OXFORD AQA
INTERNATIONAL QUALIFICATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____
I declare this is my own work.

INTERNATIONAL A-LEVEL
BIOLOGY (9610)

Unit 3 Populations and Genes

Wednesday 21 May 2025 07:00 GMT Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a ruler with millimetre measurements
- a scientific calculator, which you are expected to use where appropriate.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

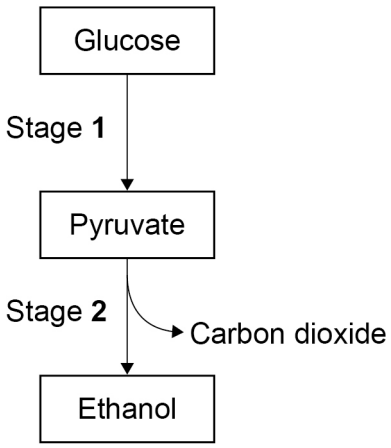
Do not write outside the box

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

0 1 Yeast is a microorganism that can use anaerobic respiration.

Figure 1 shows some of the stages of anaerobic respiration in a yeast cell.

Figure 1



0 1 . 1 Name Stage **1** shown in **Figure 1**.

[1 mark]

---

0 1 . 2 **Table 1** shows the stages of anaerobic respiration from **Figure 1**.

Complete **Table 1**.

Tick (✓) the boxes that show the molecules that each stage produces or uses.

[2 marks]

Table 1

Molecules each stage produces or uses	**Stage 1** **Glucose → Pyruvate**	**Stage 2** **Pyruvate → Ethanol**
Produces reduced NAD		
Uses reduced NAD		
Produces ATP		
Uses ATP		

Do not write outside the box

0 1 . 3 Describe why Stage **2** in **Figure 1** is important in anaerobic respiration in yeast.

[3 marks]

0 1 . 4 Anaerobic respiration can occur in muscle cells.

Give **two** differences between anaerobic respiration in a yeast cell and anaerobic respiration in a muscle cell.

[2 marks]

1

2

8

Turn over for the next question

Do not write outside the box

0 2 Some bacteria can photosynthesise.

Purple bacteria contain pigments called bacteriochlorophylls that have a similar role to chlorophyll in photosynthesis in plants.

0 2 . 1 Suggest the role of bacteriochlorophylls.

[2 marks]

0 2 . 2 The purple bacteria use hydrogen sulfide (H_2S) in photosynthesis instead of water.

Suggest the role of hydrogen sulfide.

[2 marks]

0 2 . 3 The purple bacteria do **not** produce oxygen during photosynthesis.

Suggest what the bacteria produce instead.

[1 mark]

Do not write outside the box

0 2 . 4 Purple bacteria and green bacteria are found in the same habitat.

Purple bacteria contain bacteriochlorophylls that absorb light with wavelengths between 750 and 800 nm

Green bacteria contain **different** bacteriochlorophylls that absorb light with wavelengths between 625 and 675 nm

Suggest why it is an **advantage** for the different types of bacteria to have different pigments.

[2 marks]

_____

_____

_____

_____

_____

_____

7

Turn over for the next question

Do not write outside the box

0 3 Some plants release chemicals that can:

- affect the growth of other plants
- defend plants against pathogens or pests.

These chemicals are called allelochemicals and the plants are called allelopathic plants.

0 3 . 1 Suggest **one** advantage to allelopathic plants of releasing allelochemicals.

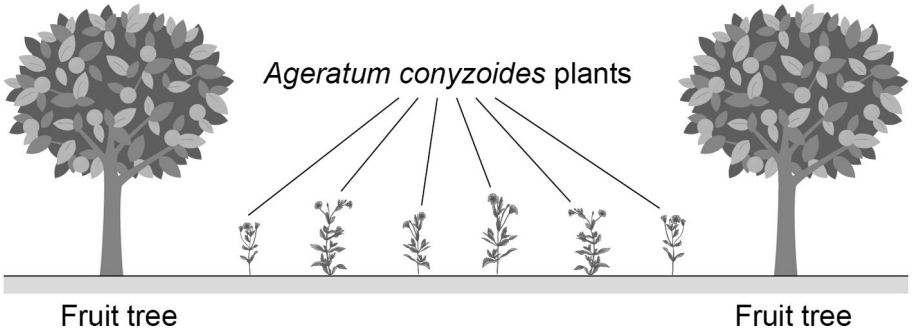
[1 mark]

Fruit trees can be grown as crops.

Ageratum conyzoides is an allelopathic plant that can be planted between fruit trees. This is called intercropping.

Figure 2 shows this example of intercropping.

Figure 2



Do not write outside the box

Red mites are pests that feed on the leaves and fruits of trees.

Figure 3 shows a red mite on a leaf.

Figure 3

A. conyzoides plants release chemicals into the air that attract predatory mites.

The predatory mites are natural predators of red mites.

0 3 . 2 Suggest the advantages and disadvantages of intercropping between fruit trees.

Use the information provided and your own knowledge of pest control.

[3 marks]

Advantages _____

_____

_____

_____

_____

Disadvantages _____

_____

_____

_____

_____

Question 3 continues on the next page

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

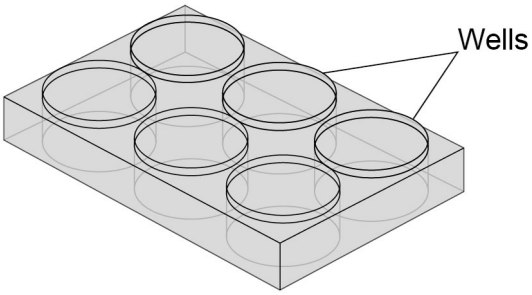
Lettuce is a common crop plant.

Scientists research the effect of allelopathic plants on the growth of lettuce seedlings.

The scientists use leaves from four allelopathic plants **W**, **X**, **Y** and **Z**.
The scientists use plates with six wells.

Figure 4 shows one of the plates.

Figure 4



This is the method the scientists use.

1. Add growth medium to three of the wells.
2. Add growth medium containing leaves from plant **W** to the other three wells.
3. Put five lettuce seeds in each of the six wells.
4. Repeat steps 1 to 3 using 19 more plates.
5. Repeat steps 1 to 4 with each of plants **X**, **Y** and **Z**.
6. Keep the plates at 25 °C

Question 3 continues on the next page

Do not write outside the box

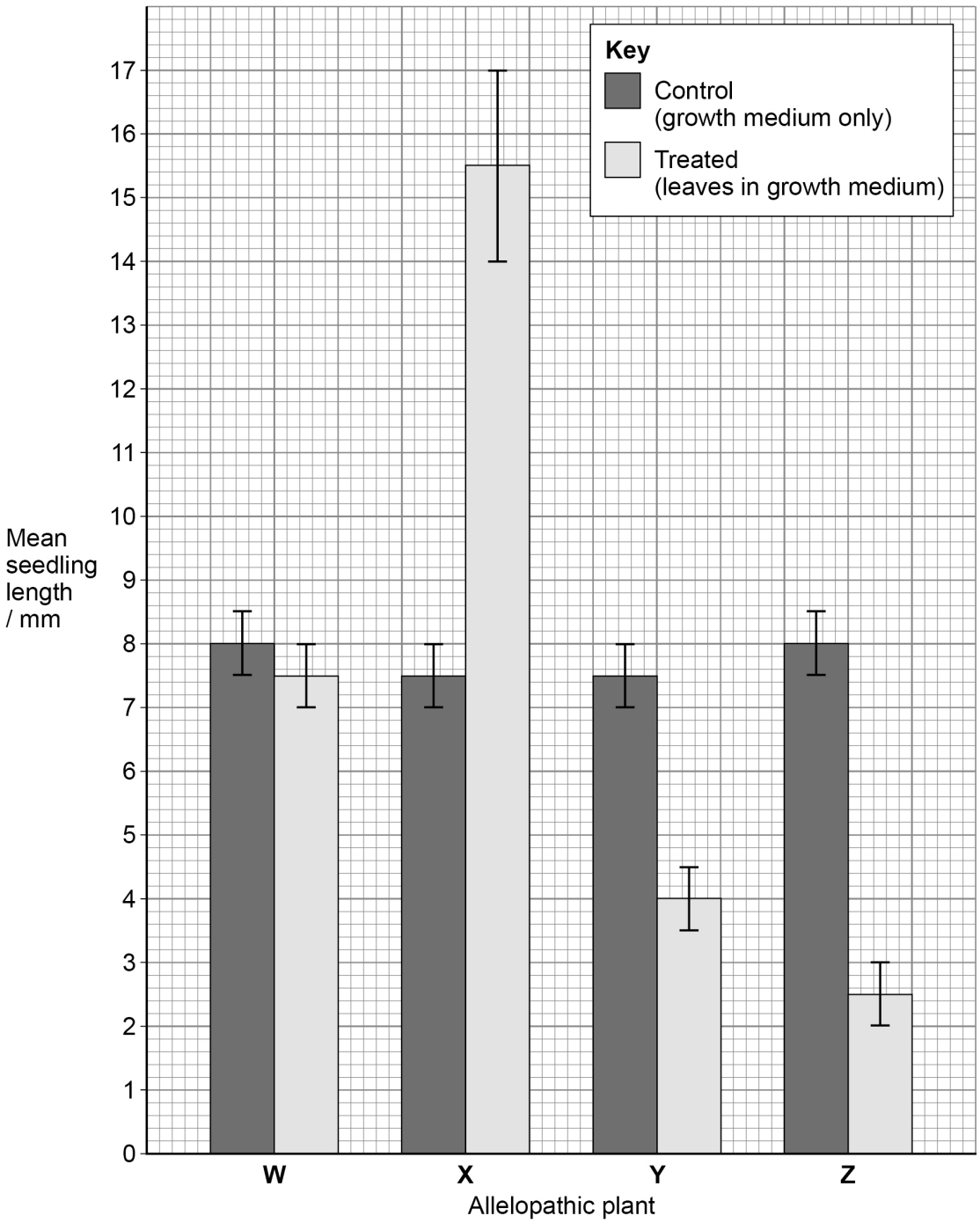
The scientists:

- measure the total length of each lettuce seedling from root tip to shoot tip after 1 week
- calculate the mean lengths.

Figure 5 shows the scientists' results.

The error bars show ± standard error.

Figure 5



Do not write outside the box

0 3 . 3 Describe what the scientists can conclude from the results shown in **Figure 5**.

[4 marks]

0 3 . 4 Suggest **one** piece of information that would be needed before one of the allelopathic plants could be used for intercropping.

[1 mark]

9

Turn over for the next question

Do not write outside the box

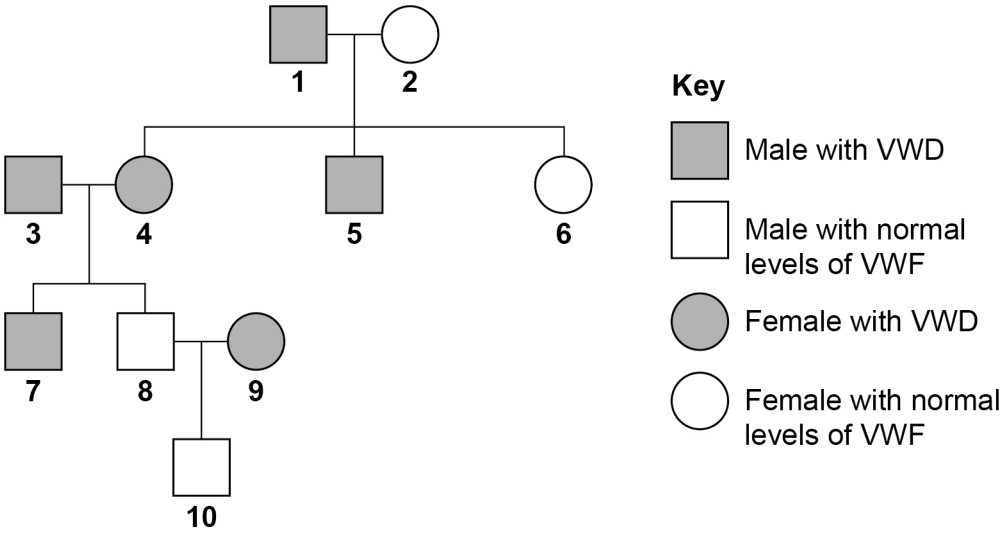
0 4 Von Willebrand Disease (**VWD**) is an inherited disease that can cause a person to lose more blood than normal after an injury.

People with VWD have low levels of a protein called von Willebrand factor (**VWF**) in their blood. VWF helps blood cells to stick together after an injury so a blood clot can form.

VWD is caused by a dominant allele, **A**. The recessive allele, **a**, causes normal levels of VWF.

Figure 6 shows the inheritance of VWD in one family.

Figure 6



0 4 . 1 Give the genotype of individual **1**.

[1 mark]

_____

0 4 . 2 Explain how **Figure 6** shows that VWD is caused by a dominant allele.

[2 marks]

_____

_____

_____

_____

_____

_____

Do not write outside the box

0 4 . 3 Explain **one** piece of evidence from **Figure 6** to show that inheritance of VWD is **not** sex-linked.

[2 marks]

_____

_____

_____

_____

_____

_____

0 4 . 4 Individuals **8** and **9** have another child.

Draw a genetic diagram to show all the possible genotypes and the ratio of phenotypes expected in the offspring.

[2 marks]

Parents	Individual **8**	Individual **9**
Genotypes of parents	_____	_____

Genotypes of offspring _____

Phenotypes of offspring _____

Ratio of phenotypes _____

Question 4 continues on the next page

Do not write outside the box

0 4 . 5 The population of the United States is about 340 million people.

The frequency of the allele for VWD is 0.004

Calculate the number of people in the United States who are heterozygous for the gene for VWD.

Use the Hardy–Weinberg equation.

Give your answer in standard form.

[3 marks]

Number of people = _____

0 4 . 6 The Hardy–Weinberg principle can be used to predict the frequency of the VWD allele in the United States.

Give **one** reason why the principle might apply and **one** reason why it might not apply.

[2 marks]

Might apply _____

_____

_____

Might not apply _____

_____

_____

0 4 . 7 Some people have VWD but did **not** inherit the dominant allele from one of their parents.

Suggest why these people have VWD.

[1 mark]

_____

_____

_____

13

Do not write outside the box

Turn over for the next question

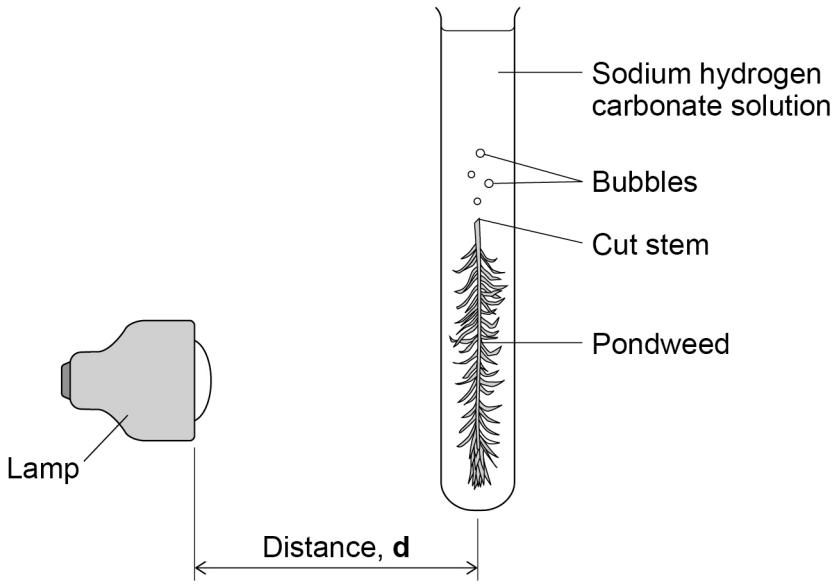
DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 5 A student investigates the effect of light intensity on the rate of photosynthesis in pondweed.

The student uses the equipment shown in **Figure 7**.

Figure 7



The student changes the light intensity by putting the lamp at different distances, **d**, from the pondweed.

The student measures the rate of photosynthesis by counting the number of bubbles released in one minute.

0 5 . 1 Give the reasons why the pondweed stem is positioned so that the cut end:

- is pointing upwards
- is in the middle of the tube.

[2 marks]

Pointing upwards _____

_____

_____

In the middle of the tube _____

_____

_____

Do not write outside the box

0 5 . 2 At each distance from the lamp, the student uses:

- the same concentration of sodium hydrogen carbonate solution
- the same piece of pondweed.

Explain why the student keeps these variables the same.

[3 marks]

0 5 . 3 Suggest **two** limitations of the student's method.

[2 marks]

Limitation 1

Limitation 2

Question 5 continues on the next page

Do not write outside the box

Table 2 shows the student's results.

Table 2

Distance	Number of bubbles released in 1 minute		
0.3	24	19	23
0.25	27	31	29
0.2	40	37	40
0.15	46	48	50
0.1	51	47	46

0 5 . 4 Give **two** ways the student could improve the table of results.

[2 marks]

Improvement 1 _____

_____

_____

Improvement 2 _____

_____

_____

Do not write outside the box

Question 5 continues on the next page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

The student processes the results by calculating $1/\mathbf{d}^2$ where **d** is the distance between the pondweed and the lamp.

This gives a measure of relative light intensity as $1/\mathbf{d}^2$ is proportional to light intensity.

Table 3 shows the student's processed results.

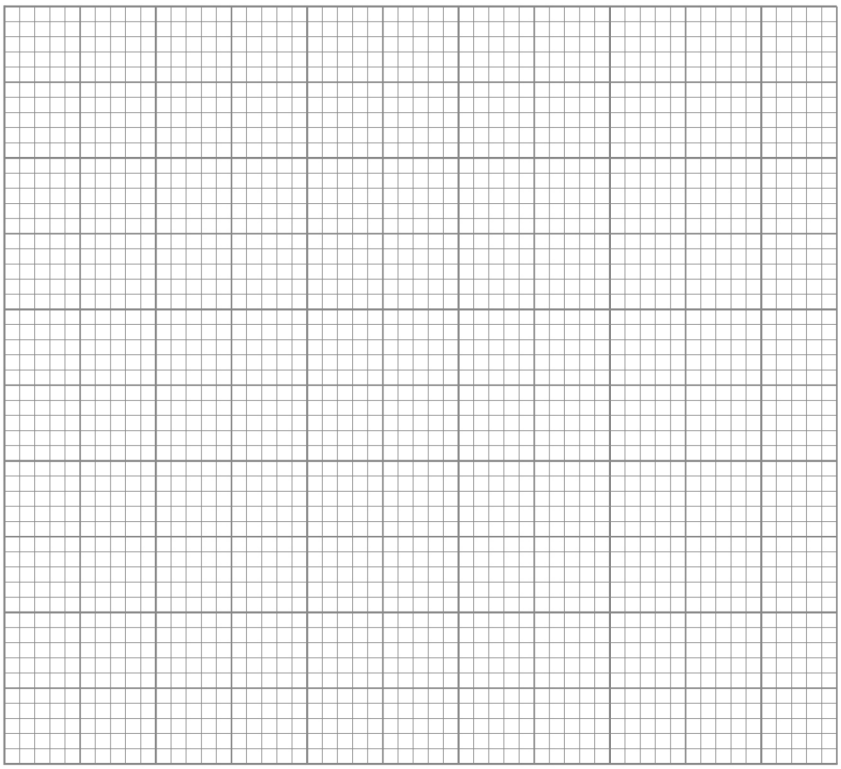
Table 3

Relative light intensity $1/d^2$ / m^{-2}	**Mean number of bubbles released in 1 minute**
11	22
16	29
25	39
44	48
100	48

0 5 . 5 Plot a graph of the student's processed results.

Draw a line of best fit on your graph.

[3 marks]



Do not write outside the box

0 5 . 6 Explain the student's results.

Use **Table 3** and the graph you plotted in Question **05.5**.

[2 marks]

0 5 . 7 The student uses a statistical test to analyse the results.

Name the statistical test the student should use.

Give the reason for your choice of test.

[1 mark]

Name of statistical test _____

Reason for choice _____

_____

15

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 6 Some breeds of chickens are farmed for meat. The chickens are often kept in large buildings called barns.

Figure 8 shows some chickens in a barn.

Figure 8

0 6 . 1 Waste from chickens can be used as a natural fertiliser. Farmers spread the waste on their fields.

A lake near a chicken farm develops a green colour.

Suggest how chicken waste on the fields could cause the green colour of the lake.

[2 marks]

_____

_____

_____

_____

_____

_____

Question 6 continues on the next page

Do not write outside the box

There are different chicken farming systems. Two of these are:

- standard indoor
- free-range indoor.

The two systems use different breeds of chicken.

Table 4 gives information about the chicken farming systems.

Table 4

Farming system	Minimum age when sold for food / days	Number of chickens per m^2	Breed of chicken
Standard indoor	36	19	Fast-growing
Free-range indoor	52	13	Slow-growing

0 6 . 2 A farm has a barn 21 m wide and 104 m long.

The farm could sell up to 198 744 chickens per year using the free-range indoor system.

The farm uses the standard indoor system.

Calculate the maximum number of chickens the farm could sell per year using the standard indoor system.

Use data from **Table 4**.

[2 marks]

Number of chickens _____ per year

Do not write outside the box

Table 5 gives information about the two different breeds of chicken.

Table 5

	Fast-growing breed	**Slow-growing breed**
Mass of food in kg needed to gain 1 kg of body mass	1.46	1.76
Percentage of chickens that cannot walk properly	38	11
Percentage of chickens that die before they are sold for food	11	5

0 6 . 3 Evaluate the use of the two chicken farming systems **and** the two chicken breeds.

Use all of the information provided.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

8

Turn over for the next question

Do not write outside the box

0 7 Surtsey is an island near the coast of Iceland. It was formed when a volcano erupted in the 1960s.

Figure 9 shows Surtsey Island.

Figure 9

New species are colonising the island every year. The island will eventually be covered by forest, but this will take 300 to 2000 years.

Scientists are studying succession on the island.

Do not write outside the box

0 7 . 1 Describe how succession occurs on an island like Surtsey.

[5 marks]

Question 7 continues on the next page

Do not write outside the box

0 7 . 2 Population sizes can vary.

Describe how **named** abiotic and biotic factors can increase population sizes.

[6 marks]

Do not write outside the box

0 7 . 3 Populations can change over time.

Describe how natural selection can cause a population to change.

[4 marks]

15

END OF QUESTIONS

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Do not write outside the box

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.oxfordaqa.com

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and OxfordAQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2025 OxfordAQA International Examinations and its licensors. All rights reserved.