AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.9

Discovery and development of drugs

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**16**
Available paper years	**2007–2024**

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.

4.3.1.9 Discovery and development of drugs

Answer 01 · Mark scheme March 2007 | BLY1A | Original Q7 | Legacy

Seven	**3**	**1**	**3**	**4**

Answer 02 · Mark scheme March 2008 | BLY1AP | Original Q8 | Legacy

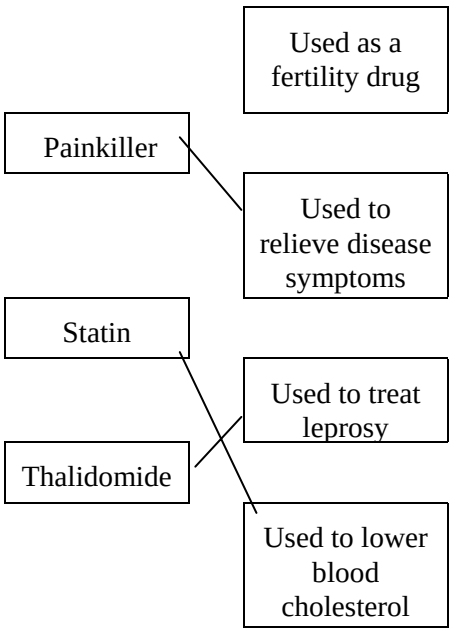
Eight	**2**	**1**	**4**	**3**

Answer 03 · Mark scheme January 2009 | BLY1F | Original Q8 | Legacy

question	answers	extra information	mark
8(a)(i)	does not contain drug / chemical	allow eg fake / sugar pill / dummy drug ignore control	1
8(a)(ii)	as control **or** to see if the effects are psychological **or** allows blind testing	allow 'to compare (with NRT)' ignore fair test	1
8(b)(i)	gum	allow gum placebo allow placebo	1
8(b)(ii)	high / highest number of participants / people **or** correct number given ie gum 16706, gum placebo 9319, placebo 16458		1
8(c)(i)	nasal spray		1
8(c)(ii)	highest <u>percentage</u> of people stopped / 24% stopped biggest difference between treatment and placebo	 allow 'highest by 4%' for **2** marks	1 1
Total			**7**

4.3.1.9 Discovery and development of drugs

Answer 04 · Mark scheme January 2010 | BLY1F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	3
5(b)(i)	8		1
5(b)(ii)	3210		1
5(c)(i)	if it is toxic		1
5(c)(ii)	if it has side effects		1
Total			**7**

4.3.1.9 Discovery and development of drugs

Answer 04 · Mark scheme

January 2010 | BLY1F | Original Q5 | Legacy

BLY1F

Answer 05 · Mark scheme

March 2010 | BLY1AP | Original Q9 | Legacy

Nine	**3**	**1**	**1**	**2**

Answer 06 · Mark scheme

March 2011 | BLY1AP | Original Q4 | Legacy

Four	**A**	doctors	**1**
	B	pregnant women	**3**
	C	politicians	**4**
	D	volunteers	**2**

Answer 07 · Mark scheme

June 2011 | BLY1AP | Original Q3 | Legacy

Three	**A**	if the drugs have any side effects	2
	B	the best dose for the drug	4
	C	if the drug is toxic	1
	D	if the effect of the drug is only psychological	3

4.3.1.9 Discovery and development of drugs

Answer 08 · Mark scheme

June 2011 | BLY1F | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)	any **two** from: • (high) CRP / protein • (no) heart condition • (not high) LDL • over 50 / age • number of tablets (each day)	allow health ignore time ignore placebo / rosuvastatin ignore number of people	2
8(b)	any **one** from: • tablet with no drug • tablet that has no effect • tablet without chemicals • tablet that people thought contained statin **or** reference to psychological effect	allow fake (pill) / dummy (pill) / sugar / chalk (pill) allow drug that has no effect ignore vitamin / mineral pill ignore control / different statin	1
8(c)	17802 / large number of people **or** enough people	ignore control group / fair test / control variables ignore time / repeats	1

Question 8 continues on the next page

Question 8 continued . . .

question	answers	extra information	mark
8(d)	any **one** from: • placebo group at risk of heart attack **or** to allow statin to be given to everyone • statin group 54% less likely to get heart attack **or** showed that statin worked **or** showed trial (very) successful • sufficient information gained / results conclusive • unethical / unfair to carry on trial	ignore cost ignore reliable ignore got results early	1
8(e)	to avoid bias **or** show impartiality **or** show results independent	allow manufacturers could cheat ignore reliability ignore could be sued / blamed if trial went wrong ignore manufacturer would know which group got statin / placebo	1
8(f)	any **two** from: • reduction in LDL • reduction in (saturated) fats • reduces deposition of fat / cholesterol / LDL in walls of blood vessels **or** blood vessels less likely to be blocked with fat / cholesterol / LDL	allow improves LDL:HDL balance **or** LDL and HDL concentrations equal ignore less cholesterol ignore more HDL do **not** accept less HDL	2
Total			**8**

4.3.1.9 Discovery and development of drugs

Answer 08 · Mark scheme

June 2011 | BLY1F | Original Q8 | Legacy

BLY1F

Answer 09 · Mark scheme

November 2011 | BLY1AP | Original Q5 | Legacy

Five	**A**	Drugs are tested on animals to see if the drugs work	**2**
	B	… tested on volunteers to detect any side effects	**3**
	C	… are tested on cells to see if the drugs are safe to test on organisms	**1**
	D	Drugs are tested on patients to find the best dose	**4**

	A	**B**	**C**	**D**

4.3.1.9 Discovery and development of drugs

Answer 10 · Mark scheme

January 2012 | BL1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	addictive	allow addicting / addict / addicted / addiction or similar allow phonetic spelling do **not** accept **/** additive / addition	1
6(a)(ii)	junction / gap / space between neurones	allow nerve cells / nerves for neurones allow idea where neurones / nerve cells / nerves meet / join	1
6(b)(i)	tablet with no drug	accept answers that convey this idea eg fake / dummy / sugar pill allow injection with no drug ignore drugs that don't work.	1
6(b)(ii)	for comparison	accept to see if drug / it works allow to see psychological effect **or** make sure, it is not all in the mind allow as a control ignore 'to make test fair / unbiased'	1
6(b)(iii)	Neither doctors nor volunteers		1

Question 6 continues on the next page . . .

BL1FP

Question 6 continued

question	answers	extra information	mark
6(b)(iv)	any **two** from: • age (range) • sex / gender (mix) • previous smoking habits **or** eg number smoked (before trial) **or** length of time smoked • number in the group • other drugs being taken **or** general health **or** height / weight / BMI / lifestyle / fitness	ignore factors already controlled ignore reference to all smokers **or** all want to give up	2
6(c)	higher percentage / number of smokers who had stopped smoking (than Drug B)	answers must refer to data and be comparative allow best results / most effective ignore best drug unqualified ignore references to 12 weeks / 1 year	1
Total			**8**

4.3.1.9 Discovery and development of drugs

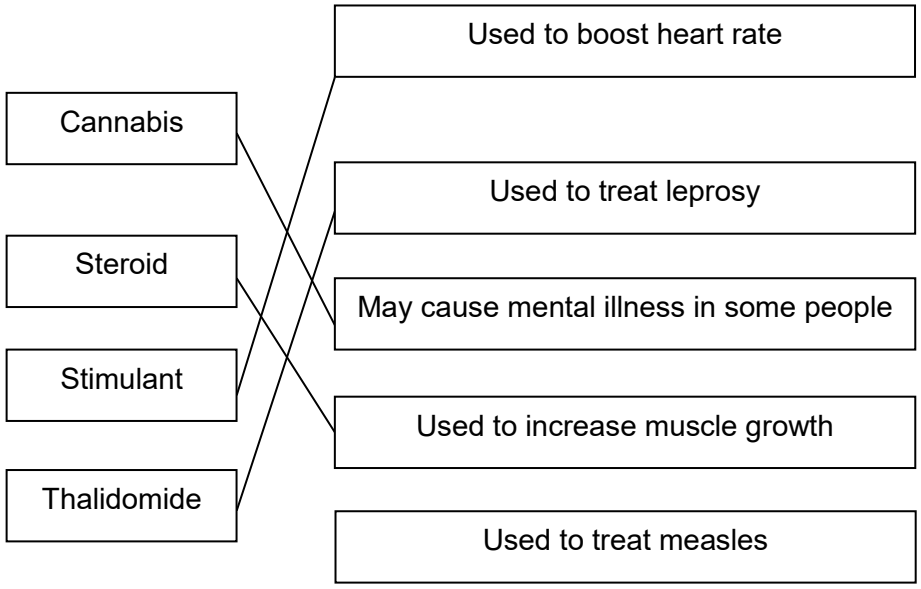
Answer 10 · Mark scheme

January 2012 | BL1FP | Original Q6 | Legacy

BL1FP

4.3.1.9 Discovery and development of drugs

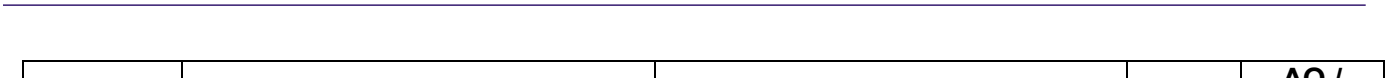
Answer 11 · Mark scheme June 2014 | BL1FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.
4(a)	 extra line from any drug cancels that mark		4	AO1 1.3.1d,f,i
4(b)(i)	any **one** from: • (live) animals • cells • tissues	accept named examples, eg mice ignore people / volunteers do **not** allow plants	1	AO1 1.3.1b
4(b)(ii)	to check that the drug works to find the best dose to use		1 1	AO1 1.3.1b
4(b)(iii)	only scientists at the drug company		1	AO2 1.3.1b
4(c)(i)	420		1	AO2 1.3.1
4(c)(ii)	statin(s)		1	AO3 1.3.1
4(c)(iii)	any **one** from: • side effects • other medication • other (medical) conditions	allow cost allow patient choice allow family history **or** age	1	AO3 1.3.1
Total			**11**	

4.3.1.9 Discovery and development of drugs

Answer 11 · Mark scheme

June 2014 | BL1FP | Original Q4 | Legacy



4.3.1.9 Discovery and development of drugs

Answer 12 · Mark scheme

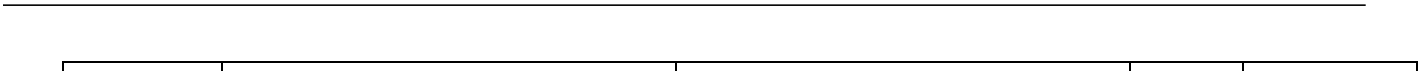
June 2015 | BL1FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	leprosy	allow bone / blood cancer ignore cancer	1	AO1 1.3.1d
8(b)(i)	6 / six		1	AO2 1.3.1a
8(b)(ii)	from 1120 to 5600	allow from 5600 to 1120 allow 4480 (alone)	1	AO2 1.3.1a
8(c)	any **one** from: • (test for) toxicity • (test for) dosage • (test for) efficacy	ignore side effects, eg allergies ignore safety / harm unqualified allow poisonous allow idea of amount allow to see if it works allow to check for interaction with other drugs	1	AO1 1.3.1b
8(d)(i)	any **two** from: • more people take / use legal / non-prescribed drugs • legal / non-prescribed drugs are (more) readily available • alcohol causes liver/brain damage **or** tobacco causes cancer	ignore reference to cost / addiction allow harmful effects of other named legal non-prescribed drugs	2	AO1 / AO3 1.3.1g
8(d)(ii)	addiction / dependency	allow withdrawal or examples of symptoms of withdrawal (if attempting to stop)	1	AO1 1.3.1h
Total			**7**	

4.3.1.9 Discovery and development of drugs

Answer 12 · Mark scheme

June 2015 | BL1FP | Original Q8 | Legacy



Answer 13 · Mark scheme

November 2020 | 8461/1F | Original Q5

The full source mark scheme begins on page 22. Follow original question 5 in that document.

4.3.1.9 Discovery and development of drugs

Answer 14 · Mark scheme

June 2022 | 8461/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	sexual intercourse		1	AO1 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	increased (at first) (then) decreased	ignore numbers unqualified do **not** accept an implication of an overall increase if no other mark awarded allow (overall) decrease for **1** mark	1 1	AO3 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	better education on how to prevent the spread of HIV		1	AO3 4.3.1.1 4.3.1.2

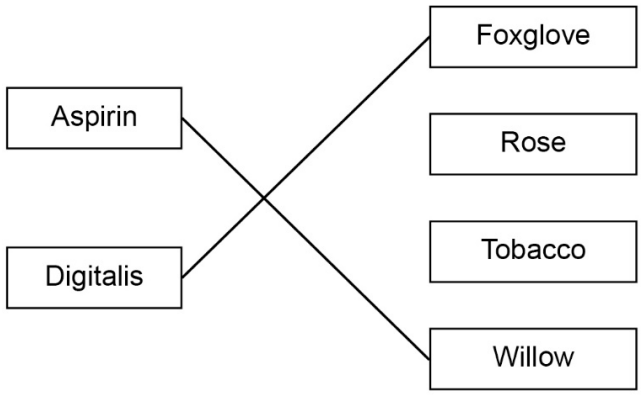
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(C) → E → A → B → D	allow **1** mark for E → A link allow **1** mark for A → B link allow **1** mark for B → D link if no other mark awarded allow **1** mark for an answer of (C) → E → B → A → D	3	AO1 4.3.1.1 4.3.1.6 4.3.1.7 4.3.1.2

4.3.1.9 Discovery and development of drugs

Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	testing on healthy volunteers		1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	drugs that destroy viruses also damage body tissues		1	AO1 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	 do **not** accept more than one line from a box on the left		1 1	AO1 4.3.1.1 4.3.1.9

Total Question 1		11

4.3.1.9 Discovery and development of drugs

Answer 15 · Mark scheme

June 2023 | 8461/1F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.1	a group of the same / similar cells **or** a group of cells with a (similar / specific) function	ignore a group of cells unqualified ignore examples of tissue functions	1	AO1 4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.2	meristem (tissue)		1	AO1 4.1.1.4 4.1.2.3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.3	willow	ignore named parts of willow	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.4	any **one** from: • (berries are) easy to access / pick • easier to extract chemical • taking berries will not harm the plant	ignore berries are not underground allow taking leaves / roots might damage / kill the plant (so it cannot produce more chemical) allow idea that the lower mass / amount (of chemical) will be less toxic / harmful allow greater mass of berries than of leaves / roots	1	AO3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.5	(0.6 × 1.2 =) 0.72	allow conversion to mg at any point in calculation	1	AO2 4.3.3.1
	(0.72 × 2 =) 1.44		1	
	1.44 × 1000	allow conversion of a correct mass calculated for berries / roots	1	
	1440 (mg)	allow a correct answer using an incorrect conversion factor of a multiple of 10	1	
	alternative route (2 × 1.2 =) 2.4 (1) (2.4 × 0.6 =) 1.44 (1) 1.44 × 1000 (1) 1440 (mg) (1)			

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.6	any **one** from: • lack of chlorophyll	allow lack of chloroplasts	1	AO1 4.3.3.1 4.3.1.2 4.3.1.4
	• lack of magnesium (ions)	allow lack of mineral (ions) **or** named example such as iron / nitrate / potassium / zinc (ions) ignore lack of nutrients / nitrogen allow lack of water allow incorrect pH of soil allow acidic / alkaline soil allow (named) infection allow lack of light allow other correct suggestions		

4.3.1.9 Discovery and development of drugs

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.7	any **two** from: • to check toxicity • to check dosage • to check its efficacy	allow to check it is safe allow to check for side effects allow to check it is not poisonous / dangerous / harmful allow to check how much is needed allow to check it works allow to check it does not interact with other drugs	2	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.8	(writers / companies may get) financial gain **or** (competitor may suffer) financial loss	ignore because the report has not been peer reviewed ignore have not used a double-blind trial	1	AO3 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
06.9	have the claims peer reviewed		1	AO1 4.3.1.9

Total Question 1	**13**

4.3.1.9 Discovery and development of drugs

Answer 16 · 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

4.3.1.9 Discovery and development of drugs

Answer 16 · 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**

4.3.1.9 Discovery and development of drugs

AQA

GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

jun2084611F/MS

4.3.1.9 Discovery and development of drugs

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.

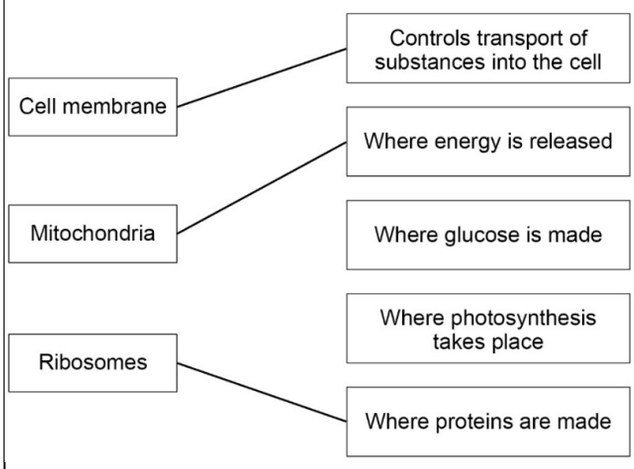
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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.

4.3.1.9 Discovery and development of drugs

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

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

4.3.1.9 Discovery and development of drugs

01.8	40 0.1 400	 do **not** accept if a unit is given	1 1	AO2 4.1.1.5 RPA 1
Total			**12**	

4.3.1.9 Discovery and development of drugs

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

4.3.1.9 Discovery and development of drugs

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**	

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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

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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**	

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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**

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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

4.3.1.9 Discovery and development of drugs

05.9	placebos		1	AO1 4.3.1.9
Total			**14**	

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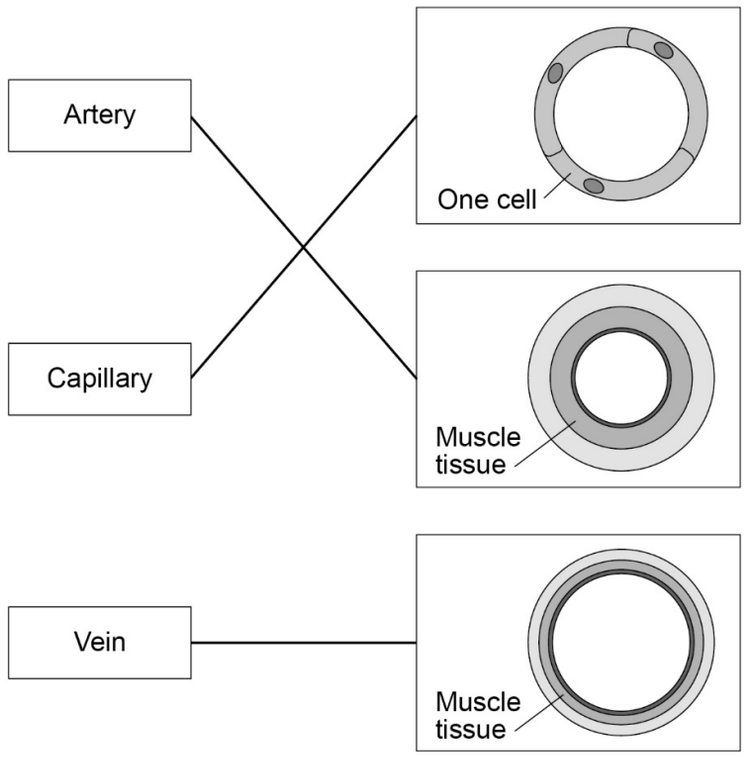
Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	all lines correct = **2** marks 1 **or** 2 lines correct = **1** mark **Type of blood vessel** / **Structure of blood vessel**  additional line from a box on the left negates the credit for that box		2	AO2 4.2.2.2

4.3.1.9 Discovery and development of drugs

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

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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**	

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

4.3.1.9 Discovery and development of drugs

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

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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**	

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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		

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**	

4.3.1.9 Discovery and development of drugs

Answer 13 · Examiner comments November 2020 | 8461/1F | Original Q5

Question 5 (low & standard demand)

As in previous years, many students missed heating the Benedict's solution in **05.5** and several confused this test with the test for starch. 25% of students scored at least one mark in this question. It was clear that a large proportion of students were not familiar with this experiment, and in these cases, students suggested splitting open the cells and looking for the glucose using a microscope which has not been seen in previous years. 22% of students gave no response to **05.5**.

Answer 14 · Examiner comments June 2022 | 8461/1F | Original Q1

Question 1 (Low demand)

01.1 The majority of students correctly identified sexual intercourse as causing the spread of HIV.

01.2 Many students failed to recognise that there were 2 marks available for this question, and only described the overall trend shown in the table, rather than the increase followed by the decrease. Students are encouraged to check the number of marks available for each question and structure their answer accordingly. Nearly 60% of students were awarded the fallback mark on this question, describing an overall decrease.

01.3 Nearly all students who attempted this question answered correctly.

01.4 Just under half of all students gained full marks in this question. Students would benefit from crossing off the letters they have already used in questions such as these, to prevent the same letter being used twice, as was seen on rare occasions.

01.5 Over 70% of students could identify the next stage in testing a vaccine following testing on live animals.

01.6 Over 80% of students knew that drugs that destroy viruses also damage body tissues.

01.7 Less than a third of students gained full marks in this question, and nearly 40% were awarded zero marks.

4.3.1.9 Discovery and development of drugs

Answer 15 · Examiner comments

June 2023 | 8461/1F | Original Q6

Question 6 (Standard demand)

06.1 Whilst most students could describe a tissue as being 'a group of cells', with many of these going on to state that these cells were 'working together'; this was insufficient for credit. Further qualification in respect of the cells being 'similar' or of the cells 'having a particular function' was required to gain this mark. Thus, relatively few students were rewarded. It was evident that some students struggled, as ideas such as tissues being 'parts of organs' were not uncommon. Almost 79% of students failed to gain the mark.

06.2 Many answers referred to parts of the plant, such as xylem or root hairs. Knowledge of 'meristem' as being the tissue in plants where stem cells are found was by no means widespread. Some students had not read the question carefully enough and suggested animal tissues, most commonly 'bone marrow'. Just over 10% of students knew that meristem tissue contains stem cells and gained the mark.

06.3 A wide variety of plants were suggested, along with some suggestions of plant tissues and even fictitious plants such as 'the aspirin tree', perhaps as students struggled to recall the answer and had been trained to write down something, rather than nothing – that said, 17% of students did not attempt a response at all. Of the plants given in responses, 'willow' was

by far the most common and gained the mark for over 18% of students. Others such as 'foxglove' were mentioned, indicating a recollection of plants named in the specification.

06.4 Many answers simply repeated information given in the table, such as 'berries have the least mass of the chemical', but this was not sufficient as it does not explain why the berries are picked in preference to leaves or roots. Vague answers such as there being 'more berries' were also insufficient to gain credit. Around a quarter of students gain the mark, with common correct answers referring to the idea that picking berries would not harm the plant, that berries would be 'easier to collect' or that 'the chemical would be easier to extract'.

06.5 Relatively few students managed to complete the calculation correctly, with only 4% gaining all 4 marks. The most common error was by students who did not know the conversion factor for grams to milligrams. Fortunately, this usually only cost students 1 of the 4 marks, as answers which had used the incorrect conversion factor (whether this involved multiplying or dividing by an incorrect multiple of 10) were still able to gain the final mark. Students often got only part way through the calculation, stopping at 0.72 or 2.4, for 1 mark only; however, the 3rd and 4th marking points could still be gained if correctly addressed. Some students divided values, rather than multiplying, as was needed, whilst others arrived at somewhat unlikely answers equivalent to many hundreds of grams, far exceeding the 200 g mass of plant tissue it was extracted from. Nearly half of all responses gained no credit – either because it was not attempted – or completely incorrect.

06.6 Around 30% of students gained the mark in this question. A lack 'of magnesium' or 'of chlorophyll' was quite well known and many students gained this mark. Answers often implied a degree of speculation by students, but those who did attempt an answer may have been rewarded for this, as, for example, a lack 'of light' or of water' were both credited. A description of 'an infection' along with naming any plant disease also gained credit, as students are not expected to know, for example, that the tobacco mosaic virus does not infect nightshade plants. A not infrequent suggestion was that having chlorosis would 'put animals off from eating them', as students interpreted the question as asking for an advantage of having chlorosis, rather than what had caused the condition.

06.7 There were many good answers to this question, with frequent references to toxicity, dosage and efficacy. Some students, though, offered two ideas relating to toxicity, with descriptions regarding safety and side effects: thus, gaining only the one mark. However, over 90% of students gained some marks in this question, which was pleasing.

06.8 Many responses referred to writers of the report, or companies who might want the public to use or avoid the drug, however relatively few references to one party or another making financial loss or gain were made and as such only around 10% of students were awarded the mark. Other insufficient responses referred to ethics of using plants or the possibility that habitats might be destroyed by large nightshade plantations. Students only needed to refer to people 'buying' or someone 'selling' the product, to gain the mark or alternatively the idea that the writer of the biased report might have been 'paid' for their work.

06.9 Nearly 64% of students correctly indicated that scientists should 'have the claims peer reviewed' to be sure claims are valid.

Answer 16 · Examiner comments

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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