



**WESTMINSTER SCHOOL**  
**THE CHALLENGE 2022**  
**BIOLOGY**

**Thursday 28 April 2022**

**Time allowed: 30 minutes**

**Please write in black or blue ink.  
Calculators are allowed.  
Write your answers in the spaces provided.**

**For examiners use only**

Total Mark		30
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**Questions 1 through 10 are multiple choice questions.**

**Select one answer for each question.**

**Carefully and clearly write your answer to each of the ten multiple choice questions in the answer grid below .**

Question	Answer
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

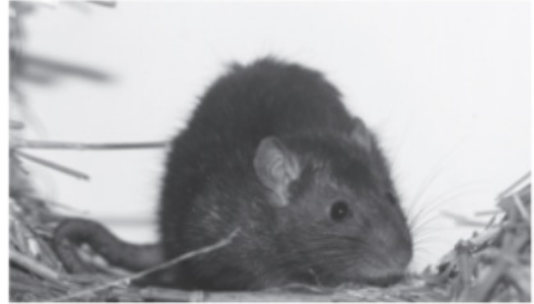
Carefully and clearly write your answer to each of the ten multiple choice questions in the answer grid on the previous page .

1.

The photographs show two different rats.



*Rattus norvegicus*



*Rattus rattus*

Which statement about the rats is correct?

- A The rats are the same genus.
- B The rats are the same species.
- C The rats can breed together to produce fertile offspring.
- D The rats do not share any of the same features.

2.

Lichens are formed from two different organisms living together.

The table shows some of the characteristics of two organisms, X and Y, found in most lichens.

X	Y
made of strands called hyphae hyphae have cell walls and many nuclei	single celled cell contains a nucleus and chloroplasts

Which kingdoms are represented by X and Y?

	X	Y
A	Fungus	Plant
B	Fungus	Protoctist
C	Protoctist	Fungus
D	Protoctist	Plant

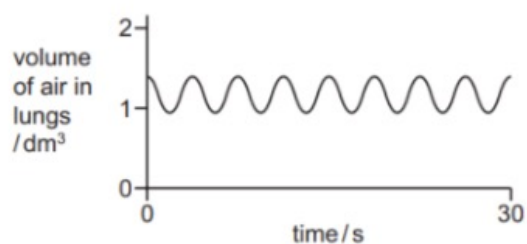
3.

What are the possible effects of deforestation?

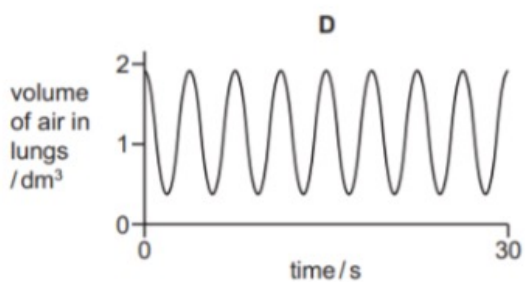
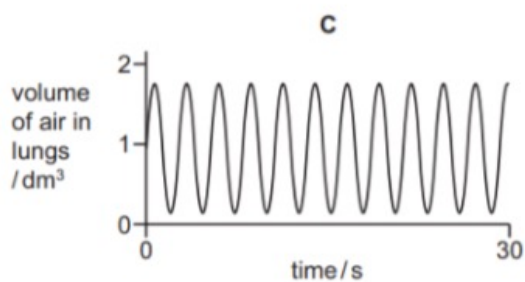
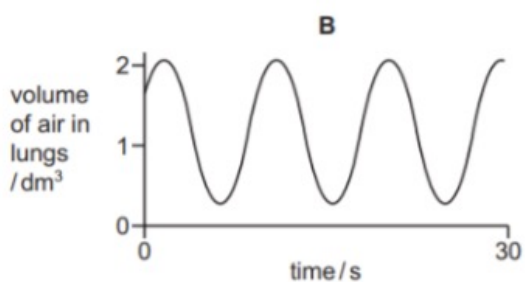
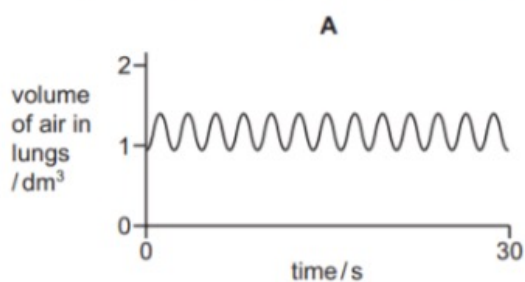
	loss of soil	flooding	decrease in atmospheric carbon dioxide
<b>A</b>	yes	yes	no
<b>B</b>	yes	no	yes
<b>C</b>	no	yes	no
<b>D</b>	no	no	yes

4.

The graph shows changes in the volume of air in the lungs of a person at rest, over a period of 30 seconds.



Which graph shows changes in the volume of air in the lungs of the same person immediately after they have done five minutes of vigorous exercise?



5.

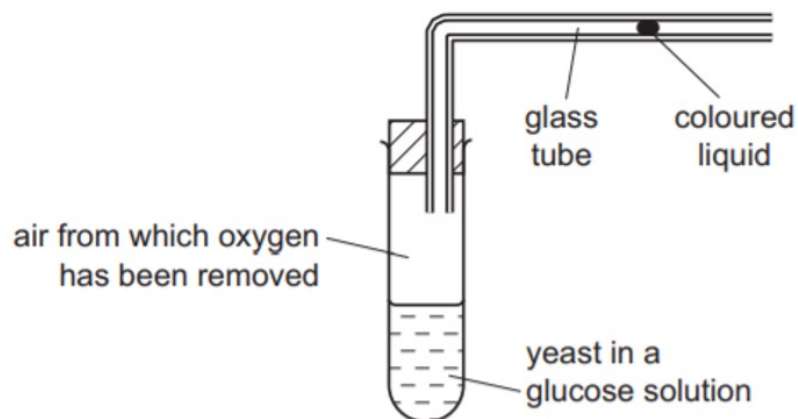
Two types of cell, one animal and one plant, were examined using a light microscope.

Which row shows the correct combination of cellular features that would be observed in the cells?

	cell structure observed			
	animal cell		plant cell	
<b>A</b>	chloroplast	membrane	vacuole	cytoplasm
<b>B</b>	cytoplasm	nucleus	chloroplast	membrane
<b>C</b>	membrane	cell wall	cytoplasm	nucleus
<b>D</b>	nucleus	chloroplast	cell wall	membrane

6.

The diagram shows apparatus used to investigate anaerobic respiration in yeast.

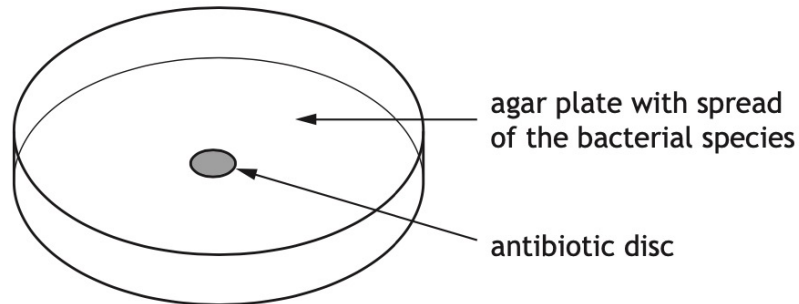


What happens to the coloured liquid?

- A** moves rapidly to the left
- B** moves slowly to the left
- C** moves to the right
- D** stays still

7.

The effect of an antibiotic on a bacterial species was tested by spreading a culture of each of the bacterial species on agar plates and adding a disc of absorbent paper soaked in the antibiotic, as shown in the diagram below.



The plate was incubated for 24 hours at 30 °C and the growth examined.

Which of the following would be a suitable control for this experiment?

Repeat the experiment exactly but

- A with no bacteria
- B incubate at human body temperature
- C use a disc with no antibiotic
- D use a disc with a different antibiotic.

8.

Mitochondria are small membrane-bound compartments present in eukaryotic cells.

One advantage to a mammalian muscle cell of having many small mitochondria is that they provide a

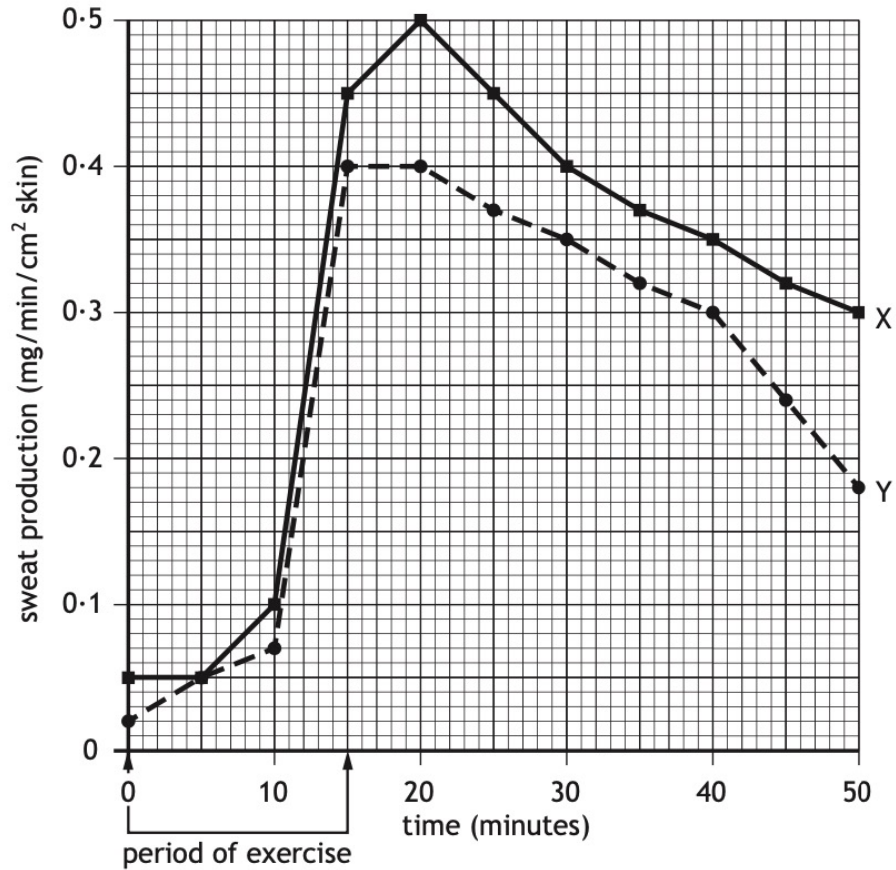
- A small surface area to volume ratio to increase the uptake of oxygen
- B large surface area to volume ratio to increase the uptake of oxygen
- C large surface area to volume ratio to decrease the uptake of carbon dioxide
- D small surface area to volume ratio to decrease the uptake of carbon dioxide.



9.

The rate of sweat production of two individuals, X and Y, was measured during and after a period of exercise.

The results are shown in the graph below.



Which of the following conclusions can be drawn from the graph?

- A The rate of sweat production of individual X is always greater than individual Y.
- B Individuals X and Y both reach their maximum sweat production at 20 minutes.
- C Individual X starts increasing sweat production sooner than individual Y.
- D The greatest difference in sweat production by individuals X and Y is at 50 minutes.

10.

The table below shows the number of beet armyworm larvae found in plots of cotton plants.

Some plots were treated with insecticide on 27 June and 1 August and other plots left untreated.

		<i>Number of beet armyworm larvae</i>	
<i>Sampling date</i>		Treated plots	Untreated plots
July	8	3	3
	15	33	2
	22	22	17
	29	42	10
August	5	120	8
	12	160	10

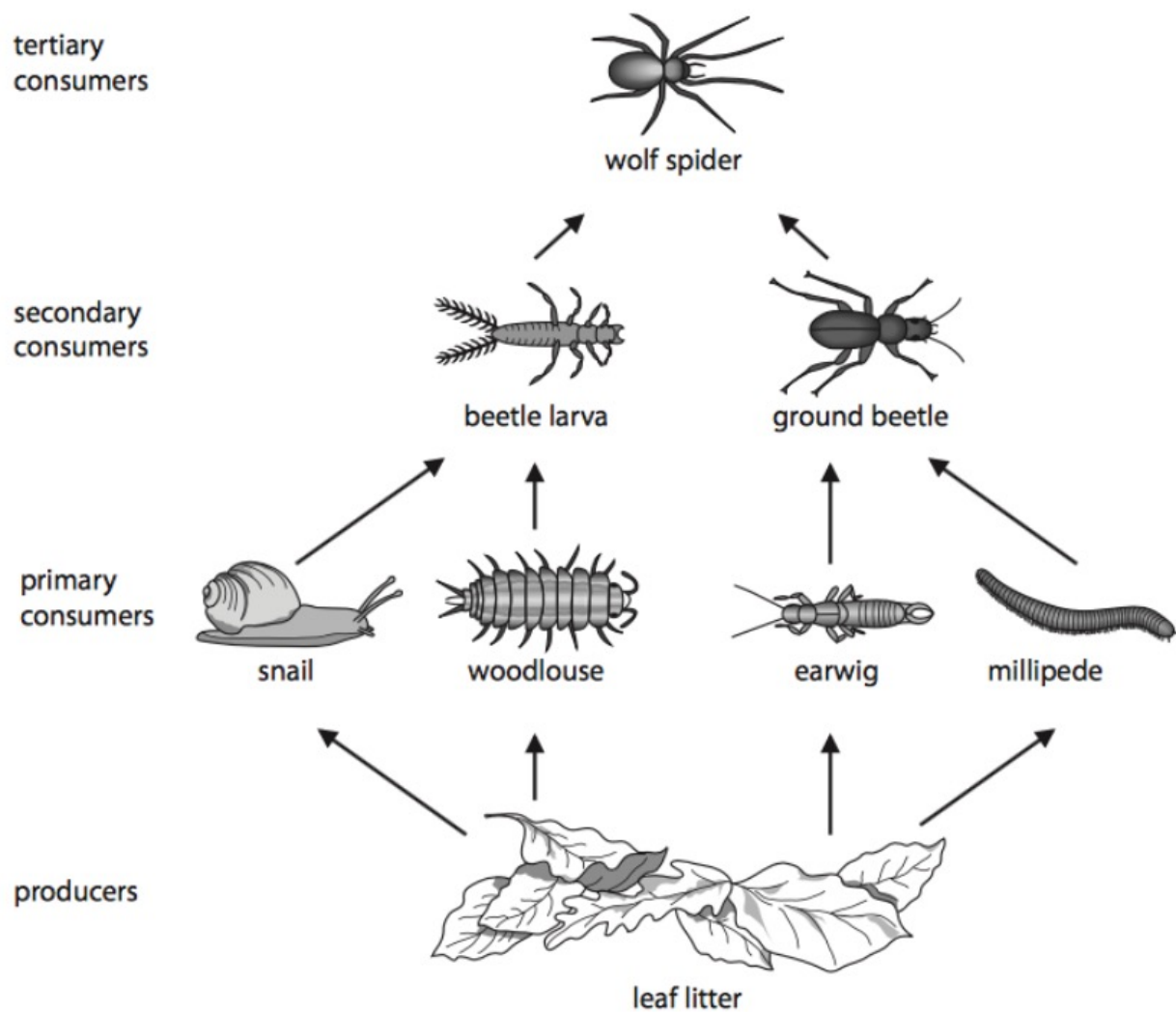
Which of the following is the most likely explanation for the differences between the treated and untreated plots?

- A The insecticide kills a predator of the larvae
- B The larvae are resistant to the insecticide
- C The beet armyworm breeds in July
- D The larvae have a short lifecycle



11.

When trees lose leaves, they fall to the ground and form leaf litter. The leaf litter provides food for many animals. The diagram shows a food web that includes leaf litter.



Use information in the food web to complete the table.

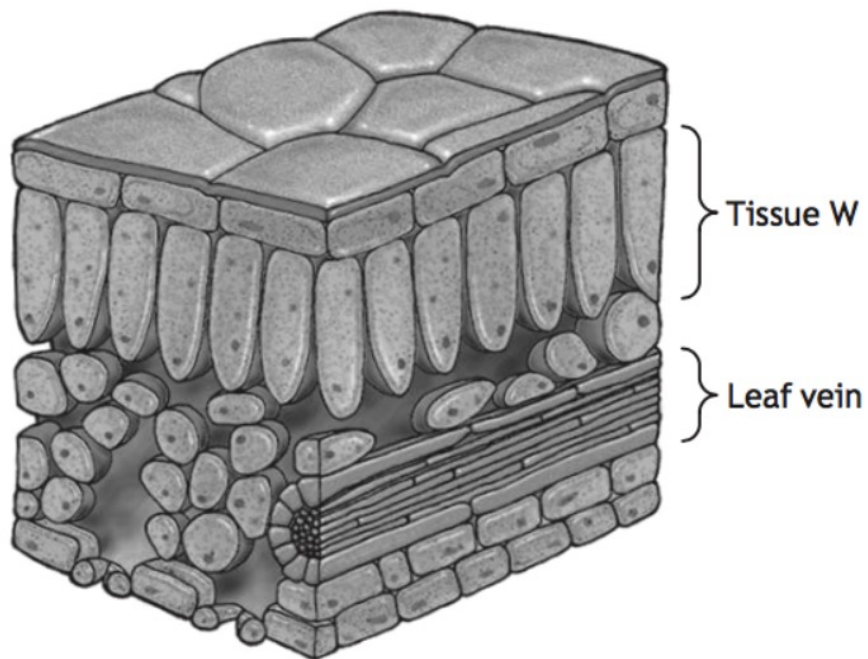
The first one has been done for you.

(4)

	Number
the number of different tertiary consumers	1
the number of trophic levels	
the number of food chains	
the number of different predators	
the number of different consumers	

12.

The diagram represents a section through a leaf.



(i) Name tissue W.

1

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(ii) The cells in tissue W have a greater number of chloroplasts than other leaf cells.

Suggest the advantage of these cells being located near the upper surface of the leaf.

1

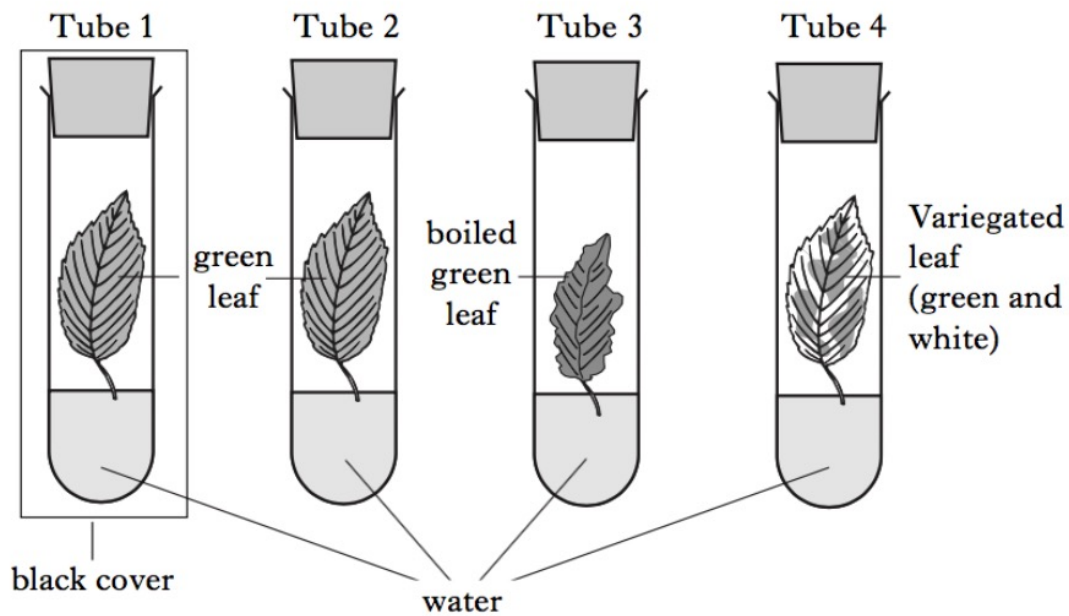
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13.

Leaves were placed in tubes as shown below.

The tubes were left in bright light.



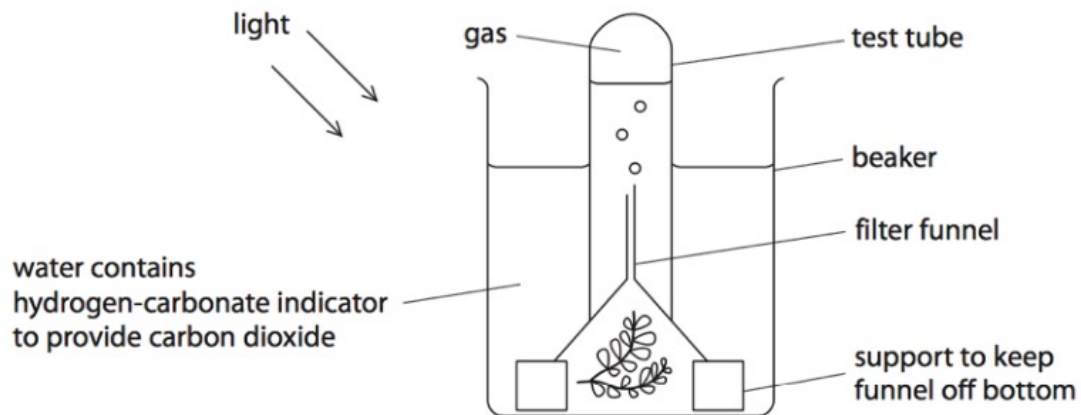
For each of the tubes, tick (✓) the appropriate box in the table to indicate which processes will take place in the leaves.

Process \ Tube	Only photosynthesis	Only respiration	Both	Neither
1				
2				
3				
4				

2

14.

A student investigated the effect of red, green and blue light on the rate of oxygen production of a water plant. She used the apparatus shown.



The student shone different coloured lights on the plant. She measured the rate of oxygen production, for each colour, by counting the number of bubbles released per minute.

The results are shown in the table.

Reading	Rate of oxygen production in bubbles released per minute		
	Red light	Green light	Blue light
1	10	1	12
2	11	1	10
3	9	1	2
Average	10	1	11

(a) Give two reasons why the data in the table are reliable.

(2)

1 .....

2 .....

(b) Suggest how the student could modify the apparatus to measure the rate of oxygen production more accurately.

(1)

.....

.....

.....

.....

(c) Name the independent variable in this investigation.

(1)

(d) The student changed the colour of the light but kept the intensity the same.

Give three other variables that she should keep the same in order to make the comparison of oxygen production valid.

(3)

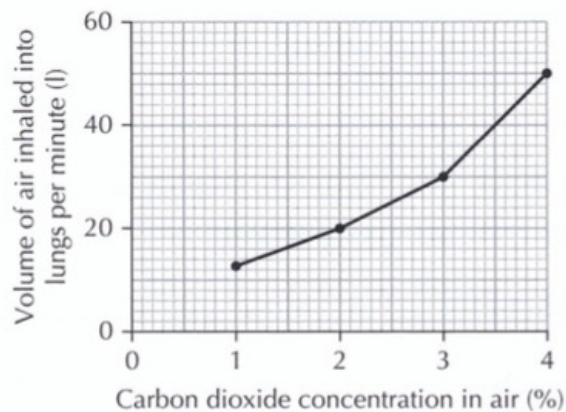
1

2

3

15.

The graph below shows the effect of carbon dioxide concentration in the air on the volume of air inhaled into the lungs of an individual at rest.



Calculate the volume of carbon dioxide entering the individual's lungs each minute when the volume of air inhaled is 20 litres per minute.

\_\_\_\_\_ litres (1)

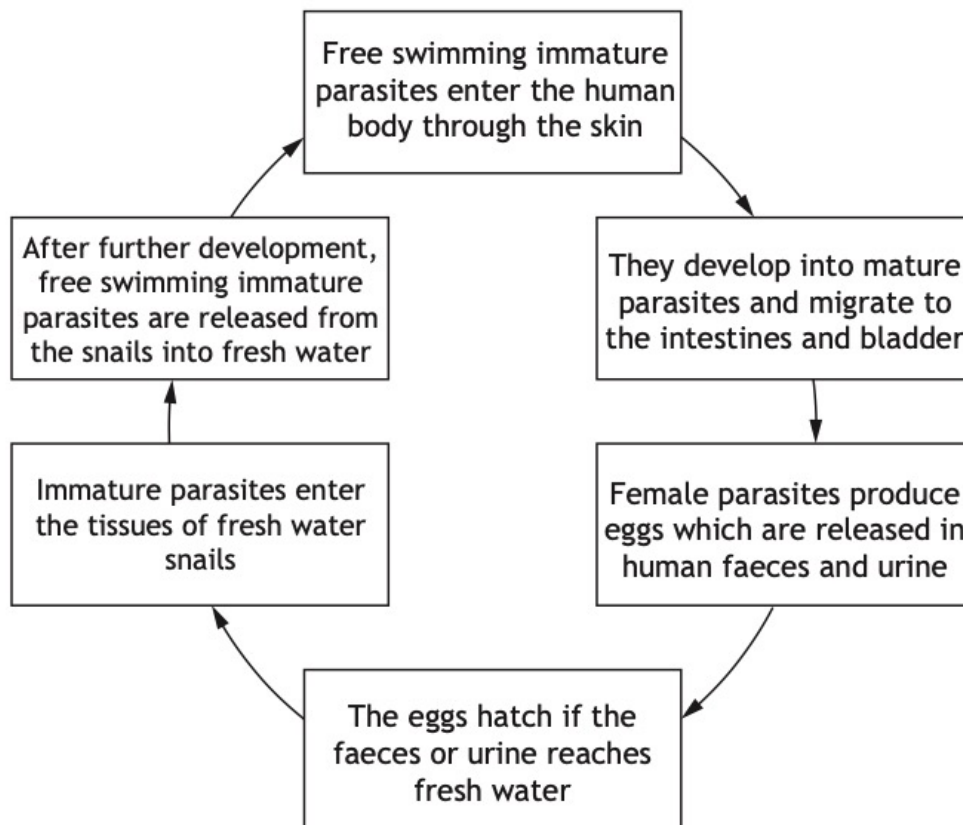


16.

The parasite *Schistosoma mansoni* causes the condition schistosomiasis in humans.

The condition is common in tropical regions where the parasite is often present in fresh water. Humans can be infected if they enter water containing the parasite.

The life cycle of *Schistosoma mansoni* is shown below.



(a) Explain why *Schistosoma mansoni* is described as a parasite.

1

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(b) Identify the secondary host and suggest a benefit to *Schistosoma mansoni* of including a secondary host in its life cycle.

2

Secondary host \_\_\_\_\_

Benefit \_\_\_\_\_

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(c) Describe **one** measure which could be adopted to reduce the number of cases of schistosomiasis.

1

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END OF QUESTIONS