AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.3.1.5

Protist diseases

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**2**
Available paper years	**2019–2021**

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 2019 | 8464/B/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	protist		1	AO1 4.3.1.5
04.2	any **two** methods with reason from: • Method: insecticides Reason: to kill mosquitos / vector • Method: (mosquito) nets Reason: to avoid being bitten • Method: insect repellents Reason: less likely to be bitten • Method: vaccination Reason: so people are immune (to malaria) • Method: anti-malaria tablets Reason: kills the pathogen / protist	1 mark for method and 1 mark for a correctly linked reason ignore kill insects unqualified allow long clothing ignore acts as a physical barrier allow DEET or named insect repellent allow named anti-malarial e.g. Larium / Malarone allow antibiotics allow ecf from 04.1 ignore kills malaria allow Method: drain swampy ground **or** remove pots of water **or** put oil on water / pond Reason: fewer breeding grounds for mosquitos allow Method: release GM / sterile mosquitos Reason: prevent / reduce reproduction if no other marks awarded allow **1** mark for kill mosquitos	4	AO1 4.3.1.1 4.3.1.5 4.3.1.7

4.3.1.5 Protist diseases

Answer 01 · Mark scheme

June 2019 | 8464/B/1H | Original Q4

04.3	any **two** from: (bacterial cell): does not have a nucleus has plasmids is smaller	 allow DNA is free in cytoplasm allow has a single loop of DNA allow has a single strand of DNA allow description, e.g. (small) ring(s) of DNA allow bacterial cells do not have mitochondria **or** do not have membrane bound organelles allow bacteria have smaller ribosomes ignore bacterial cells do not have chloroplasts	2	AO1 4.1.1.1
04.4	to allow air / oxygen in for bacteria to respire **or** so bacteria can respire aerobically	allow to allow carbon dioxide produced in respiration to escape	1	AO3 4.4.2.1

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Answer 01 · Mark scheme

04.5	(A) (no change in population size) because no / limited cell division / reproduction	allow (no change in population size) because bacteria / cells adjusting to environment / culture conditions ignore reference to growth unqualified	1	AO2 4.1.2.2 4.3.1.1 4.4.2.1 4.4.2.3
	(B) (rapid increase in population size) as cells dividing rapidly as (plentiful) supply of nutrients / food	allow rapid binary fission as (plentiful) supply of nutrients / food	1	
	(C) (population size stays the same) as rate of cell death equals rate of cell division		1	
	(D) (population size decreasing) as cells dying due to nutrients running out **or** (population size decreasing) as cells dying due to toxins / carbon dioxide / cell wastes building up (in solution)		1	

4.3.1.5 Protist diseases

Answer 01 · Mark scheme

04.6		a ratio of 30 000:1 for **X and** 0.55:1 for **Y** scores 3 marks		4.1.3.1
	(SA: vol ratio of **X** =) 2.4×10^{-7} **:** 8×10^{-12} **or** 0.000 000 24 **:** 0.000 000 000 008	if no other calculation marks awarded allow 1 mark for calculation of SA for **X and Y** **or** calculation of volume for **X and Y** **or** calculation of SA **and** volume for one **or** both cubes if not given as a ratio	1	AO2
	(SA: vol ratio of **Y** =) 726:1331		1	AO2
	conversion to same scale: 30 000:1 **and** 0.55:1		1	AO2
	(so) diffusion distance is longer in multicellular organism **or** (so) volume supplied by each unit of surface area is greater in multicellular organism	allow converse allow converse allow idea that some cells will have no surfaces exposed to outside in multicellular organism	1	AO1
	(so) diffusion rate per unit volume is slower in a multicellular organism	allow converse	1	AO2
Total			**17**	

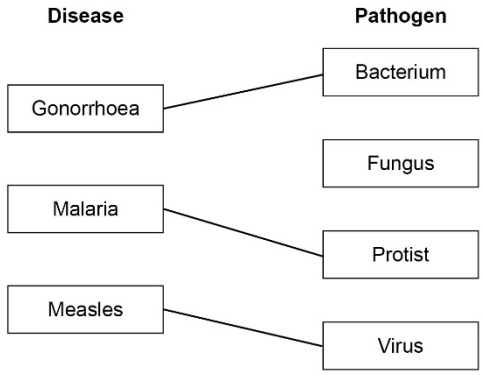
4.3.1.5 Protist diseases

Answer 01 · Mark scheme

June 2019 | 8464/B/1H | Original Q4

4.3.1.5 Protist diseases

Answer 02 · Mark scheme November 2021 | 8464/B/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left		1 1 1	AO1 4.3.1.1 4.3.1.2 4.3.1.3 4.3.1.5
04.2	reduces breeding / reproduction (in mosquitos) (so) fewer mosquitos to bite people **or** (so) fewer mosquitos to pass on pathogen / protist	allow fewer (mosquito) eggs fertilised allow no offspring produced (by sterile mosquitos) allow (so) less likely to be bitten by mosquitos ignore fewer mosquitos to pass on malaria / disease	1 1	AO2 4.3.1.1 4.3.1.5
04.3	electron microscope	ignore microscope unqualified ignore scanning / transmission do **not** accept light microscope	1	AO2 4.1.1.5 4.3.1.2

4.3.1.5 Protist diseases

Answer 02 · Mark scheme

04.4	(fungal spore) (16 μm =) 1.6×10^{-5} m **or** (virus) (2.5×10^{-7} m =) 0.25 μm $\frac{1.6 \times 10^{-5}}{2.5 \times 10^{-7}}$ **or** $\frac{16}{0.25}$ (=) 64	 allow $\frac{0.000\,016}{0.000\,000\,25}$ allow incorrect attempt at conversion or not converted value for length correctly substituted allow a correctly calculated value using an incorrectly or not converted value for length allow **1** mark **only** for $\frac{16}{2.5} = 6.4$	1 1 1	AO2 4.1.1.1 4.1.1.5 4.3.1.2 4.3.1.4

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04.5		the idea of less is only needed once		
	discolouration in leaves **or** less chlorophyll in leaves	ignore mosaic pattern of leaves unqualified	1	AO1
	(so) reduced photosynthesis	allow less light absorbed	1	AO1
	(so) less glucose produced so less amino acids / proteins / cellulose made	allow (so) less glucose so less energy for synthesis of chemicals **or** allow (so) less glucose for respiration (so) less energy transferred for growth	1	AO2 4.3.1.2 4.4.1.1 4.4.1.2 4.4.1.3 4.4.2.1
Total			**12**	

4.3.1.5 Protist diseases

Answer 02 · Mark scheme November 2021 | 8464/B/1H | Original Q4

Answer 01 · Examiner comments June 2019 | 8464/B/1H | Original Q4

Question 4 (standard, standard/high & high demand)

04.1 About 66% of students knew that malaria is caused by a protist. The most common incorrect response was virus.

04.2 Students were asked to give two methods used to prevent people catching malaria, with a reason or explanation for how each method would work. Around 65% of students gained two or more marks.

All marking points in the mark scheme were seen. Most students referred to the use of mosquito nets, but did not always gain the reason mark. A reference to avoiding being bitten, not just to there being a physical barrier, was required. Vaccination was also given as a method, but some struggled to explain how this would work.

There was confusion between antigens, antibodies and phagocytes. Many referred to the body being able to fight off the pathogen, which we always ignore. Some students confused insecticides and insect repellents. The insecticide kills the mosquito, but the repellent just reduces the chance of being bitten. Vague references to bug spray were not credited.

Some students had learnt various methods to reduce the breeding grounds for mosquitos, or talked about GM mosquitos. These were all given credit.

Some students did not appreciate that malaria is not passed from person to person. Some talked about isolating people, hygiene or protected sex, which were incorrect.

04.3 All the marking points on the mark scheme were seen. Most students gained a mark for saying a bacterial cell does not have a nucleus. 34% of students gained both marks.

Answer 01 · Examiner comments

04.4 Around 16% of students scored the mark for this challenging question. Students had to relate air, oxygen or carbon dioxide to respiration. Simply saying air had to get in to the bottle was insufficient at this level of demand.

Many said the bacteria needed air to grow, reproduce or survive. These were all insufficient. There were some confused responses, saying bacteria had to be able to enter the bottle through the holes.

04.5 The question required students to apply their knowledge from different parts of the specification to cell division and survival. Over half of the students gained one or more marks. Many students just described the sections of the graph, but did not give reasons for changes in the number of living bacterial cells.

Marking points 1 and 4 were seen most often:

- In stage A, a reference to the bacterial cells dividing slowly, or the cells adjusting to the culture conditions was needed.
- In stage B, many students either referred to the rapid rate of cell division or the plentiful supply of nutrients, but both aspects were needed to gain the mark.
- Only a few students explained why the population remained constant in stage C.
- The reason why the population decreased in stage D was often well expressed. This was usually in terms of nutrients running out rather than the build-up of wastes in the solution.

04.6 In this tough question, about 11% of students scored two or more marks, whilst about 32% scored one mark. This question differentiated across the ability range of students well.

The question stated that calculations must be included, but many students did not attempt any. Three of the five marks were for calculations. Two of these were for calculating the surface area:volume ratio for each cube. Some students calculated the surface area and volume, but did not write them as a ratio. Others forgot to multiply the surface area of one face by 6. The third calculation mark, for converting the two ratios to the same scale, was rarely seen.

If no calculation marks were gained, there was a compensation mark for calculating the total surface area of both cubes, calculating the volume of both cubes or calculating the surface area and volume of one cube when they had not written it as a ratio. Most students who had attempted to do calculations gained a compensation mark.

There were many confused explanations. Quite a lot said active transport would have to be used by the multicellular organism. Many realised that the surface area of cube Y is larger than the surface area of cube X, but did not relate this to the volume. Others thought that cell Y was 55 000 times larger than cell X, which was incorrect.

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Answer 02 · Examiner comments

November 2021 | 8464/B/1H | Original Q4

Question 4 (standard, standard/high and high demand)

This question was about diseases in humans and plants caused by pathogens. More than half of the students scored full marks for linking human diseases to the type of pathogen that each was caused by. Almost half scored 1 mark for saying that releasing sterile mosquitos into the environment would decrease reproduction in mosquitos. Few went on to explain how this would reduce the spread of malaria. As is often the case in questions about communicable diseases, students did not make it clear that reducing the spread of a disease is due to reducing the transfer of pathogens.

A third of students said an electron microscope would be used to view the virus; most just said microscope, which was insufficient. About a third of students knew what type of calculation was required to work out how many times longer the spore was compared to the virus. Few students realised that both measurements had to be converted to the same unit, and errors were seen when unit conversions were attempted. No student gave a full explanation why plants infected with TMV grow slowly. Some said there would be less photosynthesis or that the leaves would have less chlorophyll.