



**Answer ALL questions in the spaces provided.**

1. HIV can damage the human immune system.

(a) Describe two active immune responses that are affected by HIV infection.

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**(4)**

(b) Non-specific immune responses are not affected by HIV and can continue to prevent infection. Complete the table below which shows some non-specific immune responses and descriptions of their functions.

Response	Description of function
Inflammation	
	Engulf and digest bacteria
Lysozyme action	
	Prevent viruses from multiplying

**(4)**

**(Total 8 marks)**

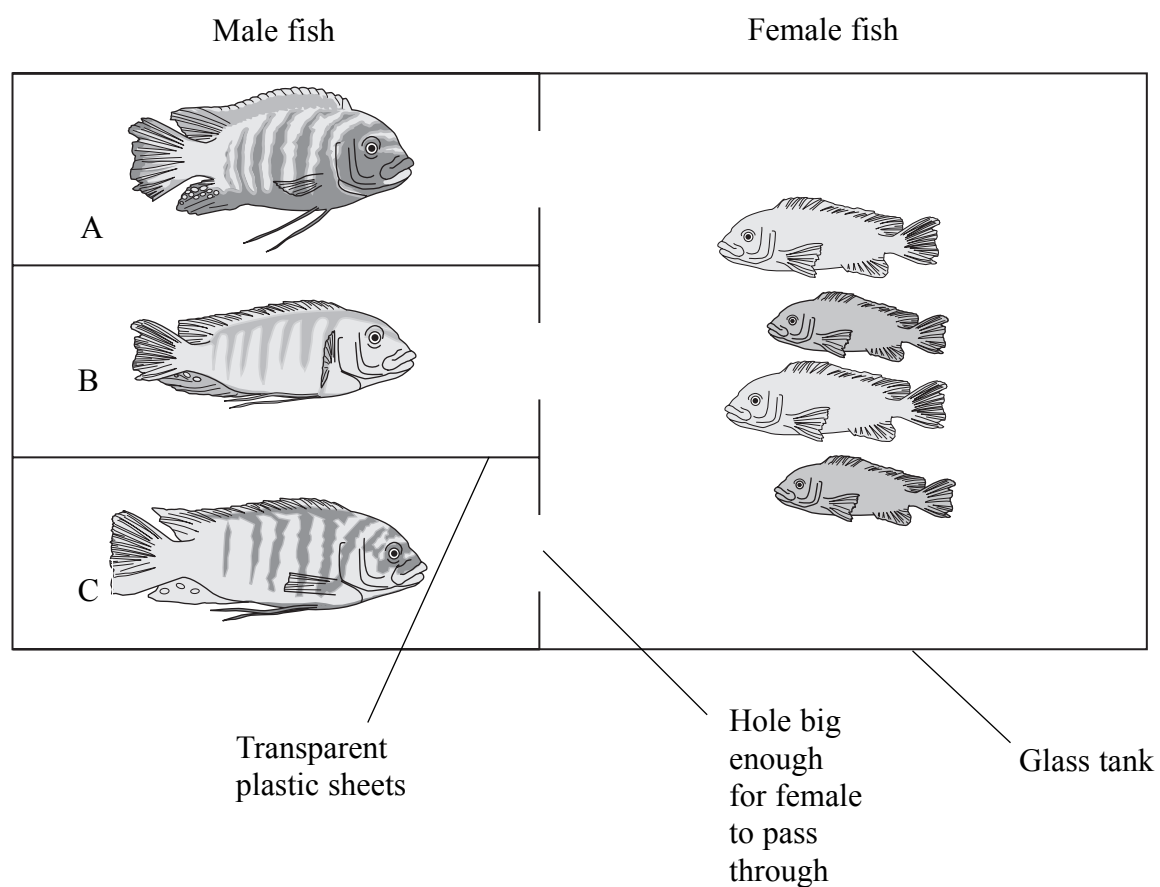
**Q1**



2. An investigation was carried out into the mating preferences of cichlid fish from three populations (A, B and C) taken from Lake Malawi. The fish were all the same species, but the males of each population showed distinct physical differences.

Male fish were separated into different areas of a tank by transparent plastic sheets. The plastic sheets had holes which allowed any female to enter, but prevented the males from leaving.

The diagram below shows the arrangement of the tank.



Females from each population were allowed to choose one mate, and their offspring were collected. The male parent of the offspring was determined using DNA analysis.



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The table below shows the number of times mating occurred between individuals of the different populations in a range of trials.

	Female from population		
Male from population	A	B	C
A	29	0	0
B	0	26	4
C	0	1	8

(a) Explain how the DNA analysis provides reliable evidence for the identity of male parents.

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**(3)**

(b) (i) Calculate the percentage of the matings that were between individuals of the same population. Show your working.

**(2)**



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(ii) Describe the mating preferences shown by the female fish in this investigation.

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**(2)**

(c) Suggest how the data support the hypothesis that population A is the most likely to become a separate species.

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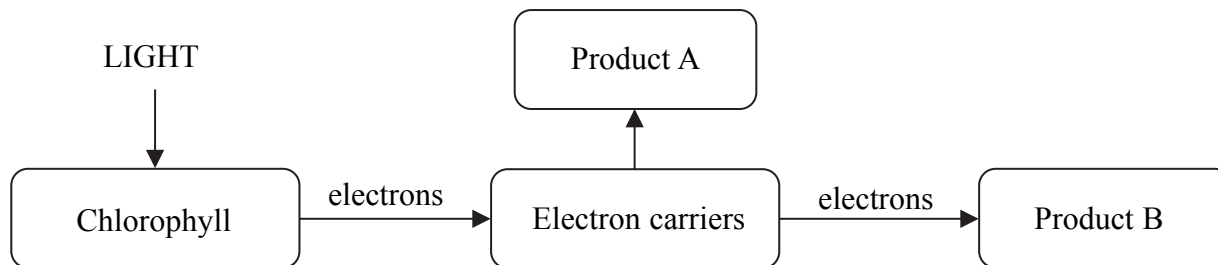
**Q2**

**(Total 11 marks)**

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3. The diagram below summarises the light dependent reactions of photosynthesis.



(a) Give the precise location within a chloroplast where this sequence of reactions occurs.

..... (2)

(b) Give the names of product A and product B.

Product A .....

Product B .....

(2)

(c) Give the name of the process that provides electrons to replace those lost by chlorophyll.

..... (1)

(d) A chemical called atrazine prevents the flow of electrons to the electron carriers. Describe and explain the likely effect of atrazine on the production of carbohydrate in a chloroplast.

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(e) Atrazine can be used as a weedkiller.

(i) Explain how the presence of weeds can reduce the yield of crop plants.

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(2)

(ii) A change in a single gene can alter the electron carriers so that atrazine is ineffective. Suggest how crop plants unaffected by atrazine could be used to increase crop yields.

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(Total 13 marks)

Q3

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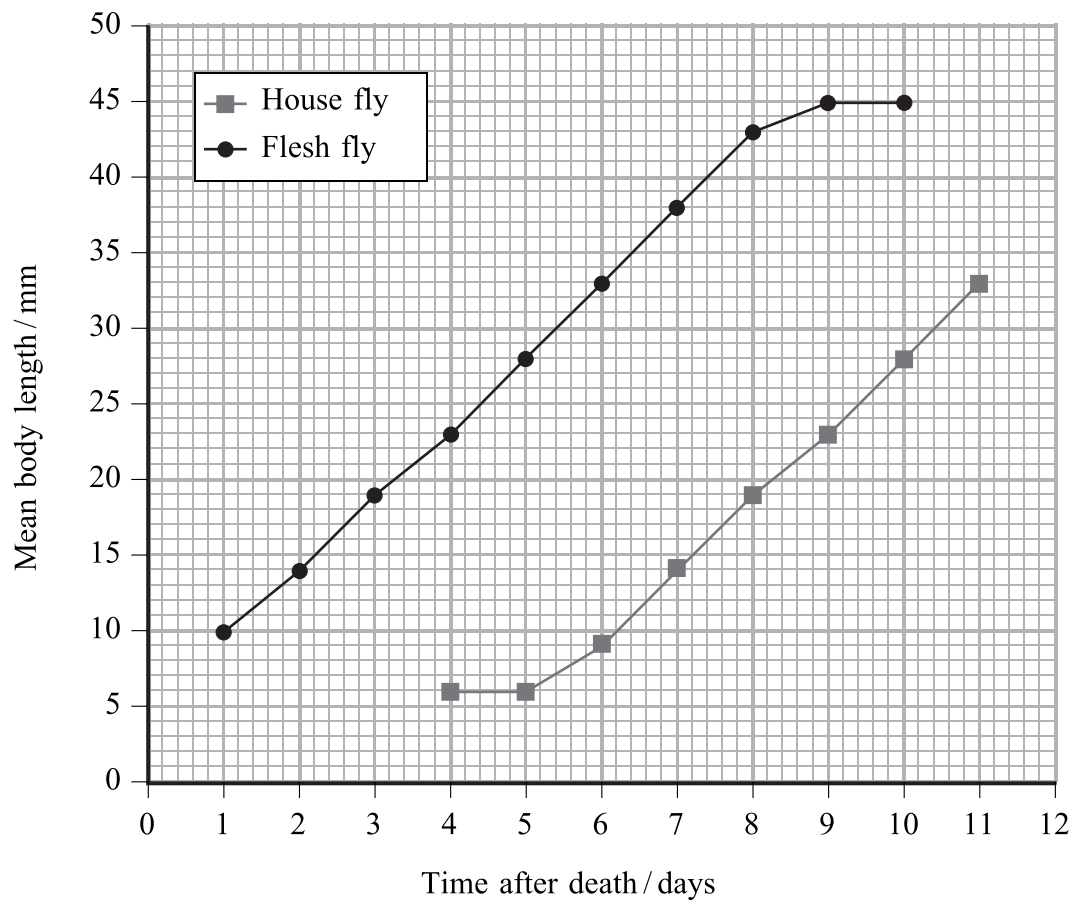


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4. The graph below shows the growth of two species of fly larvae on a dead body. The temperature was kept at 22 °C.



(a) (i) Give one factor, other than temperature, that could affect the growth of insect larvae on a dead body.

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(ii) Suggest and explain reasons why the time since death that larvae first appear on a body is different for each species.

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(b) The growth of the larvae is affected by temperature as shown in Table 1. The effects of temperature are given as the number of days ahead (+) or behind (-) their development at 22 °C.

**Table 1**

Temperature/°C	Effect on development / days	
	House fly	Flesh fly
12	-4	-4
27	+1	+1.5

Two dead bodies were found at the same address and evidence was needed to decide whether they died at the same time. One was found in a boiler room with a temperature of 27 °C and the other was found in an outside shed where the temperature was 12 °C.

Insect larvae from both bodies were collected, identified and measured. The results are shown in Table 2.

**Table 2**

Site of body	Mean length of larvae /mm	
	House fly	Flesh fly
Boiler room	23	45
Shed	6	23



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- (i) Use the information in the graph, Table 1 and Table 2 for flesh fly larvae to estimate the time of death for the body in the boiler room. The estimate using house fly larvae has been done for you.

	Length /mm	Suggested time since death at 22 °C/ days	Adjustment for 27 °C / days	Estimated actual time since death /days
House fly	23	9	1	8
Flesh fly				

(2)

- (ii) Use the measurements of larvae from the body in the shed to provide evidence that the two deaths occurred at approximately the same time.

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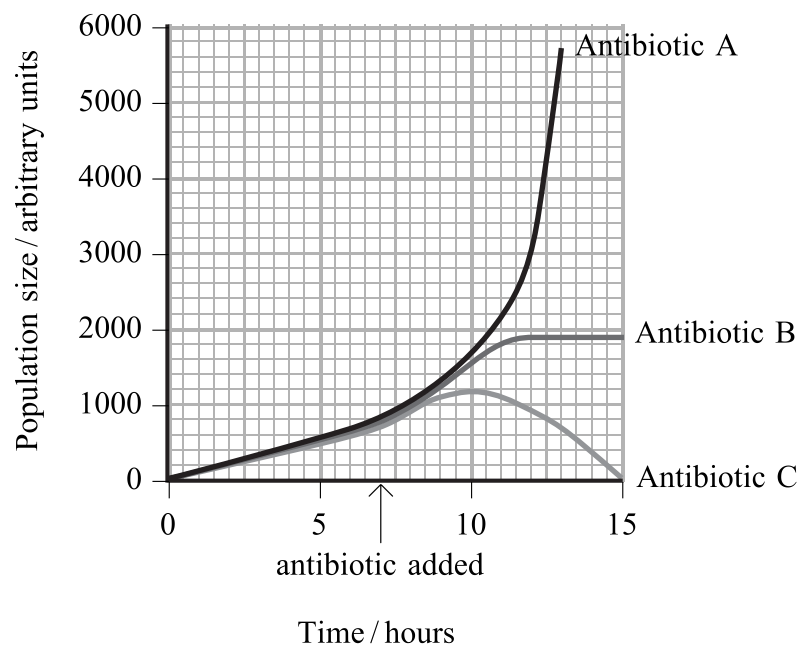
Q4

(Total 10 marks)

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5. The graph below shows the changes in population size of bacterial cultures grown in the presence of three antibiotics, A, B and C. In each case the antibiotic was added at 7 hours.



- (a) Use examples from the graph to explain the differences between bacteriocidal and bacteriostatic antibiotics.

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(b) A previous investigation on the same bacterium using antibiotic A had produced a curve similar to that for antibiotic B. Suggest an explanation for the change in the response to antibiotic A.

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(c) Outline a technique that could demonstrate the effectiveness of antibiotics on bacteria.

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**(Total 11 marks)**

**Q5**



6. Chimpanzees and humans share about 98.4% of their DNA and it is thought that they had a common ancestor about four million years ago. One gene that shows differences is 'Fox P2' which is involved in speech. All modern humans have the same allele for this gene which is different from that found in chimpanzees.

(a) Explain how the frequency of the Fox P2 allele could have increased as humans evolved.

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(3)

(b) (i) Until 1968 it was illegal to teach evolution in schools in a number of states in the USA. Suggest **two** reasons why it was thought necessary to make the teaching of evolution illegal in these schools.

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(2)



(ii) Suggest why the teaching of natural selection has less opposition than the teaching of evolution.

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(2)

(Total 7 marks)

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Q6

**TOTAL FOR PAPER: 60 MARKS**

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