

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

3430U40-1



SCIENCE (Double Award)

**Unit 4 – BIOLOGY 2
FOUNDATION TIER**

TUESDAY, 15 MAY 2018 – AFTERNOON

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	8	
2.	4	
3.	9	
4.	7	
5.	11	
6.	6	
7.	7	
8.	8	
Total	60	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the additional pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

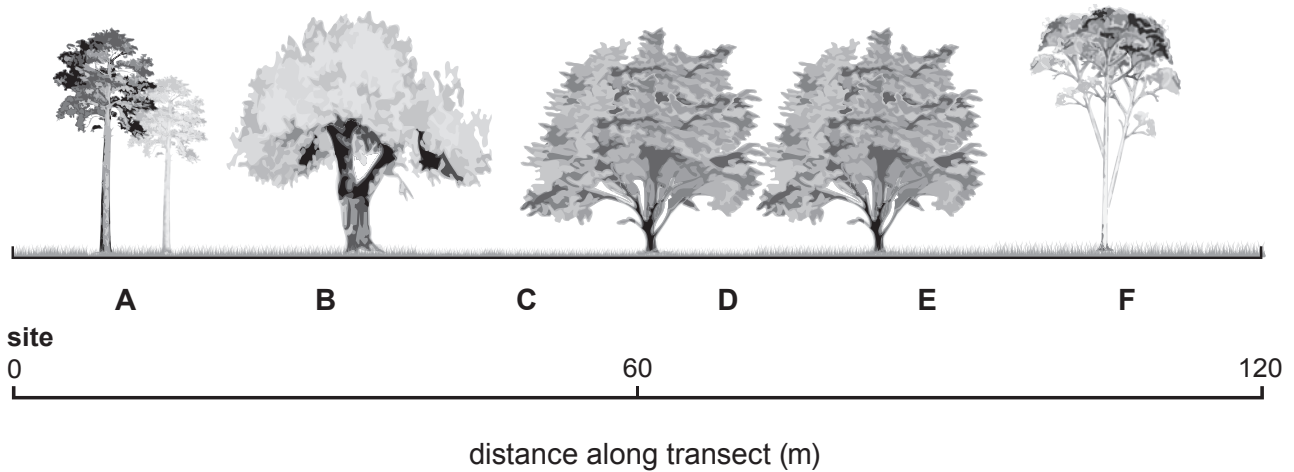
Question **6** is a quality of extended response (QER) question where your writing skills will be assessed.



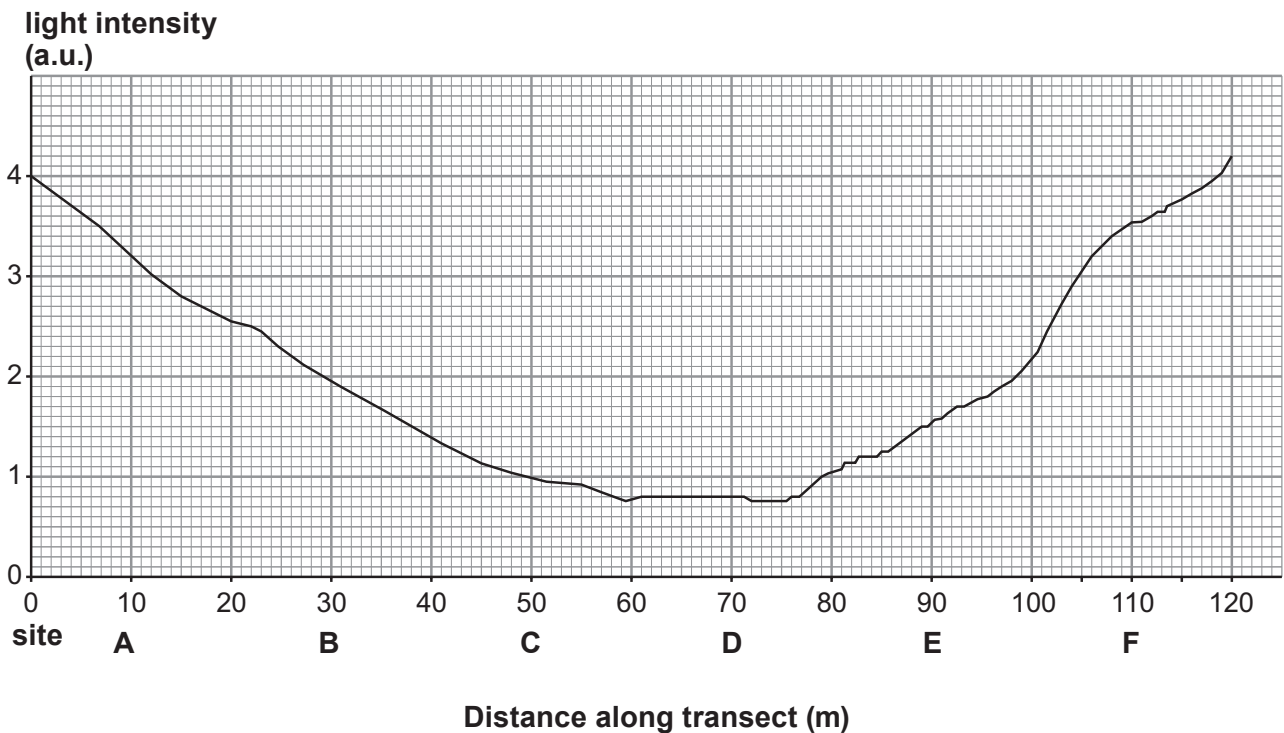
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Answer all questions.

1. Ceri used a data logger to measure light intensity at six sites (A – F) along a 120 m transect through a wood, as shown below.



The results below are shown on her computer screen.



- (i) Describe how light intensity changes along the transect.

[2]



- (ii) Ceri thought that light intensity affected the number of plant species growing under the trees along the transect.

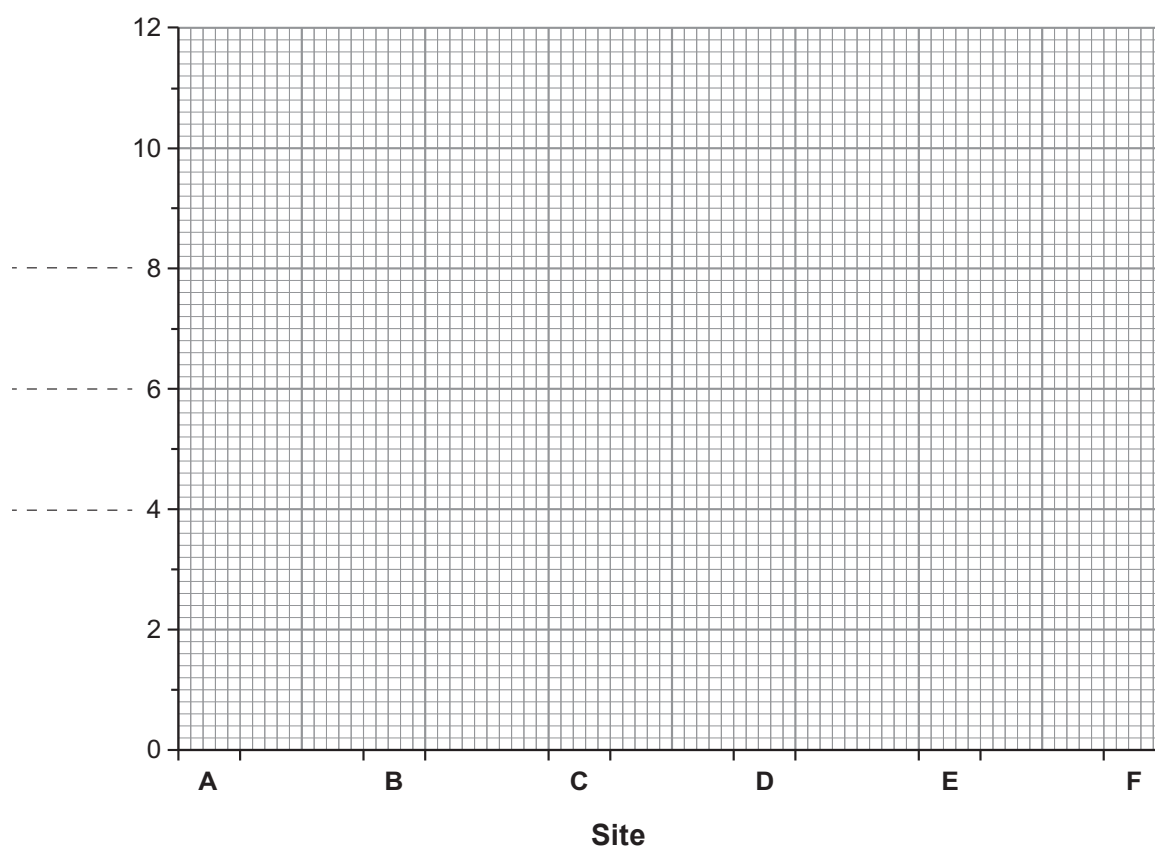
She counted the number of plant species present at each site.

The results are shown in the table.

Site	A	B	C	D	E	F
number of plant species in 1 m ²	9	8	2	1	3	11

Complete a **bar chart** on the grid below by:

- I. labelling the vertical axis; [1]
- II. using a **ruler** to draw bars for the number of plant species at each site. [2]



- (iii) State Ceri's hypothesis. [1]

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- (iv) Do the results of the investigation support her hypothesis? Give a reason for your answer. [1]

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- (v) Apart from light intensity, suggest **one** *other* environmental factor that might affect the number of plant species growing under the trees. [1]

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2. The photograph shows *Erinaceus europaeus*.



Erinaceus europaeus has many common names, such as hedgehog, urchin and furze-pig.

(a) State:

(i) the Kingdom to which the hedgehog belongs; [1]

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(ii) the Genus name for the hedgehog. [1]

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(b) Explain why scientists use the scientific name, rather than common names for organisms. [2]

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3. (a) (i) Complete the following sentences about sense organs using some of the words from the list below. [2]

impulses signs stimuli messages signals

Sense organs respond to specific by sending
information in the form of which are carried to the central
nervous system.

- (ii) State the name of:

- I. the specialised nerve cells that carry the information to the central nervous system; [1]

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- II. an organ that processes information received from sense organs. [1]

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- (b) Jed investigated the hearing of some year 11 pupils and their teachers.

He asked 12 pupils and 12 teachers to say if they could hear a buzzer when he sounded it at each of five distances away from the two groups. The same buzzer was pressed for each person.

The results are shown in the table.

Distance from buzzer (m)	Number hearing buzzer	
	Year 11 pupils	Teachers
5	12	12
10	12	12
15	12	12
20	11	7
25	8	2



- (i) Give **one** conclusion that Jed can make from this investigation. [1]

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- (ii) State **one** way in which Jed's investigation is a fair test. [1]

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- (iii) What else should Jed have done to make sure the investigation was a fair test? [1]

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- (iv) Jed thought that increasing the sample size would improve his confidence in his conclusion.

Describe how Jed would increase the sample size in this investigation. Explain why it would improve his confidence in his conclusion. [2]

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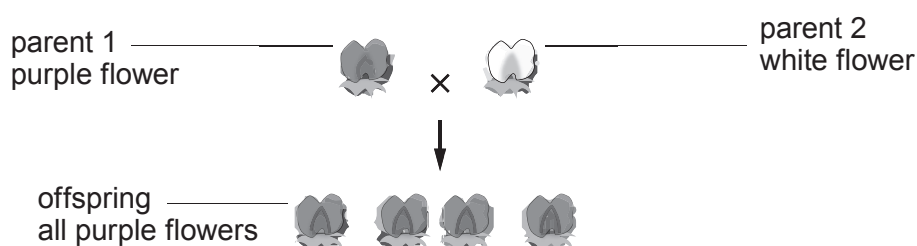
4. (a) Complete the following sentences about genes. [2]

(i) Genes are found in the nucleus of a cell on paired structures called

(ii) Genes are sections of a long molecule called

(b) Alan crossed two pea plants (*Pisum sativum*).

- Parent 1 had purple flowers.
- Parent 2 had white flowers.
- All the offspring had purple flowers, as shown below.



Flower colour in pea plants is controlled by one gene. The gene has two alleles, **D** and **d**.

(i) Underline the correct answer to complete the following sentences.

I. The genotype of parent 1 is **DD** / **Dd** / **dd** [1]

II. The genotype of parent 2 is **DD** / **Dd** / **dd** [1]

(ii) State the phenotype of the offspring. [1]

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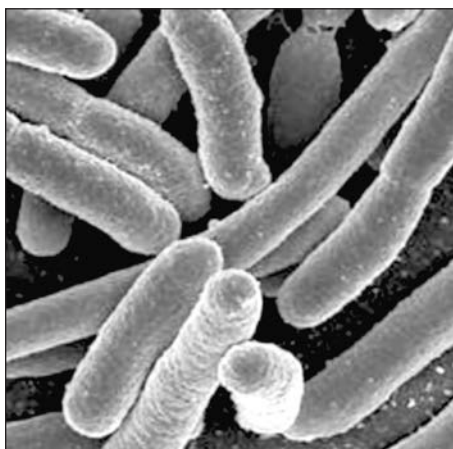
(iii) The offspring are heterozygous.

State the meaning of the term *heterozygous*. [2]

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5. (a) The photograph shows bacteria called *E. coli*.



Bacteria such as *E. coli* can be pathogens.

- (i) State the meaning of the term *pathogen*. [1]

- (ii) Describe **two** ways in which pathogens are spread from person to person. [2]

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- (b) Bacterial infections may be treated by antibiotics.

- (i) State the name of **one** antibiotic. [1]

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- (ii) Which **one** of the following results from the over use of antibiotics?
Underline the correct answer. [1]

People become immune to antibiotics

People become resistant to antibiotics

Bacteria become immune to antibiotics

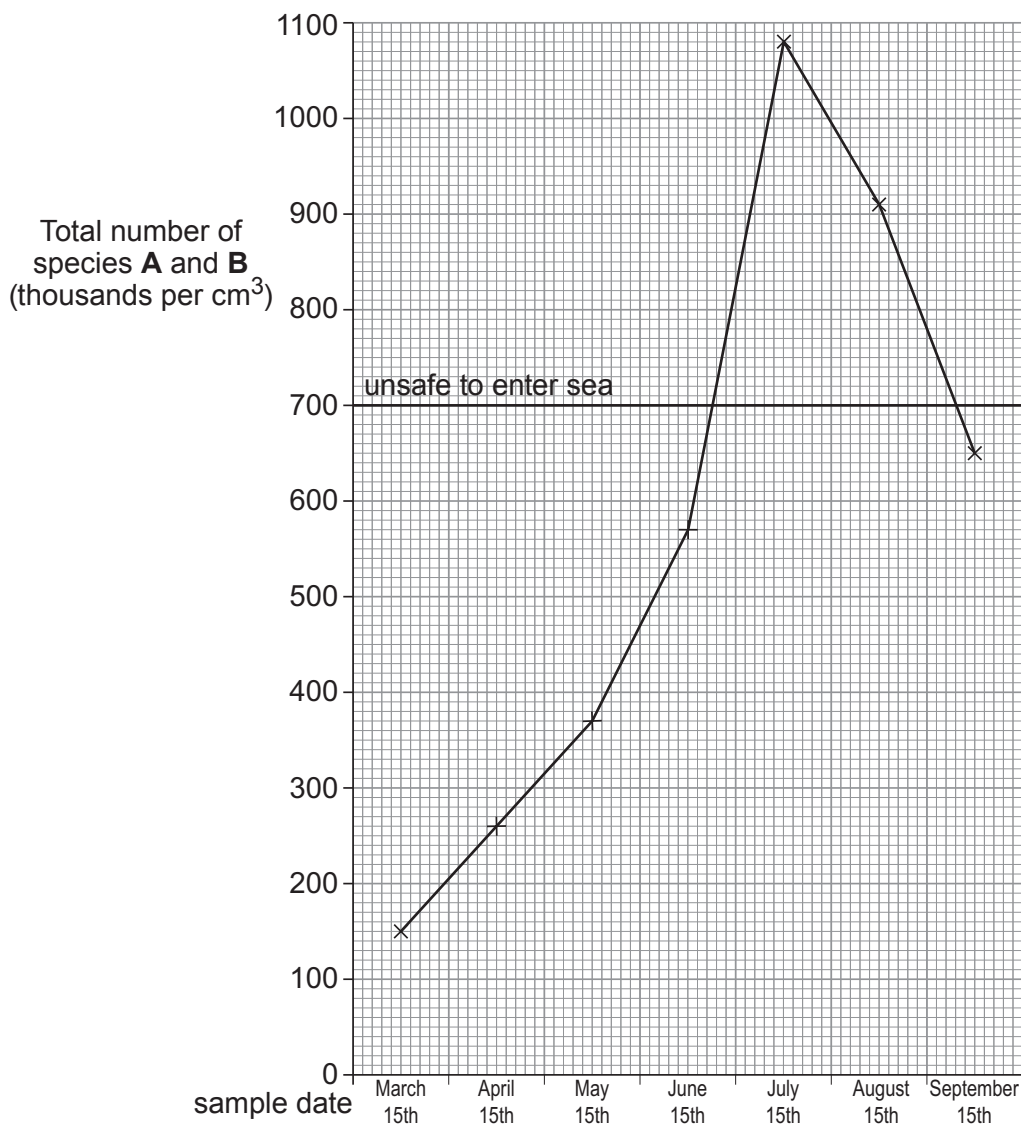
Bacteria become resistant to antibiotics



- (c) The table shows the number of two species of bacteria (**A** and **B**) in samples of seawater taken near a beach.

Date of sample	Number of bacteria (thousands per cm ³)		Total number of species A and B (thousands per cm ³)
	Species A	Species B	
March 15 th	100	50	150
April 15 th	200	60	260
May 15 th	300	70	370
June 15 th	500	70	570
July 15 th	1000	80	1080
August 15 th	800	110	910
September 15 th	300	350	650

- (i) The graph below shows how the total number of species **A** and **B** changed between March 15th and September 15th.



- I. Between which **two** sampling dates was the increase in the total number of species **A** and **B** the fastest? [1]

Between and

- II. If the total number of species **A** and **B** in the sample is likely to be greater than 700 000 per cm³ in any month, people are advised to stay out of the sea.

A safety officer said:

“On June 15th, I decided to advise people to stay out of the sea until further notice.”

Explain why the safety officer made this decision, even though the seawater was safe on that date. [2]

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- (ii) I. Describe the trends shown in the **table** for the numbers of species **A** and **B**. [2]

Species **A**:

Species **B**:

- II. Use your answer to part (I.) to explain why the sampling should continue into October. [1]

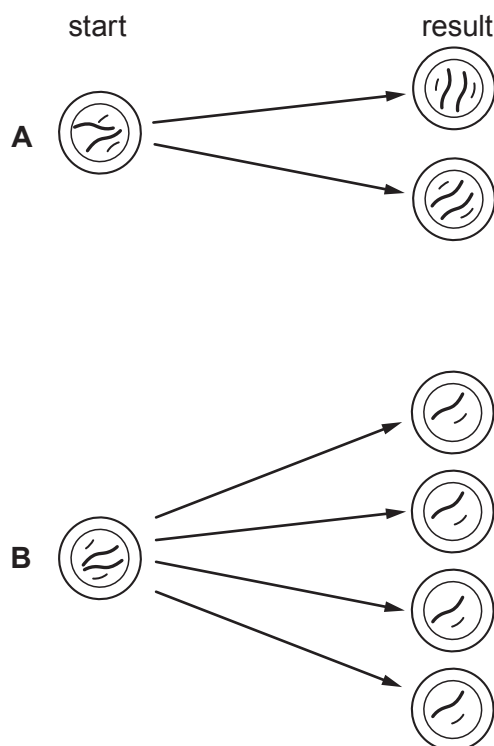
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6. Mitosis and meiosis are two types of cell division.

Diagrams **A** and **B** show the start and result of both types of cell division in a cell with four chromosomes.



Use the diagrams and your own knowledge to describe the two types of cell division.

You should:

- state which diagram shows mitosis and which shows meiosis
- describe what you can see at the start and the result for each type of cell division
- give **one** function for each type of cell division [6 QER]

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7. Read the following article about diabetes.

1 In type 1 diabetes, the cells of the pancreas that make insulin are destroyed by cells of the immune system.
 You are more likely to develop it, if diabetes runs in your family.
 The immune system may be triggered to act on the pancreas by a virus, pollutants, or stress causing type 1 diabetes.

6 In type 2 diabetes, not enough insulin is produced or cells in the liver fail to respond to the insulin that is produced. It is more likely to occur if it runs in your family, but there are also several risk factors.

These include:

- certain lifestyle choices
- certain ethnic origins
- age

16 Despite a rapid rise in the incidence of diabetes, there has been a 28% fall in the number of deaths from diabetes-related conditions in Wales between 2009 and 2013. This shows there has been some success in how diabetes has been managed but early diagnosis is vital.

A spokesperson for a charity promoting diabetes awareness in Wales said:

“Type 2 diabetes can be prevented, but there is no way of preventing type 1. Looking after your own health can reduce the risk of developing type 2 diabetes.”

Use the above information and your own knowledge to answer the following questions.

- (a) (i) Give the reason why people at high risk of developing diabetes should be tested regularly. [1]

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- (ii) Does the evidence given in the article support the claim made in line 18, that “*type 2 diabetes can be prevented*” in every individual? Give reasons for your answer. [1]

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- (b) Explain **one** way in which “*looking after your own health can reduce the risk of developing type 2 diabetes*” (lines 18 & 19). [2]

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- (c) Explain what would happen in the body if the “*cells in the liver fail to respond to the insulin that is produced*”. [3]

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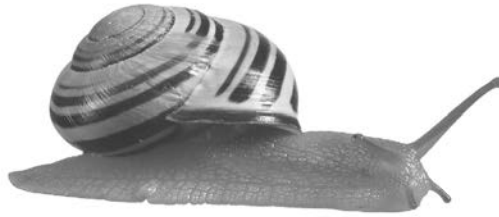
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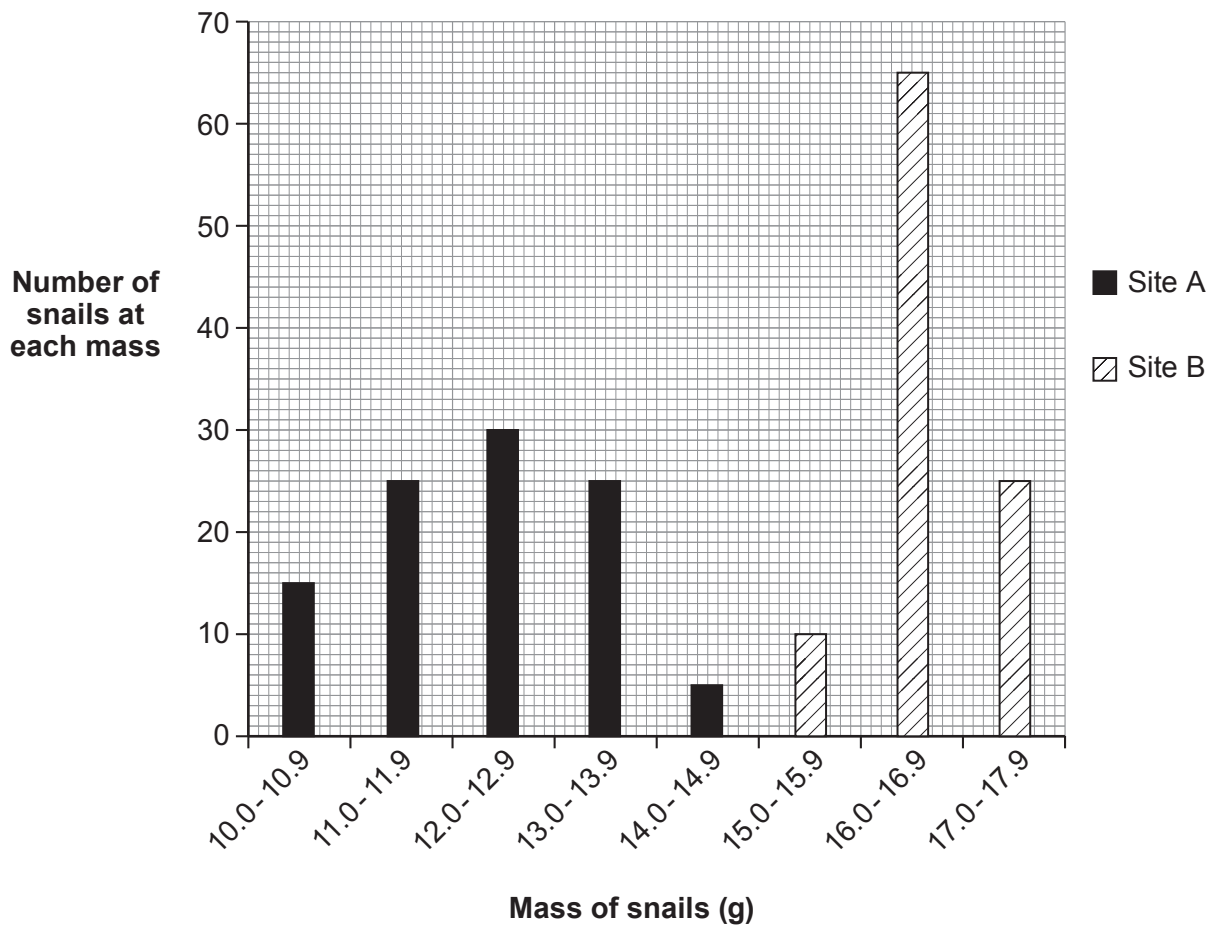
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8. The photograph shows the banded snail, *Cepaea nemoralis*.



- (a) Scientists investigated variation in the mass of individual snails sampled at random from two different sites, **A** and **B**. The mass of each snail was recorded to the nearest 0.1 g. The results are shown in the bar chart.



- (i) The table below shows the mean mass of snails collected at each site.

Site	Mean mass (g)
A	12.3
B	16.8

Calculate the percentage increase in the mean mass of the snails at site **B** compared to site **A**.

[2]

increase in mean mass = %

- (ii) At which of the two sites do the snails show the greater variation in mass? Give the reason for your choice. [1]

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- (iii) How did the scientists reduce bias in their investigation? [1]

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- (iv) Why is it important that other scientists carry out the same investigation as these scientists? [1]

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- (b) *Cepaea nemoralis* shows genetic variation.

Use your knowledge of natural selection to explain the long term advantage of genetic variation to *Cepaea nemoralis* in a changing environment. [3]

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