AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.6

Human defence systems

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**15**
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.

4.3.1.6 Human defence systems

Answer 01 · Mark scheme January 2007 | BLY1F | Original Q4 | Legacy

Question 4

	answers	extra information	mark
(a)	antibodies antitoxins antibiotics		1 1 1
(b)	any **two** from: • measles • mumps • rubella / German measles		2
(c)	less / low / no chance of getting named / all condition(s) if vaccinated quantitative figure(s) e.g. 5 times less likely to get convulsions	must be comparative	1 1
(d)	enzymes genes		1 1
total			9

4.3.1.6 Human defence systems

Answer 02 · Mark scheme

June 2008 | BLY1AP | Original Q6 | Legacy

Six	**A** antibiotics		**2**
	B painkillers		**4**
	C antibodies		**3**
	D vaccines		**1**

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

4.3.1.6 Human defence systems

Answer 03 · Mark scheme

June 2008 | BLY1F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)(i)	antibiotic or named antibiotic	ignore antibodies accept antiseptic do **not** accept disinfectant	1
5(a)(ii)	painkillers	accept named painkillers eg aspirin	1
5(b)(i)	5.5 / 5 ½ weeks		1
5(b)(ii)	rose gains **1** mark rose, then fell then rose again gains **2** marks a further **1** marks for **one** quantitative statement eg • rose for 3 weeks / to 14–15 units • dropped to 4 weeks / 9 units • rose to 7 weeks / 64–65 units		3
5(b)(iii)	(no) level begins to fall / is falling (after 7 weeks)		1
Total			**7**

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Answer 03 · Mark scheme June 2008 | BLY1F | Original Q5 | Legacy

COMPONENT NUMBER: BLY1F

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: June 2008

Answer 04 · Mark scheme March 2010 | BLY1AP | Original Q8 | Legacy

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

Answer 05 · Mark scheme June 2010 | BLY1AP | Original Q8 | Legacy

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

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Answer 06 · Mark scheme

June 2011 | BLY1F | Original Q9 | Legacy

Question 9

question	answers	extra information	mark
9	(wbc) ingest / digest pathogens / bacteria / viruses	allow eat germs ignore swallow germs ignore ingest the disease ignore attack / kill the disease	1
	(wbc) produce antibodies		1
	(wbc) produce antitoxins		1
	any **one** from: • (antibodies) destroy or kill pathogens / bacteria / viruses / germs • (antitoxins) counteract / destroy / neutralise toxins / poisons • reasonable reference to memory cells **or** rapid production of antibodies upon re-infection	 ignore destroy / kill disease ignore attack / fight pathogens ignore attack / killing toxins	1
Total			**4**

The AQA UMS Conversion Calculator is available on the Results statistics page of the AQA Website.

4.3.1.6 Human defence systems

Answer 07 · Mark scheme

November 2011 | BLY1AP | Original Q2 | Legacy

Two	**A**	antibodies	**3**
	B	antibiotics	**2**
	C	toxins	**1**
	D	painkillers	**4**

4.3.1.6 Human defence systems

Answer 08 · Mark scheme

June 2012 | BL2FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	A		1
5(a)(ii)	hydrochloric (acid) / HCl		1
5(a)(iii)	alkali / suitable named example	accept sodium hydrogen carbonate / sodium bicarbonate / milk of magnesia / other brand names allow bile (salts) ignore antacid	1
5(b)	• amylase breaks down starch • (broken down) into sugars / glucose • digestion of starch in the mouth • (also) starch broken down in small intestine • amylase produced in salivary glands / small intestine / pancreas		1 1 1 1 1
5(c)	small intestine	allow ileum / duodenum do **not** accept large intestine	1
Total			**9**

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Answer 08 · Mark scheme

June 2012 | BL2FP | Original Q5 | Legacy

BL2FP

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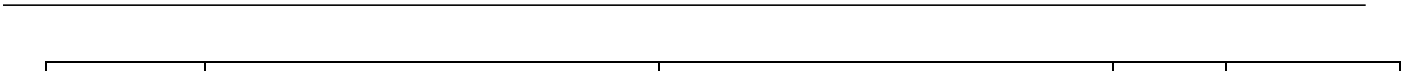
Answer 09 · Mark scheme June 2015 | BL1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	64		1	AO2 1.1
2(a)(ii)	36	allow e.c.f from (a)(i) i.e. 100 – answer given in (a)(i)	1	AO2 1.1
2(a)(iii)	any **one** from: • only considers 16-year-olds • only about some / 5 countries	ignore lack of evidence allow does not refer to all ages allow does not refer to all countries	1	AO3 1.1
2(b)	the more exercise done the healthier a person is	allow the more exercise done the higher the health rating allow the less exercise done the lower the health rating	1	AO3 1.1.1e
2(c)	having a high cholesterol level		1	AO1 1.1.1d
2(d)(i)	antibodies		1	AO1 1.1.2c/d/e
2(d)(ii)	antibiotics		1	AO1 1.1.2i
Total			**7**	

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Answer 09 · Mark scheme

June 2015 | BL1FP | Original Q2 | Legacy



4.3.1.6 Human defence systems

Answer 10 · Mark scheme June 2017 | BL1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	**either** Petri dish / culture medium sterile so no other / harmful microorganisms grow **OR** Petri dish / lid secured (with adhesive tape) (1) so microorganisms cannot leave (1) **OR** incubated at 25 °C (1) to prevent / reduce growth of pathogens (1)	reason must be consistent with safety precaution mark together ignore germs ignore other safety precautions do **not** allow viruses allow agar sterile allow so other / harmful microorganisms cannot enter ignore spread unqualified	1 1	AO2 1.1.2m
5(b)(i)	any **one** from: • largest / larger area where no microorganisms are growing • most / more microorganisms killed	allow largest clear / white area	1	AO3 1.1.2h/i/j

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Answer 10 · Mark scheme

5(b)(ii)	*idea of* E may not be best on all / other (types of) microorganism eg tested on only one type of microorganism	allow antibiotics do not kill viruses allow (other) bacteria / microorganisms may be / become resistant (to E) allow deficiency diseases are not caused by microorganisms allow disease may be minor / not life threatening allow only tested once **or** not repeated allow (patient) may be allergic to E allow idea of investigation not carried out at body temperature	1	AO3 1.1.2h/i/j 1.1.1a
5(c)(i)	B **and** C **and** D	all three required in any order for mark additional letters will cancel the mark	1	AO2 1.1.2

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5(c)(ii)	Healthy animals will produce a higher yield.		1	AO3 1.1.2
5(c)(iii)	Microorganisms become resistant to the antibiotic.		1	AO1 1.1.2h/i
5(d)(i)	white	allow phagocytes / lymphocytes / leucocytes do **not** allow other types of blood cell	1	AO1 1.1.2c/d
5(d)(ii)	These blood cells produce antibodies. These blood cells ingest pathogens.		1 1	AO1 1.1.2d
Total			**10**	

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Answer 10 · Mark scheme

June 2017 | BL1FP | Original Q5 | Legacy

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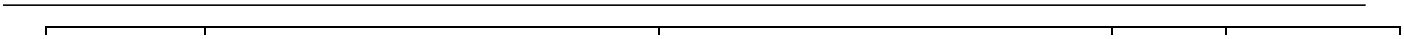
Answer 11 · Mark scheme June 2017 | BL3FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	**A** = red **B** = white	 allow lymphocyte / phagocyte	1 1	AO2 3.2.2a/c/d
3(b)(i)	low number of platelets so blood doesn't clot	ignore abnormal unqualified	1 1	AO2/3 3.2.2e
3(b)(ii)	To prevent rejection of the new blood cells.		1	AO2 3.3.1i
3(c)	carbon dioxide small intestine kidneys	allow CO_2 in this order only	1 1 1	AO1 3.2.2b
Total			**8**	

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Answer 11 · Mark scheme

June 2017 | BL3FP | Original Q3 | Legacy



Answer 12 · Mark scheme

November 2020 | 8461/1F | Original Q3

The full source mark scheme begins on page 24. Follow original question 3 in that document.

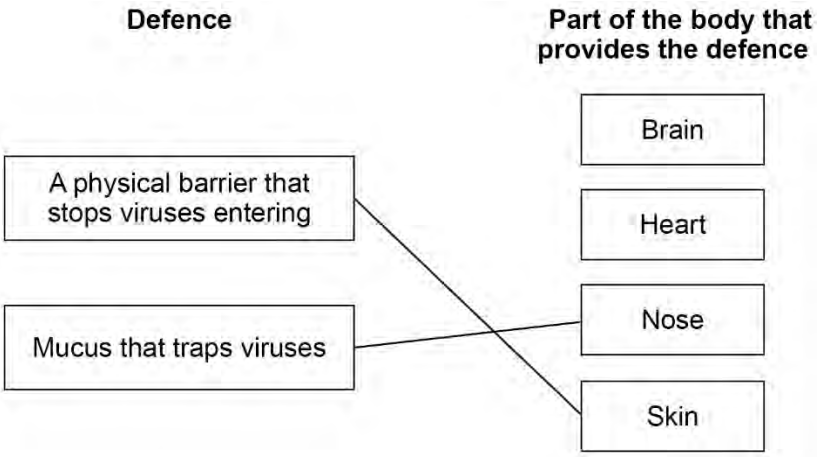
4.3.1.6 Human defence systems

Answer 13 · Mark scheme

June 2023 | 8461/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	pathogens		1	AO1 4.3.1.1

Question	Answers	Mark	AO / Spec Ref.
02.2	 do **not** accept more than one line from a box on the left	1 1	AO1 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.3	division		1	AO1 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	malignant tumours have cells that can spread to other parts of the body malignant tumours may form secondary tumours		1 1	AO1 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.5	(percentage) decreases		1	AO3 4.2.2.7 4.2.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.6	more females were vaccinated (over time)	allow males may also be vaccinated allow more people were vaccinated allow increased use of (named) barrier methods of contraception allow more awareness / education (about HPV)	1	AO3 4.2.2.7 4.2.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.7	white blood cells		1	AO1 4.3.1.7

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.8	antibodies		1	AO1 4.3.1.7 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.9	any **one** from: • people are afraid of side / unknown effects • religious / cultural objections • (some people) believe they don't work • some people think (HPV) vaccine encourages sexual activity	ignore pain of injection allow there are side effects allow people think they cause (named) disease ignore religion unqualified ignore moral / ethical objections	1	AO3 4.3.1.7

Total Question 2	11

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Answer 14 · Mark scheme

June 2024 | 8461/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.1	(physical) barrier **or** stops pathogens entering (blood / body)	allow named pathogen throughout allow produces antimicrobial secretions allow produces oil / sebum / sweat ignore reference to scabs / clots	1	AO1 4.3.1.6

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.2	$\frac{63}{210}$ $\frac{3}{10}$	 allow 0.3 ignore 30% if neither mark awarded allow $\frac{210}{63} = \frac{10}{3}$ for **1** mark	1 1	AO2 4.3.1.6 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.3	*(at pH1)* 187 (killed) *(at pH5)* 31 (killed) (187 – 31) = 156 (more bacteria killed)	ignore negative symbol throughout allow correct subtraction using incorrect calculation at pH1 and/or pH5	1 1 1	AO2 4.3.1.6 4.2.2.1

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Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
02.4	(the student) calculated the midpoint (between) 23 and 63 **OR** any **two** from: • $\frac{63 - 23}{2} = 20$ • 20 + 23 = 43 • 63 – 20 = 43	 allow (between values at) pH1 and pH3 allow $\frac{23 + 63}{2} = 43$ for **2** marks allow plot data from **Table 1** on graph (1) then read off value for pH2 (1) allow other correct methods for up to **2** marks	1 1	AO3 4.3.1.6 4.2.2.1

Total Question 2	8

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Answer 15 · Mark scheme

June 2024 | 8461/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	(A) optic nerve (B) lens		1 1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	contract		1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	thicker		1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	iris		1	AO1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	any **one** from: • (sent as) impulses • along sensory neurone(s)	allow (sent as) electrical signals ignore messages	1	AO1 4.5.2.1 4.5.2.3

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	the light rays do not meet / focus / converge on the retina	allow the light rays meet / focus / converge before the retina allow the light rays do not meet / focus / converge at the back of the eye allow lens is too thick allow eyeball is too long	1	AO3 4.5.2.3

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Answer 15 · Mark scheme

June 2024 | 8461/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	any **one** from: • (hard / soft) contact lenses • (laser) surgery • replacement lens (in the eye)	ignore spectacles / glasses	1	AO1 4.5.2.3

Total Question 4	**8**

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AQA

GCSE
BIOLOGY
8461/1F

Paper 1 Foundation Tier

Mark scheme

June 2020

Version: 1.0 Final Mark Scheme

jun2084611F/MS

4.3.1.6 Human defence systems

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

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.

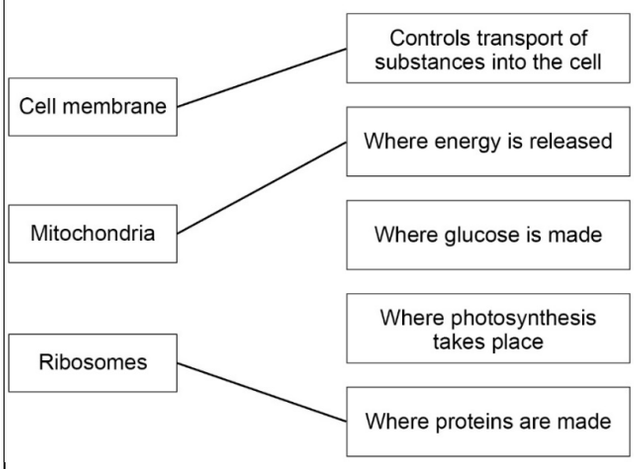
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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.

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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

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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**	

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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

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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**	

4.3.1.6 Human defence systems

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

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**

4.3.1.6 Human defence systems

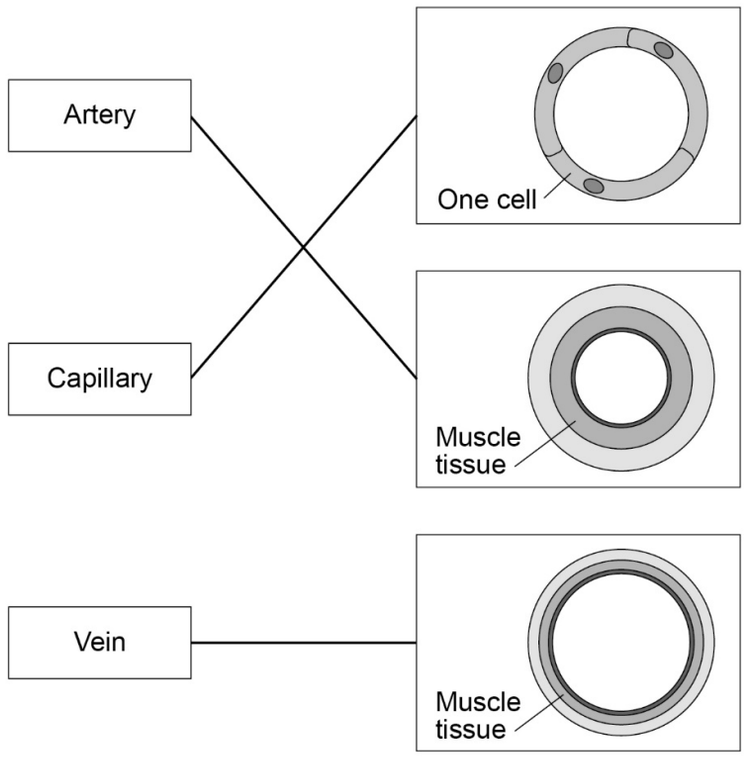
MARK SCHEME – GCSE BIOLOGY – 8461/1F – JUNE 2020

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

4.3.1.6 Human defence systems

05.9	placebos		1	AO1 4.3.1.9
Total			**14**	

4.3.1.6 Human defence systems

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

4.3.1.6 Human defence systems

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

4.3.1.6 Human defence systems

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**	

4.3.1.6 Human defence systems

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

4.3.1.6 Human defence systems

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

4.3.1.6 Human defence systems

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**	

4.3.1.6 Human defence systems

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	

4.3.1.6 Human defence systems

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		

4.3.1.6 Human defence systems

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**	

4.3.1.6 Human defence systems

Answer 12 · Examiner comments November 2020 | 8461/1F | Original Q3

Question 3 (low & standard demand)

Throughout this question, students commonly used the term ‘infection’ as a synonym for bacteria, resulting in many unclear answers. **03.9** differentiated well between lower- and higher-attaining students.

Answer 13 · Examiner comments June 2023 | 8461/1F | Original Q2

Question 2 (Low demand)

02.1 Nearly all students were able to determine ‘pathogens’ as being the name given to microorganisms that cause disease.

02.2 Almost 90% of students correctly linked both defences to the part of the body that provided the defence. 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.

02.3 A pleasing 90% of students knew that a tumour can form when changes to cells cause uncontrolled cell division**.**

02.4 Students have a clear understanding of features of malignant tumours, and indeed only around 4% of students gained zero marks on this question. Almost two thirds of students gained both available marks.

02.5 Over 95% of students gained this mark. A number went on to use data in support of their statements but this was not necessary. Some simply said that Table 2 showed that ‘the vaccine had worked’, but as the question asked specifically about how the **percentage** of females with HPV had changed, no credit could be given.

02.6 Surprisingly, only around 42% of students could suggest a correct reason for the change in HPV cases from 2010-2016. Many of these students correctly referred to more females, and sometimes more males as well, being vaccinated. Those failing to gain credit however, often simply stated ‘vaccination’ as the reason but gave no idea as to why the percentage continued to fall over time.

02.7 Nearly 80% of students knew that white blood cells respond to an inactive virus, and gained the mark.

02.8 While the most common incorrect answer was ‘antibiotics’, it was pleasing to see over 93% of students correctly identifying antibodies as being produced in response to the inactive virus.

02.9 Most credited responses here were around concerns of side effects from the vaccine and this was expressed in many different ways. Around 60% were in fact successful in gaining the mark. Reference to ‘anti-vax’ parents was seen but unless qualified as to the reason behind refusal to vaccinate it failed to gain a mark. Many students correctly quoted religious or cultural objections although, ‘religion’ or ‘beliefs’ on their own were insufficient. The idea that the vaccine might simply not work was commonly credited but answers such as ‘parents are scared of the vaccine’ or ‘it’s too expensive’ gained no marks.

4.3.1.6 Human defence systems

Answer 14 · Examiner comments June 2024 | 8461/1F | Original Q2

Question 2 (low demand)

02.1 This question specifically asked how the skin protects against pathogens and not how the human body in general is able to defend itself. References to white blood cells, antibodies, mucus and stomach acid were therefore, not creditworthy. Some students made incorrect suggestions such as 'the hairs on the skin catch pathogens' or 'the pores are small so that pathogens cannot pass through them'. Others used descriptions that lacked specificity such as 'it has many layers' or 'it is thick and strong'. Nearly 60% of students gave the correct idea of the skin being a barrier or stopping pathogens from entering.

02.2 Just over 40% of students were awarded full marks in this question, with nearly 60% gaining the first marking point for a correct fraction but an incorrect simplification. A number of students found the fraction that killed rather than the fraction surviving, and therefore gained no credit.

02.3 Nearly 73% of students gained full marks in this question, and most made good use of the scaffolding provided. A number of students missed out on the third marking point due to not accurately copying their answer from parts 1 and/or 2 correctly and to complete the correct subtraction.

02.4 Students' ability to express themselves clearly, frequently limited their access to the marks available in this question. As a result, just under 27% of students achieved both marks. Some students found explanations difficult and gave answers that lacked clarity, such as 'it just fitted the pattern'. A frequent confused use of mean, mode, median and average was also seen.

4.3.1.6 Human defence systems

Answer 15 · Examiner comments

Question 4 (low and standard demand)

04.1 Over half of students correctly labelled both the optic nerve and the lens, with a further 40% labelling at least one of them correctly for a mark.

04.2 60% of students knew that to focus on a near object the ciliary muscles contract.

04.3 Just under 50% of students knew that the lens becomes thicker to focus on a near object.

04.4 One third of students knew that the size of the pupil is controlled by the iris, with the most common wrong answer being suspensory ligaments.

04.5 15% of students were able to achieve this mark, with many falling short by using poor terminology such as 'messages' or referring to 'signals' unqualified.

04.6 A little over 10% of students were able to articulate themselves clearly enough to gain the mark. All of the different options on the mark scheme were seen with some good descriptions given as to why the image would not be clear. Many students stated that the light rays had crossed without specifying where this has happened and fell short of the mark. Other students talked about the light rays not meeting, but at the wrong part of the eye such as the sclera or optic nerve so again did not gain the mark.

04.7 A well answered question with 75% of students gaining credit, mostly for referring to either 'laser eye surgery' (or simply just 'surgery') or to contact lenses.

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