosis	do **not** accept meiosis	1	4.1.2.2 AO1
02.5	hair		1	4.1.2.2 4.1.2.3 AO1
02.6	axolotls are cheap to feed axolotls are easy to breed		1 1	4.1.2.3 AO3
02.7	D		1	4.2.2.2 AO1
02.8	trachea	allow windpipe allow cartilage (ring)	1	4.2.2.2 AO1
02.9	pulmonary artery		1	4.2.2.2 AO1
Total			**11**	

4.1.2.2 Mitosis and the cell cycle

Answer 07 · Mark scheme

June 2019 | 8461/1F | Original Q2

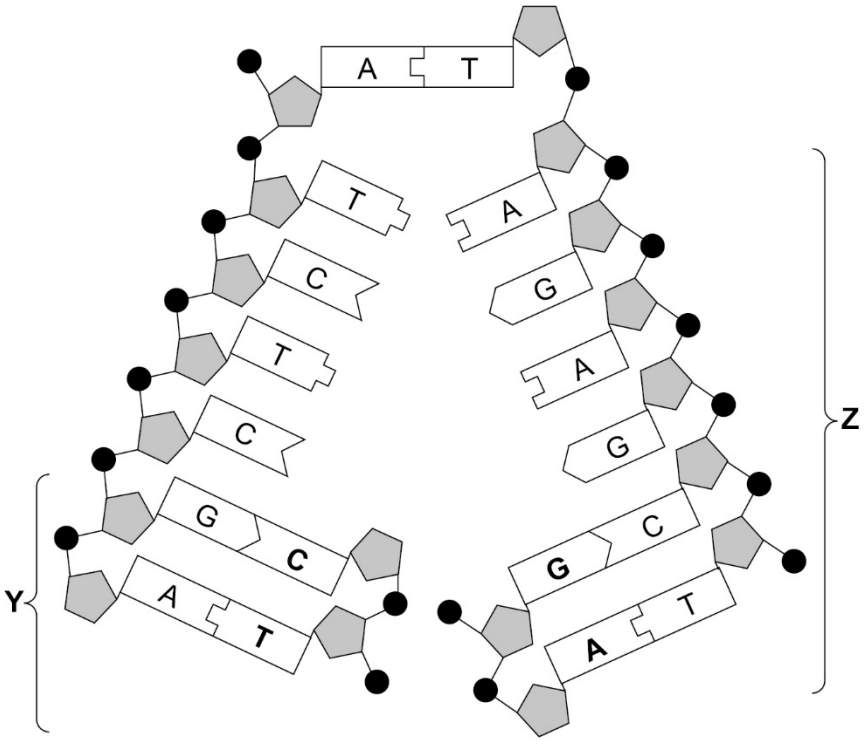
Answer 08 · Mark scheme

November 2020 | 8461/1F | Original Q2

The full source mark scheme begins on page 29. Follow original question 2 in that document.

4.1.2.2 Mitosis and the cell cycle

Answer 09 · Mark scheme November 2021 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	chromosome(s)	allow chromatid(s) / gene(s) / allele(s)	1	AO1 4.6.1.4
08.2	sugar	allow deoxyribose allow pentose do **not** accept ribose	1	AO1 4.6.1.5
08.3	base(s)	allow nitrogenous base(s) allow adenine **and** cytosine **and** guanine **and** thymine	1	AO1 4.6.1.5
08.4		all four required for the mark	1	AO3 4.6.1.5

4.1.2.2 Mitosis and the cell cycle

Answer 09 · Mark scheme

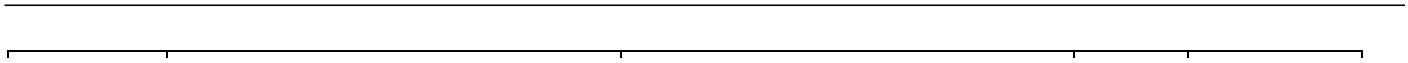
November 2021 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	replication		1	AO3 4.6.1.5 4.1.2.2
08.6	protein	allow polypeptide	1	AO1 4.6.1.4
08.7	3×10^{-12} grams		1	AO2 4.6.1.2
08.8	meiosis		1	AO1 4.6.1.2
Total			**8**	

4.1.2.2 Mitosis and the cell cycle

Answer 09 · Mark scheme

November 2021 | 8461/2F | Original Q8



4.1.2.2 Mitosis and the cell cycle

Answer 10 · Mark scheme

June 2022 | 8461/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	$\frac{1}{4}$		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	10		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	grows replicates divides	must be in this order	1 1 1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	C		1	AO3 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	10%		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	circulatory system		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	cardiovascular disease / CVD **or** (coronary) heart disease / CHD	allow heart attack allow any correctly named heart condition eg arrhythmia, hole in the heart	1	AO1 4.2.2.4 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	any **one** from: • unethical • (against) religious / cultural / personal beliefs • the method is not (fully) tested • risk of infection • (heart cells) may be rejected	 allow examples of unethical such as destroying a (potential) life allow against God's will ignore religion unqualified allow the method might not work allow may cause side effects	1	AO2 4.1.2.3 4.2.2.4

Total Question 2		10

4.1.2.2 Mitosis and the cell cycle

Answer 11 · Mark scheme

June 2023 | 8461/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	vector		1	AO1 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	any **two** from: • (it has) mitochondria • (it has a) nucleus • (it has) no plasmids	if neither mark awarded, allow **1** mark for protist has membrane-bound structures allow it does not have a loop of DNA allow other appropriate features do **not** accept (it has) cytoplasm do **not** accept (it has) a (cell) membrane do **not** accept it has no cell wall	2	AO2 4.3.1.5 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	Salmonella		1	AO2 4.1.1.1 4.3.1.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	only one parent is involved		1	AO1 4.3.1.5 4.6.1.1

4.1.2.2 Mitosis and the cell cycle

Answer 11 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	14		1	AO2 4.3.1.5 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	decreased haemoglobin		1	AO2 4.3.1.5 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7		allow alternative route allow correct conversion to standard form at any stage		AO2 4.3.1.5
	$\frac{210\ 000\ 000}{2}$ **or** 105 000 000	allow $\frac{210 \text{ million}}{2}$ **or** 105 million	1	
	105 000 000 × 3	allow 105 million × 3	1	
	315 000 000	allow 315 million	1	
	3.15×10^8		1	

4.1.2.2 Mitosis and the cell cycle

Answer 11 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	any **two** from: • wear long(er) sleeves / clothes • use insect repellent or insecticides • don't go out in the evening • avoid going to countries / places with malaria / mosquitos • destroy breeding grounds • release sterile male mosquitos	ignore vaccination / anti-malarial drugs allow reduce bare skin exposure allow insect repellent methods such as citronella candles allow close doors / windows in the evening allow methods of destroying breeding grounds such as drain water holes allow other correct suggestions	2	AO2 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.9	percentage / chance (of getting malaria) decreases (with age) correct use of data such as two pairs of data from **Table 4**	do **not** accept percentage / chance of having disorder **S** decreases with age allow use of processed data	1 1	AO3 4.2.2.5 4.3.1.5

Total Question 4	15

4.1.2.2 Mitosis and the cell cycle

Answer 12 · Mark scheme

June 2023 | 8461/1F | Original Q5

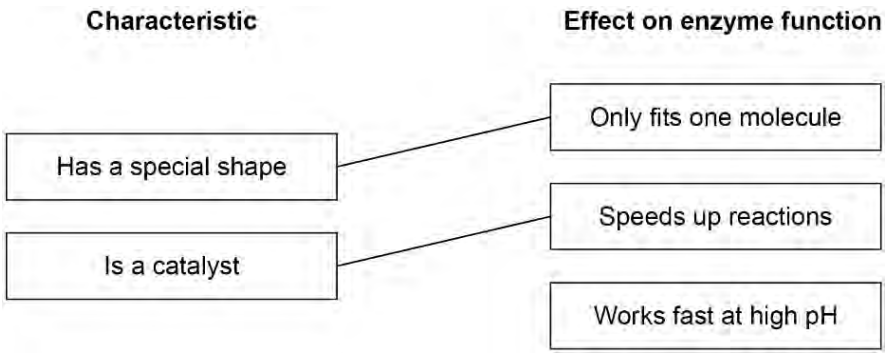
Question 5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.1	any **one** from: • growth • development	allow replacement (of old cells) allow for repair allow to heal wounds	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	amino acids		1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.3	Biuret reagent		1	AO1 4.2.2.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.4	purple		1	AO1 4.2.2.1 RPA4

Question	Answers	Mark	AO / Spec Ref.
05.5	 do **not** accept more than one line from a box on the left	1 1	AO1 4.2.2.1

4.1.2.2 Mitosis and the cell cycle

Answer 12 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.6	9	allow answer in the range 8.5 to 9.5	1	AO3 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.7	fastest breakdown is at pH 2	allow acid **or** low pH for pH 2 throughout allow maximum / most breakdown is at pH2 allow works best at pH 2 allow (it / pH2) is the optimum pH allow a tolerance of ± 0.5 pH units	1	AO2
	stomach has (hydrochloric) acid		1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.8	active site		1	AO2 4.2.2.1
	substrate		1	

4.1.2.2 Mitosis and the cell cycle

Answer 12 · Mark scheme

Question	Answers	Mark	AO / Spec Ref.
05.9	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5-6	AO2 4.2.2.1 RPA4 RPA5
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method 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	
	No relevant content.	0	
	Indicative Content: • add iodine solution to spotting tile • use measuring cylinder • (to) add amylase (solution), pH solution and starch (solution) together • start the timer • use pipette • (to) remove a drop of mixture at regular intervals (e.g. every 30 seconds) • add drop of mixture to iodine (solution) • if starch is present, mixture and iodine (solution) turns blue / black • continue until the iodine (solution) and the mixture remain yellow / orange / brown • record the time taken for the mixture to remain orange • repeat at different pH • compare times at each pH (control variables): • volume of starch (solution) / amylase (solution) / pH solution / iodine (solution) • concentration of starch (solution) / amylase (solution) / pH solution / iodine (solution) • temperature for Level **3** reference to control variables in an investigation involving different pHs is required for Level **2** students must describe the mixing of amylase, starch and a buffer at different pH values		

Total Question 5	17

4.1.2.2 Mitosis and the cell cycle

Answer 13 · Mark scheme

June 2024 | 8461/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.1	ionising radiation viruses		1 1	AO1 4.2.2.5 4.2.2.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	mitosis		1	AO1 4.2.2.7 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.3	grow replicate	must be in this order	1 1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.4	40%		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.5	chromosomes are pulled to each end of the cell		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.6	(cell) membrane		1	AO2 4.1.1.2

4.1.2.2 Mitosis and the cell cycle

Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.7	$\frac{50}{800}$ 0.0625 (mm) 62.5 (µm)	allow conversion to µm at any stage in the calculation allow correct conversion from student's incorrect calculation	1 1 1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.8	cells people	must be in this order	1 1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.9	placebo	allow placebo effect ignore examples and descriptions of placebos	1	AO1 4.3.1.9

Total Question 5	14

4.1.2.2 Mitosis and the cell cycle

Answer 14 · Mark scheme

June 2025 | 8461/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	testis / testes / testicle(s)		1	AO1 4.5.3.4 4.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	**A** = 46 **D** = 23	if no other mark awarded allow **1** mark for **A** = 92 **and D** = 46	1 1	AO1 4.6.1.2 4.6.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	fertilisation		1	AO1 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	pollen		1	AO1 4.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	mitosis		1	AO1 4.1.1.6 4.1.2.2 4.6.1.1 4.6.1.2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	sugar water		1 1	AO2 4.4.1.3 4.2.3.2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	any **one** from: • produces (genetic) variation (in offspring) • (seeds / fruits) can be dispersed (to new areas) • many seeds / offspring produced • offspring not competing (for light / water / ions) • can survive in a new environment • enables evolution	allow offspring are not (genetically) identical allow description of an advantage of variation eg not all killed by one pathogen / disease	1	AO1 4.6.1.1 4.6.1.3 4.6.2.2 4.6.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	any **one** from: • fast • many offspring produced • (genetically) identical offspring • only one parent needed • offspring less vulnerable (as attached to parent) • offspring receive water from parent • can out-compete other species • can colonise local area • less energy is needed	allow they are clones allow offspring receive named example of nutrient from parent allow pollinators / bees not required	1	AO1 4.6.1.1 4.6.1.3 4.6.2.2 4.6.3.1

Total Question 3	10

AQA

GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

jun2084611F/MS

MARK SCHEME – GCSE BIOLOGY – 8461/1F – JUNE 2020

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 Examiner.

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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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 <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.

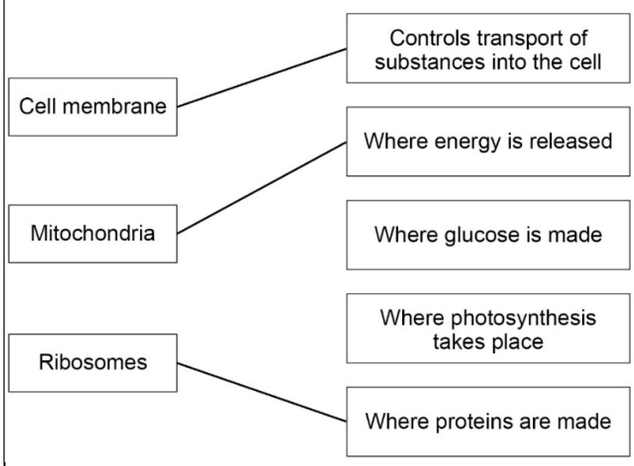
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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.

4.1.2.2 Mitosis and the cell cycle

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	bacterium		1	AO2 4.1.1.1
01.2	to strengthen the cell		1	AO1 4.1.1.1 4.1.1.2
01.3	chloroplast		1	AO2 4.1.1.2 4.2.3.1
01.4	**Structure** **Function**  additional line from a box on the left negates the mark for that box		3	AO1 4.1.1.2 4.1.3.1
01.5	adjust the focus knob		1	AO3 4.1.1.2 RPA1
01.6	(A =) 15 (mm) (B =) 60 (mm)	allow a tolerance of ± 1mm	1 1	AO2 4.1.1.2 RPA 1
01.7	$\frac{60}{15} = 4(.0)$	allow ecf from question **01.6**	1	AO2 4.1.1.2 RPA 1

4.1.2.2 Mitosis and the cell cycle

01.8	$\frac{40}{0.1}$ 400	 do **not** accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			**12**	

4.1.2.2 Mitosis and the cell cycle

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	mitosis		1	AO1 4.1.2.2
02.2	all lines correct = **2** marks 1 or 2 lines correct = **1** mark **Stage of cell cycle** / **What happens during that stage** Stage 1 → The cell grows and the chromosomes replicate Stage 2 → One set of chromosomes is pulled to each end of the cell Stage 3 → The cytoplasm and cell membrane divide to form two new cells additional line from a box on the left negates the credit for that box		2	AO1 4.1.2.2
02.3	$\frac{7}{10} \times 100$ 70(%)	allow $\frac{252}{300} \times 100$ allow answer calculated from angle in range 250° to 254° if no other mark awarded, allow 0.7 for **1** mark	1 1	AO2 4.1.2.2
02.4	3		1	AO2 4.1.2.2
02.5	DNA	allow deoxyribonucleic acid	1	AO1 4.1.2.1 4.1.2.2
02.6	a gene		1	AO1 4.1.2.1

4.1.2.2 Mitosis and the cell cycle

02.7	(bone marrow) cells differentiate into many / other types of (named) cell (so) will cure diseases where new cells are needed **or** will cure diseases where cells are damaged	allow (bone marrow) cells can become many / other types of (named) cell allow (so) will cure anaemia / leukaemia **or** blood cancer **or** blood disorders allow (so) will cure paralysis / diabetes	1 1	AO1 AO2 4.1.2.3
Total			**10**	

4.1.2.2 Mitosis and the cell cycle

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **one** from: • bacteria • fungi • protists	allow singular allow names of pathogens e.g. Salmonella ignore virus / germ	1	AO1 4.3.1.1 4.3.1.3 4.3.1.5
03.2	hydrochloric acid is produced by the stomach the skin is a barrier covering the whole body		1 1	AO1 4.2.2.1 4.3.1.6
03.3	white blood cells engulf the microorganisms.		1	AO1 4.2.2.3 4.3.1.6
03.4	weakened fast	in this order only	1 1	AO1 4.3.1.7
03.5	by coughs / sneezes	allow 'by droplets in the air' do **not** accept other means of transmission e.g. touch	1	AO1 4.3.1.1 4.3.1.2
03.6	(from day) 10 (to day) 18	allow (from day) 18 (to day) 10	1	AO2 4.3.1.2
03.7	14 (days)	allow in the range 13 to 15 (days)	1	AO3 4.3.1.2
03.8	any **one** from: • they had been vaccinated • they already had antibodies • they were immune • they had had it before • they did not get any / enough virus from infected child • they did not play (much) with the infected child	 ignore they were resistant ignore they wore a mask unqualified	1	AO3 4.3.1.2 4.3.1.7

4.1.2.2 Mitosis and the cell cycle

03.9	antibiotics do not kill viruses	allow antibiotics do not work on viruses allow antibiotics only kill bacteria	1	AO3 4.3.1.8
Total			**11**	

4.1.2.2 Mitosis and the cell cycle

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	increased (at first) until 4 minutes **or** 50 breaths per minute (then) stayed constant (from 4 minutes **or** at 50 breaths per minute)		1 1 1	AO2 4.4.2.2
04.2	175 (beats per minute)		1	AO2 4.4.2.2
04.3	140 (beats per minute)		1	AO2 4.4.2.2
04.4	because his rate is lower than the maximum safe rate	allow ecf for incorrect values in question **04.2** and question **04.3**	1	AO3 4.2.2.2 4.4.2.2

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04.5	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2
	No relevant content	0	

	Indicative content
	
	• heart rate increased
	  ○ to increase blood flowing to muscles / lungs
	  ○ to provide more oxygen (to muscles)
	  ○ to provide more glucose (to muscles)
	  ○ to remove carbon dioxide more quickly (from the muscles / blood)
	  ○ to remove lactic acid more quickly (from the muscles)
	
	• breathing rate increased
	  ○ supplies more oxygen / air to lungs
	  ○ so more oxygen to blood
	  ○ more carbon dioxide removed
	
	• more oxygen to muscles
	  ○ needed for (increased) respiration
	  ○ to release / provide energy
	  ○ for muscle contraction
	
	• anaerobic respiration occurs
	  ○ due to lack of oxygen
	  ○ which causes a build-up of lactic acid
	  ○ oxygen debt
	  ○ muscle fatigue / pain
	
	To reach **Level 3**, there must be reference to heart rate, breathing rate and respiration
			4.2.2.2
			4.2.2.3
			4.4.2.1
			4.4.2.3
			4.4.2.2

Total			**12**

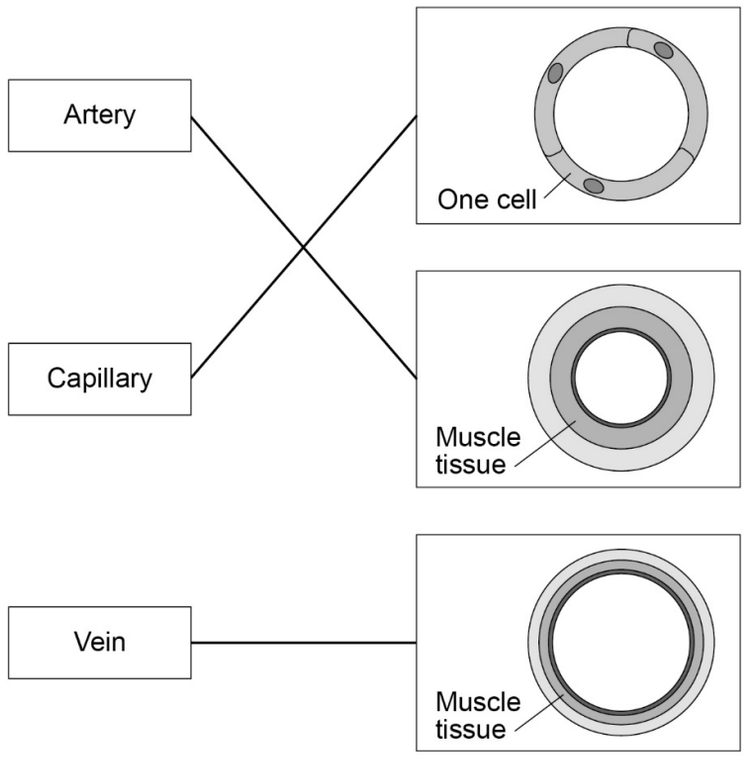
4.1.2.2 Mitosis and the cell cycle

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	will stop animals / herbivores eating it	allow it will not be eaten	1	AO3 4.3.3.2
05.2	chemical		1	AO1 4.3.3.2
05.3	thorns / spikes / spines / prickles (to stop animals / herbivores eating it)		1	AO3 4.3.3.2
05.4	for respiration to store as starch		1 1	AO1 4.4.1.3 4.4.2.1
05.5	add Benedict's (solution / reagent to the liquid) boil / heat (if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red	 allow any temperature of 65 °C or above	1 1 1	AO1 4.2.2.1 RPA 4
05.6	(nitrate ions are needed) to make proteins / amino acids which are needed for growth / enzymes / new cells	allow to make chlorophyll / DNA / ATP / nucleic acid allow correct process for named molecule in mp1	1 1	AO1 AO2 4.1.3.3 4.4.1.3 4.4.2.3
05.7	in / on the (soil) water	allow through air (spaces) in the soil	1	AO3 4.3.1.1 4.3.1.4
05.8	dosage toxicity		1 1	AO1 4.3.1.9

4.1.2.2 Mitosis and the cell cycle

05.9	placebos		1	AO1 4.3.1.9
Total			**14**	

4.1.2.2 Mitosis and the cell cycle

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	all lines correct = **2** marks 1 **or** 2 lines correct = **1** mark **Type of blood vessel** / **Structure of blood vessel**  additional line from a box on the left negates the credit for that box		2	AO2 4.2.2.2

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06.2	any **one** from: • thick(er) (muscle) walls / tissue (1) to push blood (all) around the body (1) **or** • thick(er) elastic walls / tissue (1) to maintain / withstand high (blood) pressure **or** to retain / regain shape (1) **or** • narrow lumen (1) to maintain high (blood) pressure (1)	allow to withstand high (blood) pressure do **not** accept to pump blood (all) around the body	2	AO1 4.2.2.2
06.3	(A) – white (blood) cell(s) (B) – platelet(s)	allow any named white (blood) cell(s)	1 1	AO2 4.2.2.3
06.4	(no nucleus) more space for haemoglobin / oxygen (has haemoglobin) to bind / carry oxygen	allow to carry more oxygen ignore carries carbon dioxide	1 1	AO3 4.1.1.2 4.1.1.3 4.2.2.3
06.5	plasma		1	AO1 4.2.2.3
06.6	platelets		1	AO3 4.2.2.3

06.7	any **one** from: • (continued) bleeding • (more) bruising	allow described allow blood does not clot (at cuts) allow ecf from answer to question **06.6**	1	AO3 4.2.2.3
Total			**11**	

4.1.2.2 Mitosis and the cell cycle

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	*before arrow* carbon dioxide **and** water *after arrow* glucose	allow correct chemical symbols ignore any attempt at balancing equation ignore light / chlorophyll either order ignore sugar / carbohydrate do **not** accept starch	 1 1	AO1 4.4.1.1
07.2	light (light) is captured / trapped / absorbed by chlorophyll / chloroplasts	ignore description of subsequent parts of the photosynthesis reaction allow sunlight ignore sun allow (light) is used by chlorophyll / chloroplasts	 1 1	AO1 4.1.1.2 4.4.1.1
07.3	$\frac{(18.5 + 19.3 + 19.5)}{3}$ **or** $\frac{57.3}{3}$ 19.1 (cm^3/hour)	 allow an answer correctly calculated using only two correct values	1 1	AO2 4.4.1.2 RPA 6
07.4	a ring around 14.2	allow clear indication of correct result	1	AO3 4.4.1.2 RPA 6

4.1.2.2 Mitosis and the cell cycle

07.5	any **one** from: • scale / value was misread • there was air / oxygen in the syringe / measuring cylinder / apparatus • the lamp / light was moved • temperature changed • had different mass / length of pondweed • pondweed had not acclimatised	ignore human error ignore references to counting bubbles or time allow measurement error allow light intensity changed ignore different bulb / lamp unqualified	1	AO3 4.4.1.2 RPA 6
07.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
07.7	any **one** from: • light (intensity) • carbon dioxide (concentration) • pondweed size / amount • pondweed species	do **not** accept temperature ignore time allow distance / power / colour of lamp / light allow same (piece of) pondweed	1	AO3 4.4.1.2 RPA 6
07.8	enzyme(s) lose the shape of the active site	allow enzyme(s) (start to) denature allow enzyme(s) destroyed / damaged do **not** accept enzyme(s) killed	1	AO2 4.2.2.1

4.1.2.2 Mitosis and the cell cycle

07.9	y-axis labelled '(rate of) photosynthesis in cm^3/hour'		1	AO2 4.4.1.2 RPA 6
	suitable scale on y-axis	must take up half or more of grid provided	1	
	all points plotted to within ± ½ small square	allow 3 or 4 correct plots for **1** mark ignore any attempt to plot a point at 20 °C	2	
	correct curved line of best fit	ignore line joined point to point with straight lines ignore extrapolation	1	
Total			**16**	

4.1.2.2 Mitosis and the cell cycle

MARK SCHEME – GCSE BIOLOGY – 8461/1F – JUNE 2020

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	movement / spreading out of molecules / particles	allow movement / spreading out of (named) substances / chemicals / gases / liquids ignore reference to membranes / cells	1	AO1 4.1.3.1
	from (an area of) high(er) concentration to (an area of) low(er) concentration	allow down / with the concentration gradient ignore along / across the concentration gradient do **not** accept movement from / to a concentration gradient	1	
08.2	increased carbon dioxide concentration in the air		1	AO2 4.1.3.1 4.2.3.2
	increased number of stomata that are open		1	

08.3	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.1.3.1 4.2.2.2 4.2.2.3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	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
	• (many) alveoli
	  • provide a large(r) surface area (**:** volume)
	
	• capillaries are thin
	  or alveoli / capillary walls are thin **or** one cell thick
	  or capillaries are close to the alveoli
	  • which provides short diffusion path (for oxygen / carbon dioxide)
	
	• breathing (mechanism) moves air in and out
	or lungs are ventilated
	  • to bring in (fresh) oxygen
	  • to remove carbon dioxide
	  • to maintain a concentration / diffusion gradient`
	
	• large capillary network (around alveoli)
	or good blood supply
	  • to remove oxygen(ated blood) quickly
	  • to bring carbon dioxide to the lungs quickly
	  • to maintain a concentration / diffusion gradient		

4.1.2.2 Mitosis and the cell cycle

08.4	Osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
08.5	active transport (because) energy is needed (to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)	 allow (to move nitrate ions) against / up the concentration gradient allow (because) there is a lower concentration (of nitrate ions) in the soil **or** (because) there is a higher concentration (of nitrate ions) in the root / cell ignore reference to amount / number of nitrate ions ignore along / across the concentration gradient do **not** accept if reference to molecules / atoms moving	1 1 1	AO3 AO2 AO2 4.1.1.3 4.2.3.2 4.1.3.3
Total			**14**	

4.1.2.2 Mitosis and the cell cycle

Answer 08 · Examiner comments November 2020 | 8461/1F | Original Q2

Question 2 (low & standard demand)

In **02.3**, whilst there is no expectation for students to use a protractor to measure angles, this was occasionally seen. **02.7** was not answered well due to weak use of language, with 4% of students gaining both marks, and 23% gaining one mark. Many students talked generally about new cells replacing the old ones, and some new cells actually 'fixing' or repairing the damaged cells. The idea of stem cells 'adapting' was a common occurrence, as was a repeat of the stem of the question, in relation to stem cells becoming specialised. A few students thought that stem cells were made of plastic or metal (confusing them with replacement heart valves). There was confusion from some students regarding the bone marrow itself being damaged.

Answer 10 · Examiner comments June 2022 | 8461/1F | Original Q2

Question 2 (Low demand)

02.1 It was clear that many students had not previously had experience of viewing cells in different stages of division under a microscope, with just over a quarter of students gaining the mark in this question.

02.2 Students' understanding of mitosis maintaining the chromosome number was poor, with less than 40% of students gaining the mark in this question. The most common incorrect answer was 5, perhaps because students were confusing the process with meiosis, where the chromosome number is halved.

02.3 Many students struggled to select the correct terms to describe the cell cycle in this question, often confusing the word 'contracts' with 'divides'.

02.4 Nearly all students were able to determine the longest part of the cell cycle from **Figure 2**.

02.5 Over three quarters of students were able to calculate that stage **A** in **Figure 2** represented 10%, with the most common incorrect answer being 15%.

02.6 Over 75% of students were able to correctly identify the heart as being part of the circulatory system, with the most common incorrect answer being the respiratory system.

4.1.2.2 Mitosis and the cell cycle

Answer 10 · Examiner comments June 2022 | 8461/1F | Original Q2

02.7 Less than half of students were awarded a mark in this question. Common incorrect answers did not relate to the heart, such as diabetes, and students are reminded of the need to read all questions carefully, to avoid such errors. In addition, some students named parts of the heart rather than medical conditions, perhaps indicating that they had not read the question properly. 'Chronical' heart disease was more commonly seen than anticipated and cancer was often given, which was not creditworthy.

02.8 Over 55% of students gained credit in this question, with the most common answers relating to religious or personal beliefs. Occasionally, risk of infection was seen but rejection was a rarity. This is the type of question where many students had the right idea, but articulated themselves poorly and so did not get the mark. Vague descriptions such as 'they don't agree with it' were not given credit.

4.1.2.2 Mitosis and the cell cycle

Answer 11 · Examiner comments

June 2023 | 8461/1F | Original Q4

Question 4 (Low and standard demand)

04.1 Nearly two thirds of students knew the term 'vector' correctly describes the mosquito.

04.2 Although the question states that Figure 2 showed a (single) cell of a malarial protist, some students remained confused and believed that there were 'cells depicted within a cell'. Others incorrectly discussed the absence of plant cell features, such as 'no chloroplasts', while others got prokaryotic and eukaryotic cells muddled. Reference to size was ignored. While 25% of students failed to gain any marks, the most frequently seen correct feature was 'nucleus', followed by 'mitochondria'. Phonetic spellings were obviously allowed as students have difficulty in spelling both of these words. As in all questions of this nature, the 'list rule' applied so that where a student gave 3 answers, 2 of which were correct and 1 wrong, only one mark could be given.

04.3 Over two thirds of students gained the mark by selecting *Salmonella* to be prokaryotic. While the remaining students indicated 'cow' or 'grass', in equal amounts.

04.4 Around 77% of students knew that asexual reproduction involved only one parent.

04.5 It is clear that many students still remain unclear about the number of chromosomes involved in mitosis. Only around a third of students correctly selected '14' as the number of chromosomes each new protist cell would have after mitosis. The most common incorrect answer seen was '28', which was selected by a further third of the students.

04.6 Around half of students were correct in selecting 'decreased haemoglobin' as a change that would happen in the blood of a person with malaria.

04.7 Nearly 35% of students who are adept at mathematics found this question very straightforward and an easy route to four marks. A further 31% managed three marks, via many routes, but most commonly by reaching the point of 350 million but then failing to convert to standard form or incorrectly doing so. Others forgot that the question referred to 'millions' of people being infected and used 105 and 315 but, nevertheless, an answer of 3.15×10^2 was still awarded three marks.

04.8 Many students were aware of what should be done to reduce the chance of being bitten by mosquitoes but then used inadequate scientific language to express themselves and as such only around 13% of students gained both available marks. Answers such as 'cover yourself up' or 'use bug spray / repellent' were not credited. 'Wear more / thicker clothes' was also deemed insufficient and 'close windows / doors' also failed to get credit without qualifying that this was only important in the evenings. Some correctly suggested not going to places with mosquitoes or where there was an incidence of malaria and a few answers referred to destruction of breeding grounds. Other correct suggestions were also awarded credit, but overall 42% of students scored zero marks.

04.9 Nearly three quarters of students gained one mark here for correctly describing that the chance of getting malaria decreased with age. A few incorrectly understood the context of disorder S, however, and said that the likelihood of having this, rather than malaria, was lower as age increased. Even though the instruction given in the question was to use data

4.1.2.2 Mitosis and the cell cycle

Answer 11 · Examiner comments June 2023 | 8461/1F | Original Q4

from Table 4 only around 10% of students went on to gain the second mark for an appropriate use of figures. Some, unfortunately, glanced too quickly at the results and believed there was a decrease of 5% every 2 years.

4.1.2.2 Mitosis and the cell cycle

Answer 12 · Examiner comments

June 2023 | 8461/1F | Original Q5

Question 5 (Low and standard demand)

05.1 This question asked why a person needs new cells. The context was of mitosis but many students lost this focus. Although many referred to 'growth' some failed to give complete answers by focusing only on the fact that 'cells die', and not go on to say that new cells had to be made to **replace** these dead cells. Other vague responses included, 'to keep us alive' / 'to fight disease' / 'to keep us healthy' / 'to get stronger'. The mention of 'protein' in the question stem also led some to mistakenly bring 'denaturation' into their responses. Nearly half of students articulated themselves adequately to gain the mark.

05.2 Over 67% of students knew that proteins were made from amino acids.

05.3 Students continue to be confused between the Benedict's reagent and Biuret reagent, and this was shown here with more than half of students failing to select Biuret as the correct answer.

05.4 Over half of students knew that purple was the colour seen in a positive test for protein.

05.5 It was pleasing that over three quarters of students gained two marks here for correctly linking the characteristic of enzymes, with the effect on its function. Students should be reminded that they must not draw more than one line from a box on the left in these questions, as this will not gain credit.

05.6 The majority of students were able to identify the optimum pH for enzyme Y using the graph provided. Of the 16% who did not gain credit, they were often only marginally out of the accepted range.

05.7 This question was in the context of a graph (Figure 3) showing the rate of protein breakdown by two enzymes in respect of pH. The ability to process and understand this data discriminated well between students, with only just over 16% of students gaining 2 marks. Good answers described how enzyme X worked best at pH 2 (or in low pH or acidic conditions) and then explained that this was the same pH level as that found in the stomach. Some students incorrectly stated the enzyme itself was acidic. The first marking point was only awarded if students understood from the graph that the enzyme worked best / maximally / optimally at pH 2. Comparative words such as 'better' or 'faster' were insufficient. Knowledge of acid being present in the stomach was more evident but this was then often linked with confusing statements such as 'so enzyme X will neutralise the acid'. The fact that the graph showed breakdown of protein by a second enzyme Y led some to mistakenly think that they had to compare the two. The question context of digestion and pH confused others who drifted into discussions of amino acids / fatty acids. Students should be advised not to refer to 'it' in answers except where there can be no ambiguity. In this question 'it' could have meant either enzyme X or the stomach. Just under half of students scored zero marks for this question.

05.9 This levelled response question required students to describe a method to investigate the effect of pH on the rate of starch breakdown by amylase, based on the required practical activities 4 and 5 in the specification. It was hoped that the procedures involved in the investigation would be familiar to students but many struggled with writing clear and coherent

Answer 12 · Examiner comments June 2023 | 8461/1F | Original Q5

answers. It was very evident when students had been exposed to the required practical activities, and indeed almost 15% of students did not even attempt a response, and a similar percentage scored zero marks.

Figure 4, showed some of the apparatus used as an aid to help students in their responses. It was evident, however, that many were unfamiliar with spotting tiles, and mistook them for test tube racks or otherwise believed that the 'dimples' could accommodate large volumes of solutions. Required practical activities include the use of appropriate equipment. In this case, appreciation of how to use a pipette, a measuring cylinder and a timer, as shown in Figure 4, could have earned credit in answers. Answers could have been given in bullet point or numbered form – in fact, this method might well have helped students organise their thoughts.

Only around 1.3% of students achieved 5 or 6 marks, showing clear, logical sequencing of the investigation and evidence of how valid results might have been obtained.

Level 3 students routinely included reference to:

- appropriate mixing of amylase, pH and starch solutions
- timed additions of the mixture to iodine solution
- recorded time for the mixture to remain orange
- repeated experiments at different pH levels
- evidence of at least one variable having been controlled

Just under 16% of students gave a level 2 response, where students included mention of appropriate mixing of amylase, pH and starch solutions as well as referencing repeated experiments at different pH levels.

The majority of students gave answers that matched a level 1 response only. Marks within level 1 were dependent upon the degree to which indicative content points were mentioned. Students very often managed to achieve 2 marks by simply referring to the use of equipment given in Figure 4.

4.1.2.2 Mitosis and the cell cycle

Answer 13 · Examiner comments

June 2024 | 8461/1F | Original Q5

Question 5 (low and standard demand)

05.1 73% of students scored one mark in this question, in comparison to 24% who scored two marks. The most common incorrect response was the selection of monoclonal antibodies rather than viruses. Students should be reminded to check the instructions given at the start of the question, as a minority only ticked one box, rather than two.

05.2 48% of students correctly identified mitosis as being the type of cell division occurring in cancer cells. The majority of incorrect responses were for binary fission.

05.3 69% of students achieved two marks in this question, but it was clear from the number of answer changes that many had deliberated over their responses to this question. Students should be reminded that if they change their minds in any question, they should clearly cross out and rewrite their answers rather than relying on unclear arrows which may possibly be misinterpreted.

05.4 86% of students answered this question correctly.

05.5 66% of students answered this question correctly.

05.6 53% of students gave the correct answer. Many students found identifying the cell membrane from a cell photograph more difficult than from a diagram. The context of cell division led some to give 'egg cell' or 'zygote' and others to suggest the 'nucleus' in their answer. Other incorrect responses included 'cell wall' despite the fact that the picture was of an animal cell.

05.7 In this calculation, which was well answered, nearly two thirds of students achieved full marks. Students were asked to calculate the real width of a cell using figures and an equation given in the question. Most students managed to complete the substitution step correctly although some used the figures the wrong way round. The further requirement to convert the answer obtained in millimetres into micrometres proved more difficult for some.

05.8 Students were often uncertain about the correct choice of words in this question. Many believed that preclinical testing of cancer drugs should be carried out on people and that safety checks should be completed using plants. 28% of students achieved both marks in this question, and 34% achieved one mark.

05.9 54% of students were able to identify a placebo as being a tablet that does not contain an active drug. This question elicited a variety of responses including 'paracetamol', 'aspirin' and 'antibiotics' and no credit was given for descriptions alone. Phonetic spellings of the term were credited and seen frequently.

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Answer 14 · Examiner comments

June 2025 | 8461/2F | Original Q3

Question 3 (Low and Standard demand)

03.1
Three quarters of students knew that sperm are produced in the testes/testicles. There were many alternative phonetic spellings of testes and testicles seen which were given credit. The most common incorrect answers were ovaries and penis along with other parts of the male and female reproductive organs. 'Genitalia' and colloquial terms were also frequently seen uncreditworthy answers, along with a few unexpected parts such as pancreas, stomach and spine.

03.2
All combinations of numbers were seen, including that for the compensation mark. Just under 40% of students gained both marks.

03.3
95% of students knew that fertilisation was the process where a sperm cell joins with an egg cell.

03.4
Over 50% of students knew that pollen is the male gamete in a flower.

03.5
60% of students knew that mitosis produces new cells in runners.

03.6
Over half of students could identify at least one substance that passes through the runners, with a further 25% being able to identify both sugar and water.

03.7
A third of students were able to give one advantage of reproducing sexually.
The most commonly awarded mark was for the idea of variation, either given in those terms or that the offspring would not be the same. All other bullet points were seen, with the idea of dispersal being the next most common. The most frequent reason for not gaining the mark here was for giving an advantage of asexual reproduction, possibly through having misread the question.

03.8
Over 50% of students were able to give one advantage of reproducing asexually with bullet points 1, 3 and 4 most commonly seen. Several students gave more than one idea in a single sentence e.g. ' it is faster because there is no need to find a mate'. A few students implied the idea of the offspring gaining resources from the parent plant but did not specify water or a named nutrient, instead referring to 'nutrients', so were unable to gain credit for bullet point 6. Others referred to asexual reproduction as being 'easier' without elaborating as to how this manifested itself. As with question **03.7** some students were unable to gain this mark because they gave an advantage of the other type of reproduction.