AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.6

Human defence systems

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**14**
Available paper years	**2007–2020**

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 June 2007 | BLY1H | Original Q4 | Legacy

The full source mark scheme begins on page 18. Follow original question 4 in that document.

Answer 02 · Mark scheme June 2008 | BLY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	antibiotics	**2**
	B	painkillers	**4**
	C	antibodies	**3**
	D	vaccines	**1**

Answer 03 · Mark scheme June 2009 | BLY1AP | Original Q2 | Legacy

Two	**A** antibodies	**4**		
	B antitoxins	**2**		
	C pathogens	**1**		
	D toxins	**3**		
	A	**B**	**C**	**D**

4.3.1.6 Human defence systems

Answer 04 · Mark scheme

June 2009 | BLY2H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	(genotype / gametes from **T** / mother) h and h (accept h)	eg may be in punnett square	1
	(genotype / gametes from **U** / father) H and h	allow own upper and lower case symbols or allow any symbol correctly used with key	1
	offspring genotypes: correctly derived from correct gametes		1
	chance = 50% / ½ / 0 .5 / 1 : 1 / 1 out of 2	do **not** accept 1 : 2 allow irrespective of working	1
6(b)(i)	(cells from) embryo tested for particular allele / gene / (named) genetic condition / the disease / gender	ignore x-rays / ultra sound	1
6(b)(ii)	any **one** from: • possible harm to embryo **or** mother • sensible reference to abortion • hard to make moral / ethical decisions	ignore moral / ethical unqualified ignore not natural / playing God references to other ideas eg designer babies must be well argued	1
6(c)(i)	(cystic fibrosis is) recessive (allele / gene)	allow not dominant	1
	need two alleles / genes **or** need one allele / gene from each parent **or** both parents must have cystic fibrosis allele / gene		1

Question 6 continues on the next page…

BLY2H

Question 6 Continued

question	answers	extra information	mark
6(c)(ii)	any **three** from: • osmosis / diffusion • more concentrated solution outside cells / in mucus • water moves from dilute to more concentrated solution • partially permeable membrane (of cell)	do **not** accept reference to movement of ions / solution by osmosis / diffusion assume concentration is concentration of solute unless they tell us otherwise allow correct references to movement of water in relation to concentration gradient	3
6(c)(iii)	ribosomes		1
Total			**12**

4.3.1.6 Human defence systems

Answer 05 · Mark scheme

November 2009 | BLY1AP | Original Q2 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 06 · Mark scheme

November 2009 | BLY1AP | Original Q8 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 07 · Mark scheme

March 2010 | BLY1AP | Original Q3 | Legacy

Three	**3**	**4**	**4**	**1**

Answer 08 · Mark scheme

June 2010 | BLY1AP | Original Q3 | Legacy

Three	**4**	**1**	**3**	**1**

4.3.1.6 Human defence systems

Answer 09 · Mark scheme

June 2011 | BLY1H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3	(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**

4.3.1.6 Human defence systems

Answer 09 · Mark scheme

June 2011 | BLY1H | Original Q3 | Legacy

BLY1H

4.3.1.6 Human defence systems

Answer 10 · Mark scheme

June 2012 | BL1HP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5 (a)(i)	dead / inactive / weakened	allow antigen / protein ignore ref to other components ignore small amount	1
	pathogen / bacterium / virus / microorganism	ignore germs / disease	1
5 (a)(ii)		antigen / antibiotic instead of antibody = max 2	
	white blood cells produce / release antibodies	accept lymphocytes / leucocytes / memory cells produce antibodies do **not** accept phagocytes	1
	antibodies produced quickly		1
	(these) antibodies destroy the pathogen	allow kill do **not** accept antibodies engulf pathogens	1
5 (b)(i)	(live) bacteria still in body	ignore numbers	1
	would reproduce	ignore mutation / growth	1
5 (b)(ii)	antibiotics / treatment ineffective **or** resistant pathogens survive	accept resistant out compete non-resistant	1
	these reproduce		1
	population of resistant pathogens increases	allow (resistant pathogens reproduce) rapidly	1
Total			**10**

4.3.1.6 Human defence systems

Answer 10 · Mark scheme June 2012 | BL1HP | Original Q5 | Legacy

BL1HP

4.3.1.6 Human defence systems

Answer 11 · Mark scheme

June 2012 | BL2HP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	(alternative) forms / types of a / the same gene		1
7(a)(ii)	only expressed if 2 copies inherited **or** not expressed if other allele present	allow over ruled / over powered by the other allele	1
7(b)(i)	**Nn**	ignore heterozygous	1
7(b)(ii)	genetic diagram including:	accept alternative symbols, if defined	
	gametes: **N** and **n** from both parents	accept alternative symbols if correct for answer to (b)(i)	1
	correct derivation of offspring genotypes: **NN Nn Nn nn**	allow if correct for candidate's parental genotypes / gametes	1
	identification of **nn** as having cystic fibrosis		1

Question 7 continues on the next page . . .

BL2HP

Question 7 continued

question	answers	extra information	mark
7(c)	**Argued evaluation** any **four** from: • PGD higher financial cost • PGD occurs before pregnancy / implantation • PGD does not involve abortion so less trauma / less pain / ethical comparison • PGD higher incidence of false positive / use of numbers so higher risk of destroying healthy embryo • PGD no chance of miscarriage whereas CVS does **or** PGD less chance of miscarriage	accept CVS only costs £600 accept detected at earlier stage so less unethical / less trauma accept PGD has (surplus) embryos so some destroyed / unethical	4
Total			**10**

UMS Conversion Calculator www.aqa.org.uk/umsconversion

4.3.1.6 Human defence systems

Answer 12 · Mark scheme

January 2013 | BL1HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • (produce) toxins / poisons • (cause) damage to cells	 kill / destroy cells allow kills white blood cells	1
6(a)(ii)	produce antitoxins engulf / ingest / digest pathogens / viruses / bacteria / microorganisms	 accept phagocytosis or description ignore eat / consume / absorb for engulf ignore references to memory cells	1 1
6(b)(i)	dead / inactive / weakened (measles) pathogen / virus	accept idea of antigen / protein ignore bacteria	1 1
6(b)(ii)	(after infection) rise begins sooner / less lag time steeper / faster rise (in number) longer lasting **or** doesn't drop so quickly	accept converse if clearly referring to before vaccination idea of staying high for longer ignore reference to higher starting point	 1 1 1
6(b)(iii)	antibodies are specific or needs different antibodies	accept antigens are different **or** white blood cells do not recognise virus	1
6(c)	reduces spread of infection / less likely to get an epidemic	 accept idea of eradicating measles	1
Total			**10**

4.3.1.6 Human defence systems

Answer 12 · Mark scheme

January 2013 | BL1HP | Original Q6 | Legacy

BL1HP

4.3.1.6 Human defence systems

Answer 13 · Mark scheme June 2018 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	DNA / deoxyribo(se)nucleic acid		1	AO1 4.1.2.1
06.2	controls the movement of substances in / out of cell	ignore allows substances in / out of cell	1	AO1 4.1.1.2
06.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.		5–6	AO2 4.2.2.1 4.2.2.2 4.4.2.1
	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 fewer (digestive) enzymes enter small intestine • (so) enzymes break down / digest less food • (therefore) less absorption of nutrients • (so) less glucose can enter the blood(stream) • (so) less (glucose) available for respiration • (less absorption of nutrients so) fewer amino acids can enter the blood(stream) • (so) less protein is made (for growth) ignore ref to bile less oxygen enters blood(stream) / reaches cells / organs / tissues (ignore body / lungs) • (so) less (oxygen) available for (aerobic) respiration • (so) less energy released / available (for growth) do **not** accept energy produced for **level 3**, reference to both enzymes and oxygen is required			

4.3.1.6 Human defence systems

Answer 13 · Mark scheme

June 2018 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	put ages in (ascending / descending / chronological) order		1	AO2 4.2.2.5
	find middle value	allow a way of achieving this ie $\frac{(n+1)}{2}$ where n is the number of people	1	AO1 4.2.2.5
06.5	most common in young people **or** (more) don't live to an old age	allow causes of this	1	AO3 4.2.2.5
06.6		an answer of 10 584 scores **2** marks		AO2 4.2.2.5
	$0.98 \times 10\,800$	allow $\frac{98}{100} \times 10\,800$	1	
	10 584	allow $10\,800 - (0.02 \times 10\,800)$ or equivalent	1	
06.7	take stem cells from patient (bone marrow / skin)		1	AO2 4.1.2.3
	remove / change / fix the faulty / CF gene		1	
	create embryo using these stem cells	allow idea of transferring nucleus from stem cells into enucleated egg / ovum	1	
	remove stem cells (from embryo) and stimulate / allow them to divide / differentiate into lung (cells)	if no other marks awarded allow **1** mark for therapeutic cloning	1	

4.3.1.6 Human defence systems

Answer 13 · Mark scheme

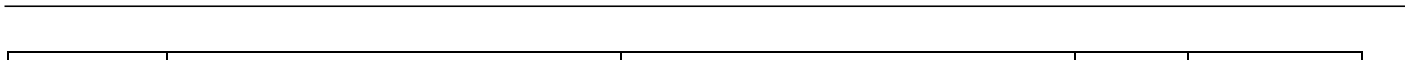
June 2018 | 8461/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	idea of ethical / religious concerns about use of embryos such as loss of (potential) human life	allow idea that embryo cannot give consent ignore idea of against human rights of embryo unqualified ignore religious / ethical reasons unqualified	1	AO3 4.1.2.3
Total			**18**	

4.3.1.6 Human defence systems

Answer 13 · Mark scheme

June 2018 | 8461/1H | Original Q6



Answer 14 · Mark scheme

November 2020 | 8461/1H | Original Q7

The full source mark scheme begins on page 30. Follow original question 7 in that document.

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Biology 4411

BLY1H Unit Biology 1

Mark Scheme

2007 examination - June series

4.3.1.6 Human defence systems

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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

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Dr Michael Cresswell, Director General.

4.3.1.6 Human defence systems

MARK SCHEME

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 and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

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

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 lines 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.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates 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.

4.3.1.6 Human defence systems

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate 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

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

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 are 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 e.c.f. 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 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.3.1.6 Human defence systems

BLY1H Question 1

	answers	extra information	mark
(a)	scientists figures based on research / calculations / data **or** scientists sample whole area	ignore reasons based on bias	1
	fishermen based on impression / hearsay / experience **or** fishermen fish in well-stocked / limited areas	scientists sample a wider area = **2** marks fishermen only fish in well-stocked areas = **2** marks if no marks gained fishermens' opinion **and** scientists' opinion gains **1** mark	1
(b)	any **two** from: • economic considerations • political impact • pressure groups **or** fears of extinction	eg fear for jobs, profits, big demand for cod eg allow EU / government decide or laws will be passed	2
total			4

4.3.1.6 Human defence systems

BLY1H Question 2

	answers	extra information	mark
(a)	any **two** from: • area of bed sampled • sampling time • size of net • kicking action • net position	control variables from information given	2
(b)	any **two** from: • some animals not dislodged • some animals missed / through / escaped net • invertebrates difficult to identify • invertebrates from outside area	must be ideas related to a sample ignore reliability etc	2
(c)	10 to 99 **or** 10 – 99 **or** 99 to 10 **or** 99 – 10		1
(d)	any **two** from: • increased / goes up • 0 at sample 4 • to (more than) 100	allow increase implied from all data described	2
(e)	mayfly because not found downstream of point where sewage enters stream **or** only in the unpolluted water		1 1
total			9

4.3.1.6 Human defence systems

BLY1H Question 3

	answers	extra information	mark
	adaptation and linked advantage eg	max **2** for 3 adaptations	max 2 max 2
	• roots widespread / long (1) to collect water from large area (1)	ignore large roots accept to collect more water	
	• some roots deep / long (1) to collect water from deep down (1)	ignore large roots accept to collect more water	
	• absence of leaves (1) reduces water loss (1)		
	• swollen stem (1) to store water (1)		
	• roots near surface (1) to absorb rainwater (1)		
	• roots widespread (1) support in sandy soil (1)		
total			4

4.3.1.6 Human defence systems

BLY1H Question 4

	answers	extra information	mark
(a)(i)	viruses live inside cells		1
	viruses inaccessible to antibiotic	allow drug / antibiotic (if used) would (have to) kill cell	1
(ii)	mutation	ignore mutation caused by antibiotic	1
	natural selection **or** no longer recognised by antibiotics	accept description of natural selection	1
(b)	(stimulate) antibody production	ignore antitoxin	1
	(by) white cells		1
	<u>rapidly</u> produce antibody on re-infection	ignore antibodies remain in blood	1
total			7

4.3.1.6 Human defence systems

BLY1H Question 5

	answers	extra information	mark
(a)	ovary or ovaries		1
(b)	(hormone) implant		1
(c)	do not have to remember to take		1
(d)	does not involve hormone **or** it is a mechanical method	allow coil may be dislodged allow egg <u>is</u> fertilised / released allow not preventing egg fertilisation / release	1
(e)	involves death of fertilised egg **or** (regard) fertilised egg as human **or** stops fertilised egg developing	allow embryo / baby for fertilised egg ignore against religion only allow fertilised egg is alive ignore side effects	1
(f)(i)	inhibit FSH (production) so no eggs mature / develop / are produced	allow inhibits LH allow (LH) <u>stimulates</u> egg release ignore progesterone	1 1
(ii)	contains FSH which causes egg to mature / develop / be produced **or** in women whose FSH is low	allow contain LH allow (LH) <u>stimulates</u> egg release	1 1
total			9

4.3.1.6 Human defence systems

BLY1H Question 6

	answers	extra information	mark
(a)	asexual reproduction / mitosis **or** no fusion of gametes **or** division after fusion **or** from fertilised egg **or** from same embryo **or** from same egg **and** sperm	ignore cloning	1
	each embryo has identical genetic information / genes / DNA / chromosomes		1
(b)	any **two** from: • experimental subject and control are identical **or** fair test since monkeys identical • monkeys similar to humans, so effect of drugs likely to be similar • all identical so will have same reaction to drugs / disease • it's better than catching wild ones	allow closely related so… ignore evolved from	2
total			4

4.3.1.6 Human defence systems

BLY1H Question 7

	answers	extra information	mark
(a)	any **two** from: • balance between two important for good heart health • high LDL causes heart disease / high cholesterol • high HDL reduces heart disease / cholesterol	ignore blood pressure do **not** accept converse argument do **not** accept converse argument	2
(b)	heart attacks greater amongst patients with low HDL levels statins reduce heart attacks of patients **or** placebo is less effective	ignore statins cause heart disease ignore comparative effects of the two statins allow pravastatin is more effective supported by appropriate calculations eg pravastatin > 39 33% < 39 31.4% Average 32.4 > 39 32% < 39 28.2% Average 30.05%	1 1
total			4

4.3.1.6 Human defence systems

BLY1H Question 8

	answers	extra information	mark
(a)	present day organisms have evolved from simpler organisms	ignore answers in terms of natural selection	1
	over long periods of time **or** millions / billions of years		1
(b)	(natural selection operates on successful) characteristics produced by chance / (random) mutation		1
	in this experiment caused by hormones / environment	allow this example indicates inheritance of acquired characteristics for **2** marks allow this is Lamarckism only for **1** mark	1
total			4

AQA

GCSE
BIOLOGY
8461/1H

Paper 1 Higher Tier

Mark scheme

June 2020

Version: 1.0 Final

206G8461 1H/MS

4.3.1.6 Human defence systems

MARK SCHEME – GCSE BIOLOGY – 8461/1H – 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.

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MARK SCHEME – GCSE BIOLOGY – 8461/1H – 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.

4.3.1.6 Human defence systems

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.

4.3.1.6 Human defence systems

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		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	
01.2		ignore description of subsequent parts of the photosynthesis reaction		AO1 4.1.1.2 4.4.1.1
	<u>light</u>	allow sun<u>light</u> ignore sun	1	
	(light) is captured / trapped / absorbed by chlorophyll / chloroplasts	allow (light) is used by chlorophyll / chloroplasts	1	
01.3	$\frac{18.5 + 19.3 + 19.5}{3}$ **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	
01.4	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

01.5	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
01.6	did not use it in calculation (of mean)		1	AO3 4.4.1.2 RPA 6
01.7	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
01.8	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

01.9	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.
02.1	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	
02.2	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

02.3	**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

02.4	osmosis	allow diffusion	1	AO1 4.1.3.1 4.2.3.2 4.1.3.2
02.5	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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	any **two** from: (both have) • cytoplasm • (cell) membrane • DNA / genetic material • ribosomes	ignore reference to shape allow RNA ignore genetic information if no other mark awarded allow sub-cellular structures for **1** mark if no other mark awarded allow correct cellular process, e.g. respiration for **1** mark	2	AO2 4.1.1.1 4.1.1.2 4.1.2.1
03.2	any **three** from: • prokaryotic cell is smaller • prokaryotic cell has no mitochondria • prokaryotic cell has no nucleus **or** DNA is free in the cytoplasm **or** genetic material is free in the cytoplasm • prokaryotic cell has a single loop of DNA **or** prokaryotic cell has a single loop of genetic material • prokaryotic cell has plasmids	allow converse for eukaryotic cells allow reference to bacterium instead of prokaryotic cell ignore reference to features not shown in Figure **5** if neither mark awarded, allow prokaryotic cell has no membrane-bound organelles ignore genetic information ignore genetic information ignore circular / rings of DNA allow prokaryotic cells have smaller ribosomes	3	AO2 4.1.1.1 4.1.1.2 4.1.2.1

03.3	1 µm = 0.001 mm **or** 1 mm = 1000 µm **or** 0.05 mm = 50 µm **or** 0.05 × 1000 (1:) 50	 do **not** accept if a unit is given	1 1	AO2 4.1.1.1 4.1.1.2
03.4	mitosis	correct spelling only	1	AO1 4.1.2.2
03.5	35%		1	AO2 4.1.2.2
03.6	 (stage 1) DNA / chromosomes replicate / duplicate mitochondria / ribosomes / sub-cellular structures increase in number **or** mitochondria / ribosomes / sub-cellular structures replicate (stage 2) one set of chromosomes is pulled / moved to each end of the cell (stage 3) the cytoplasm **and** cell membrane divides (to form two cells)	ignore names of the stages of the cell cycle ignore genetic material ignore DNA / chromosomes double / reproduce allow cytoplasm increases ignore cell grows unqualified allow one of each chromosome is pulled / moved to each end of the cell ignore nucleus divides allow cytoplasm divides **and** (new) cell membranes form ignore nucleus divides	 1 1 1 1 1	AO1 4.1.2.2
Total			**13**	

4.3.1.6 Human defence systems

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	fatty acids		1	AO1 4.2.2.1
	glycerol		1	4.4.2.3
04.2	enzyme binds to the substrate because they are complementary (shapes)	allow enzyme joins to the substrate because they fit together exactly allow enzyme joins to the substrate because the substrate fits the active site ignore reference to specificity do **not** accept same shape	1	AO2 4.2.2.1
	(so) substrate is broken down (into products)	allow (so) substrate splits (into products) ignore products are formed, unqualified	1	
	(so) products are released **or** enzyme is not changed	allow enzyme is not used up allow reference to activation energy for either marking point 2 **or** marking point 3	1	
04.3	each <u>active site</u> has a specific shape (so only fits one type of lipid molecule)	allow each <u>active site</u> is a different shape do **not** accept reference to the substrate having an active site	1	AO2 4.2.2.1
04.4	add Benedict's (solution / reagent to the liquid)		1	AO1 4.2.2.1 RPA 4
	boil / heat	allow any temperature of 65 °C or above	1	
	(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick)red		1	

04.5	add iodine solution / reagent (to the liquid) (if starch is present) it changes colour to blue / black (from yellow / orange / brown)	allow add a drop of iodine ignore iodine unqualified	1 1	AO1 4.2.2.1 RPA 4
04.6	glucose from photosynthesis (excess) glucose converted to starch	do **not** accept starch made in photosynthesis allow (excess) glucose is stored as starch	1 1	AO2 4.2.2.1 4.4.1.1 4.4.1.3 4.4.2.3
04.7	starch (stores) have been converted to glucose (so the glucose can be) used for respiration / (named) metabolic reactions **or** (so the glucose can be) used to release energy (because) there is no light to make (new / more) glucose by photosynthesis	ignore reference to residual glucose from previous photosynthesis do **not** accept idea of energy being produced / created / made	1 1 1	AO3 4.4.1.1 4.4.2.1 4.4.1.3
04.8	any **one** from: • test roots / stems of plants (in the light and dark) • test other species of plant • measure the concentrations of glucose **and** starch • vary the time in the dark / light • test variegated leaves	do **not** accept reference to changing the independent variable allow test other parts of the plants allow test other types of plant ignore mass / amount allow any other valid extension ignore repeats	1	AO3 4.4.1.2 4.4.1.3
Total			**17**	

4.3.1.6 Human defence systems

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	mechanical	allow physical allow structural	1	AO3 4.3.3.2
05.2	any **one** from: • to deter herbivores • to prevent animals damaging it	ignore to injure animals, unqualified allow to deter animals eating it do **not** accept to deter predators	1	AO2 4.3.3.2
05.3	chemical		1	AO3 4.3.3.2

05.4	any **two** from : • lack of magnesium (ions) (1) (so) not enough chlorophyll for (efficient) photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infection by pathogen / bacteria / virus / fungus (1) (so) leaves become discoloured / yellow so less photosynthesis (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • infected by aphids (1) (which) remove sugars from phloem (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) • lack of (available) light (1) (so) chlorophyll breaks down (1) (so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)	allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1) allow correctly named pathogen allow has rose black spot / TMV allow other symptoms of named pathogens / disease award once only award once only award once only	5	AO2 4.3.3.1 4.3.1.1 4.3.1.2 4.3.1.4 4.4.1.1 4.4.1.2 AO1 4.4.2.3 4.4.1.3

4.3.1.6 Human defence systems

05.5	(bacteria) obtain glucose / sugar (from the plant) (glucose used) for respiration **or** (glucose used) for making other named substances	 allow (glucose used) to release energy	1 1	AO3 AO2 4.2.3.2 4.4.1.3
05.6	(gorse plant) obtains nitrate (ions) needed for amino acids / proteins	 allow needed to make chlorophyll / DNA	1 1	AO2 4.1.3.3 4.4.2.3 AO1 4.3.3.1
05.7	willow bark		1	AO2 4.3.1.9
Total			**13**	

4.3.1.6 Human defence systems

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	any **two** from: • BMI / morphology / obesity level • smoking habits • diet • medication • family history of liver disease • fitness levels • ethnicity • area of UK they live in	ignore genetic factors allow mass / weight **and** height allow previous drinking habits allow medical conditions allow drug use allow level of exercise allow race	2	AO3 4.2.2.6
06.2	2.55 – 1.60 (= 0.95) $\left(\frac{0.95}{2.55} \times 100 = \right)$ 37 (.2549019608…) (%)	allow 1.60 – 2.55 (= –0.95) allow value for with meals in range 1.60 to 1.65 (for 1.60) allow answer correctly calculated from values in ranges 1.60 to 1.65 and 2.50 to 2.60 allow – 37(.2549019608...)(%)	1 1	AO2 4.2.2.6
06.3	12 × 2 × 7 = 168 (g/week) 1.8	 allow in range 1.8-1.9 allow correct reading from a calculation that omits the 2 **or** the 7 do **not** accept if a unit is given	1 1	AO2 4.2.2.6

4.3.1.6 Human defence systems

06.4	any **two** from: • consuming alcohol increases the RR (with / without meals) **and** supporting data • consuming less than 50 g/week of alcohol with meals does not increase the RR • even (small amounts of alcohol at) 25 g/week increases the RR if not with meals	allow risk for RR throughout allow data in terms of number of glasses of wine allow increasing alcohol consumption increases the RR at an increasing rate allow any value between 35 and 60 g/week	2	AO3 4.2.2.6
06.5	any **two** from: • large number in survey • long term / 15 year survey • well controlled	allow 800 000 in survey if neither mark awarded allow large study allow many controls	2	AO3 4.2.2.6
06.6	any **one** from: • people underestimate / overestimate alcohol consumption • people may change (lifestyle / drinking) habits over time • some people may drink all their weekly alcohol at once	allow people lie about alcohol consumption **or** people lie about other named control variables ignore survey only tested women	1	AO3 4.2.2.6

06.7	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3-4	AO2 4.4.2.3 4.2.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-2	AO1 4.4.2.2 4.2.2.6 4.2.2.5 4.5.3.3
	No relevant content	0	
	Indicative content Responses may refer to either total or partial liver failure • no bile made (in the liver) ○ fats / lipids are not emulsified ○ surface area of fats / lipids not increased ○ pH of small intestine will not be alkaline / neutralised ○ enzymes (in small intestine) will not work effectively **or** (named) food not digested / absorbed ○ so may lose weight • lactic acid not broken down / oxidised ○ accumulation of lactic acid in blood / body ○ lactic acid is toxic **or** body will be poisoned ○ oxygen debt higher / prolonged ○ so muscle pain / fatigue • proteins / amino acids will not be broken down (in liver) ○ (amino acids) not deaminated ○ amino acids not made into urea **or** will not form ammonia ○ (however) any ammonia formed is toxic ○ so accumulation of amino acids in blood / body • liver does not break down / remove other toxins (like alcohol) ○ toxins accumulate in blood / body ○ body will be poisoned ○ so pain **or** jaundice **or** swollen liver **or** portal hypertension occurs • glycogen stores will not be formed ○ cannot control blood glucose ○ so hyperglycaemia / hypoglycaemia / diabetes / coma may occur		

Total			**15**

4.3.1.6 Human defence systems

Question	Answers	Extra information	Mark	AO / Spec.Ref.
07.1		ignore add mAbs and dye to slide (unbound)		AO2 4.3.2.2
	bind fluorescent dye to mAbs		1	
	put (bound) fluorescent mAbs on the slide (and rinse off)		1	
	mAbs will bind to Candida albicans / pathogens and show up under the microscope	allow mAbs will bind to Candida albicans / pathogens and show up under UV (lamp)	1	
07.2	more Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells	allow Candida albicans / pathogens will be engulfed / killed by phagocytes / white blood cells more quickly do **not** accept white blood cells produce antibodies do **not** accept lymphocytes engulf Candida albicans	1	AO2 4.2.2.3 4.3.1.6 4.3.1.7
	therefore less damage to cells / tissues / organs	ignore less toxin released (by Candida albicans)	1	

07.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4-6	AO1 4.3.1.9
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.		1-3	
	No relevant content		0	
	Indicative content • given first to healthy volunteers o at (very) low dose o to test it is safe **or** to test for toxicity **or** to check for any side effects • then to some patients (with the disease) **or** people with the disease o to test for the correct / optimum dose o to check for any side effects o to test for efficacy **or** to test if it works o in a double blind trial o where neither patients nor doctors know who has the mAbs and who has a placebo (or alternative treatment) • reference to large trial **or** long duration **or** control variables			
07.4	any **one** from: • (the body will) not reject the mAbs **or** (the body is) less likely to reject the mAbs • mouse mAbs are (more likely to be) rejected • the human lymphocytes have already responded to that infection / cancer cell so they are known to work against the disease	do **not** accept idea of rejection of cells	1	AO3 4.3.2.2 4.3.2.1 4.3.1.6
Total			**12**	

4.3.1.6 Human defence systems

Answer 13 · Examiner comments

June 2018 | 8461/1H | Original Q6

Question 6 (standard, standard / high & high demand)

Following updated research information and communications with parents of children with cystic fibrosis, we have decided to withdraw the question on this topic from this paper.

It has been decided not to provide a replacement question as it would not be possible to determine accurately how a replacement question would have performed if it had been part of the original paper taken in 2018.

The following statistics may help you to make effective use of the remainder of the paper:

Mean mark (maximum mark)	
06.1	0.47 (1)
06.2	0.65 (1)
06.3	2.27 (6)
06.4	1.27 (2)
06.5	0.69 (1)
06.6	1.33 (2)
06.7	0.56 (4)
06.8	0.42 (1)
Question 6	7.66 (18)

4.3.1.6 Human defence systems

Answer 14 · Examiner comments

November 2020 | 8461/1H | Original Q7

Question 7 (standard/high & high demand)

Many students unnecessarily explained how monoclonal antibodies were produced for **07.1**, and very few scored marks on this question. Many students misunderstood the context of the question, and indicated that the mAbs would be injected into the slide. Some students thought that the mAbs were made of lymphocytes. In **07.2**, several students incorrectly stated that the mAbs themselves or lymphocytes would engulf the pathogen.

In **07.3**, many students were able to access Level 2, however, a number of students made blanket statements about clinical trials that applied to all participants. Several students were unable to clarify the difference between patients and healthy volunteers, with some using confusing terminology such as ‘healthy patients’.

Concluding Remarks

Generally, the standard of this paper was broadly comparable to previous years. Students generally scored well on simple recall of knowledge questions (AO1) and the topics of cell structure, photosynthesis and movement across membranes were well answered. Most students were able to apply their knowledge effectively in straightforward questions (AO2), but some found application of knowledge to new situations more difficult. Many student's understanding of the structure and function of enzymes is limited and a lack of clear knowledge meant that some students articulated answers poorly on paper. Many students struggle to answer AO3 questions, particularly where complex data needs to be analysed or improvements to practical techniques need suggesting. A lack of precision when quoting, plotting or describing data is common.

As in previous years, details of the Benedict's test for sugar and iodine solution test for starch had not been recalled well, indicating that many students understanding of this practical activity was below expectations. Students continue to find the role of the liver in the human body a challenge.

Mark Ranges and Award of Grades

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