AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.5

Protist diseases

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**4**
Available paper years	**2016–2023**

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.

4.3.1.5 Protist diseases

Answer 01 · Mark scheme

June 2016 | BL1HP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	0.67(%)	allow $0.\dot{6}$ or 0.7 allow **1** mark for evidence of $(2 \times 10^6) \div (3 \times 10^8)$ **or** allow **1** mark for 0.0067 or 0.6	2	AO2 1.1.2
6(b)(i)	idea that food chains start with plants / producers idea that these make food (for other organisms in the chain)	allow food chains do not start with animals **or** larvae are consumers allow idea that plants / producers photosynthesise **or** plants / producers get energy from the sun allow mosquito larvae do not make food / photosynthesise **or** mosquito larvae do not get energy from the sun	1 1	AO1 1.5.1a

4.3.1.5 Protist diseases

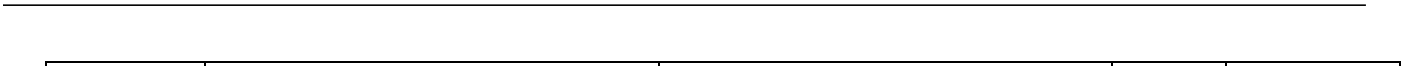
Answer 01 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(b)(ii)	any **four** from: • reasoned argument for **or** against release *advantages:* • fewer mosquitos biting **or** spreading malaria • fewer people get / die from malaria • lower medical costs (for those infected **or** for treatment) **or** less healthcare needed • better economically for developing / tropical countries. *disadvantages:* • fewer crops reproduce • poorer crop yield • possible starvation (of people) • high cost of GM production / mosquito release • less food for bats / birds **or** bats / birds die • gene could 'escape' into other wildlife / species	must refer to at least one advantage and one disadvantage. max **3** marks for either only advantages **or** only disadvantages allow people won't get / die from malaria allow fewer crops pollinated allow disruption to food chain / ecosystem **or** reduction of biodiversity ignore into plants	4	AO3 1.7.2f
6(b)(iii)	any **three** from: • gene from bacteria cut out • ref to enzymes (anywhere in process) • (gene) transferred to chromosome of mosquito • at an early stage of development	allow allele for gene allow at any point in process, ie in cutting or in splicing allow DNA for chromosome allow egg / embryo	3	AO1 1.7.2d/e
Total			**11**	

4.3.1.5 Protist diseases

Answer 01 · Mark scheme

June 2016 | BL1HP | Original Q6 | Legacy



4.3.1.5 Protist diseases

Answer 02 · Mark scheme

June 2019 | 8461/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	a protist		1	4.3.1.5 AO1
02.2	lower percentage of people with malaria when using (mosquito) nets	allow converse if clearly describing people who do not use (mosquito) nets allow fewer people with malaria when using (mosquito) nets allow **only** 1.2% of people with malaria when using (mosquito) nets ignore reference to data from table unqualified do **not** accept incorrectly calculated figures	1	4.3.1.5 AO3
02.3	any **one** from: • some people who use (mosquito) nets have malaria • data from only one area / part of Africa • size of group too small **or** sample size too small **or** only 476 people • only 50 people did not use (mosquito) nets **or** uneven group sizes (nets vs. no nets) • no other information about people considered • people may have lied about using (mosquito) nets	allow people can get malaria when they are not sleeping allow correlation does not imply causation allow examples of information not considered e.g. age, other medical issues such as sickle cell, whether taking anti-malarial medication, vaccination ignore ref to other factors unqualified	1	4.3.1.5 AO3
02.4	any value between 88 – 91	allow decimal values	1	4.3.1.5 AO2

4.3.1.5 Protist diseases

Answer 02 · Mark scheme

June 2019 | 8461/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec.. Ref
02.5	any **one** from: • improved health care	allow examples of improved health care such as **more / cheaper / new** treatments / vaccinations / antibiotics	1	4.2.2.5 4.3.1.5 AO2
	• use of mosquito control methods	allow descriptions such as spraying of insecticides / repellent **or** draining water holes **or** preventing mosquitoes from breeding		
	• changing behaviour to avoid being bitten (by mosquitoes)	allow descriptions such as wear long clothing **or** avoid going out at dusk		

Answer 02 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
02.6	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	4.3.1.6 4.3.1.7 AO1
	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 ***prevents pathogens from entering*** **skin** • tough / dry / dead outer layer • skin acts as a barrier • sebum / oil on (surface of) skin • sebum / oil repels pathogens • scabs form over cuts **or** scabs form a barrier • platelets are involved in forming clots / scab **stomach** • contains (hydrochloric) acid • (HCl) kills bacteria • in food **or** in swallowed mucus **eyes** • produce tears • contains enzymes to kill bacteria • tears are antiseptic **breathing system** • trachea / bronchi / nose produce mucus • mucus is sticky • (mucus) traps bacteria • (mucus) carried away by cilia ***defends itself against pathogens inside the body*** • immune system / white blood cells (WBCs) • WBCs engulf pathogens • antitoxins are produced • (antitoxins) neutralise toxins / poisons (produced by pathogen) • antibodies are produced • (antibodies) help destroy pathogens • memory cells (are formed) • (memory cells give a) more rapid response if pathogen re-enters a **level 2** response should refer to body defence **and** the immune system		
Total		**11**	

4.3.1.5 Protist diseases

Answer 02 · Mark scheme

June 2019 | 8461/1H | Original Q2

4.3.1.5 Protist diseases

Answer 03 · Mark scheme

November 2021 | 8461/2H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	mutation means less oxygen for (aerobic) respiration	allow haemoglobin **or** red blood cell carries oxygen for (aerobic) respiration do **not** accept no oxygen for respiration	1	AO2 4.6 4.6.1.5 4.2.2.3
08.2	4 ÷ 17 0.235(29...)	allow 4:13 allow 0.24 **or** 24% allow ratio 1 : 3.25	1 1	AO2 4.6.1.5 4.2.2.3
08.3	father / **8**'s gametes correct: $H^A + H^A$ mother / **9**'s gametes correct: $H^A + H^S$	allow **1** mark for both sets of gametes if parents not identified	1 1	AO2 AO2
	correct derivation of offspring genotypes: H^AH^A H^AH^A H^AH^S H^AH^S	allow correctly derived offspring genotypes from incorrect parental gametes	1	AO2
	correct phenotype for each derived genotype		1	AO2
	0.25 / ¼ / 25% / 1 in 4 / 1:3	allow **only** a probability consistent with student's derivations	1	AO3 4.6.1.6 4.6.1.7 4.6.1.8

4.3.1.5 Protist diseases

Answer 03 · Mark scheme

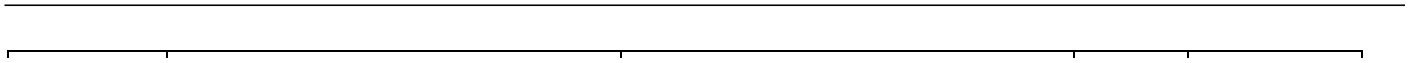
November 2021 | 8461/2H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any **three** from: *points for:* • H^AH^S do not get malaria • H^AH^S survive sickle cell anaemia *points against:* • H^AH^A may die from malaria • H^SH^S may become (severely) ill with sickle cell anaemia • Judgement: if parents H^AH^S then some offspring survive both malaria and sickle cell anaemia **or** if parents H^AH^S then some offspring may become (severely) ill with malaria and some become (severely) ill with sickle cell anaemia	to gain full marks both point(s) for and point(s) against must be given	3	AO3 4.6.2.1
Total			**11**	

4.3.1.5 Protist diseases

Answer 03 · Mark scheme

November 2021 | 8461/2H | Original Q8



4.3.1.5 Protist diseases

Answer 04 · Mark scheme

June 2023 | 8461/1H | Original Q5

Question 5

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

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.2	any **three** from: • protist / it has mitochondria • protist / it has (a) nucleus **or** protist DNA / genetic material is not free in the cytoplasm • protist / it does not have a single loop of DNA / genetic material • protist / it does not have <u>plasmid</u>s • protist / it does not have a cell wall	allow converse for prokaryotic cells allow eukaryotic for protist if neither mark awarded, allow **1** mark for protist has membrane-bound structures ignore genetic information ignore genetic information do **not** accept eukaryotic cell does not have a cell wall allow protist / it does not have a slime capsule ignore cilia / flagellae / ribosomes ignore size / shape	3	AO2 4.1.1.1 4.3.1.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.3	less oxygen carried (in blood)	allow less oxygen carried (to cells) ignore reference to number of red blood cells unqualified do **not** accept no oxygen carried	1	AO2 4.4.2.3 4.4.2.1 4.2.2.3
	less energy released from respiration	do **not** accept energy produced / made / created	1	

Question	Answers	Mark	AO / Spec Ref.
05.4	any **three** pairs from:	3	AO1 4.6.1.1 4.1.2.2

Sexual reproduction	Asexual reproduction
involves two parents	involves one parent
involves gametes joining / fusing **or** involves fertilisation	involves no (fusion of) gametes **or** does not involve fertilisation
there is mixing of genetic material / information **or** there is genetic variation **or** offspring are genetically different	there is no mixing of genetic material / information **or** there is no genetic variation **or** offspring are genetically identical ignore reference to clones
involves (only) meiosis	involves mitosis **or** does not involve meiosis
more energy required	less energy required
slower	faster

if no other mark awarded allow **1** mark for asexual reproduction produces many offspring

pairs of answers can be in any order

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.5	(no bases so) DNA replication cannot occur	allow copying / duplicating / doubling for replication ignore cannot make DNA unqualified	1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.6	(after DNA replication) one set of chromosomes is pulled to each end of the cell	allow one (member) of each pair of chromosomes is pulled to each end of the cell ignore (half the) chromosomes are pulled to each end of the cell	1	AO1 4.1.2.2
	nucleus divides	allow two (new) nuclei form	1	
	cytoplasm **or** cell membrane divides to form two cells	allow cytokinesis	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
05.7	having disorder **S** reduces incidence / percentage of malaria	allow having disorder **S** reduces chance of getting malaria allow having disorder **S** protects against malaria	1	AO3 4.2.2.5 4.3.1.5
	as age increases a lower percentage of children with disorder **S** get malaria until age 10, then the percentage increases	allow protection against malaria increases with (increasing) age until age 10, then it decreases	1	

Total Question 5	15

4.3.1.5 Protist diseases

Answer 03 · Examiner comments November 2021 | 8461/2H | Original Q8

Question 8 (standard/high & high demand)

This question was about the inheritance of sickle cell anaemia and its effects. Answers to **08.1** were generally insufficient. Many students knew that a mutation in the haemoglobin gene could result in less oxygen being transported around the body (although some stated this would 'affect' the amount of oxygen), but hardly any went on to explain that this would mean a lower level of respiration.

Calculations in **08.2** were weak. Some students did not count the number of normal and sickled cells in Figure 13. Many did not understand the difference between the ratio 4:13 and the fraction $\frac{4}{13}$. Many did not go on to convert the correct fraction $\frac{4}{17}$ to a decimal (0.24) or to a percentage (24%). Some students, having worked out a percentage, did not include the % symbol in their answer, thus giving an incorrect proportion of '24'. Thus few students scored both marks.

08.3 was a construction of a Punnett square to determine the probability that certain parents from the family pedigree diagram would produce a child with sickle cell trait, followed by multiplication by ½ to find the probability that this child would be female. A very small proportion of students was completely successful. Errors included assigning the same genotype to parents who had different phenotypes, not stating which gametes came from which parent, not identifying the phenotypes of the offspring genotypes and not dividing the probability from the Punnett square by 2 to allow for the biological sex specified in the question. A few students showed the offspring as being haploid even though each was derived from two haploid gametes.

In **08.4**, students had difficulty in applying information from various other parts of question 8 to evaluate the scientist's statement about the advantage of having the H^S allele in countries where malaria occurs. Around 96% of studebts did not discuss the effects of sickle cell anaemia and malaria on people of different stated genotype and thus scored no marks.

Answer 04 · Examiner comments June 2023 | 8461/1H | Original Q5

Question 5 (Standard, standard/high and high demand)

05.1 The majority of students answered this question correctly with just over 68% of students gaining credit. A number of students referred to 'communicable disease' or 'carrier' which were not creditworthy.

4.3.1.5 Protist diseases

Answer 04 · Examiner comments

June 2023 | 8461/1H | Original Q5

05.2 Students were told in the stem of the question that the malarial protist is a eukaryotic cell, and clearly most students processed this information and just under 95% of student gained some marks. Incorrect responses were seen often when students mixed up protist and prokaryote structures or had misconceptions regarding prokaryote structure suggesting a lack of cell membrane or cytoplasm.

05.3 Most students gained credit for stating that lesson oxygen could be carried by the blood, if red blood cells burst. Only around 20% of students linked this idea to respiration and energy release for the second marking point. Some students suggested that as a result 'no oxygen would be carried' which was not creditworthy. We again this year saw the usual incorrect idea of energy being produced or created which lost students this second marking point.

05.4 Over 70% of students were able to gain some marks on this question, with 8% gaining the full 3 marks available. Many students knew that sexual reproduction involved 'gametes' but they failed to include the idea of fusion and missed out on the first marking point. A pleasing number of students gave the idea of genetic variation for the second marking point, but when 'genetic' was omitted or students simply referred to 'clones' credit was not awarded. The full array of possible creditworthy ideas were seen, as well as the fallback mark.

05.5 Only around 37% of students gained this mark. Those that did not, often lacked detail in their answer. Students were required to specifically refer to DNA, and terms such as 'chromosome' or 'genetic material' were ignored. Furthermore, references to DNA 'multiplying' or 'reproducing' did not gain credit.

05.6 This was a high demand question, and in particular the first marking point proved a good discriminator with very few students referring to 'one set of chromosomes' being pulled to each end of the cell, and instead giving vague references to 'chromosomes pulling apart', or 'DNA halves' which are insufficient at this level. While the process of mitosis is undoubtedly familiar to most students, they struggled to articulate their ideas clearly in their responses. Less than 3% of students gained all 3 marks as a result. Almost 37% gained 1 mark for references either the 'nucleus dividing' or 'the cell membrane / cytoplasm dividing' to form 2 cells.

05.7 The majority of students got muddled with the data in this question or misinterpreted it due to misreading the information provided in the stem informing them that 'the incidence of malaria in children with disorder S was calculated as a percentage of the incidence in children without disorder S'. Consequently, most students concluded that that having disorder S *increased* the chances of children getting malaria and therefore only a minority gained credit, with only 1% of students gaining 2 marks. The trend was however described correctly by around 27% of students for the whole age range obtaining 1 mark.