OCR
Oxford Cambridge and RSA

H

Friday 26 November 2021 – Morning

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/08 Paper 8 (Higher Tier)

Time allowed: 1 hour 10 minutes

8343536693

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

J250/08

Please write clearly in black ink. **Do not write in the barcodes.**

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

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

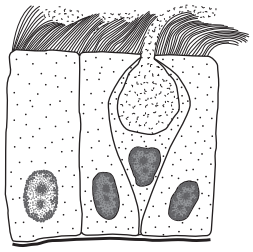
SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answers to each question in the box provided.

1 The cells in the diagram are important for defence from pathogens in the air.



Which organ of the body are the cells found in?

A Arteries

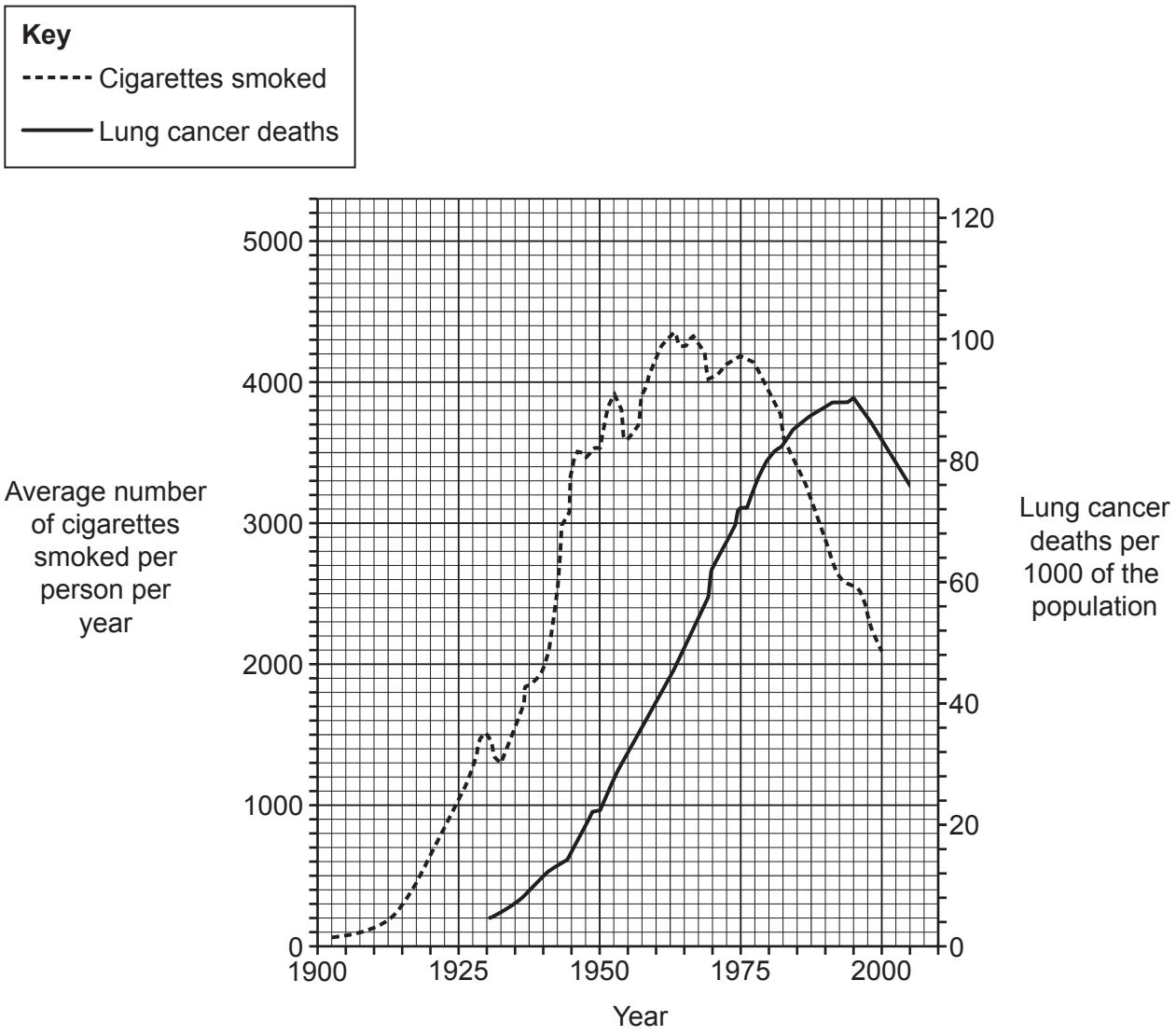
B Brain

C Lungs

D Small intestine

Your answer ☐ **[1]**

2 The graph shows the link between smoking cigarettes and lung cancer.



The average number of cigarettes smoked per person starts to fall in 1975.

How many years later did the number of lung cancer deaths also start to fall?

A 5

B 10

C 15

D 20

Your answer ☐ **[1]**

3 Which term describes the interaction between living organisms and their physical environment?

A Community

B Ecosystem

C Habitat

D Trophic level

Your answer ☐ **[1]**

4 The mass of an individual is one example of their phenotype.

Which row describes variation in mass of individuals within a population?

	Type of variation	**Influenced by the environmental**	**Influenced by their genetics**
A	continuous	no	yes
B	continuous	yes	yes
C	discontinuous	yes	no
D	discontinuous	no	yes

Your answer ☐ **[1]**

5 A flower homozygous dominant for colour is crossed with a homozygous recessive flower.

What is the predicted percentage of **heterozygous** offspring?

A 25%

B 50%

C 75%

D 100%

Your answer ☐ **[1]**

6 Animals can indicate water pollution levels. The animals in **Fig. 6.1** were sampled in various parts of a river.

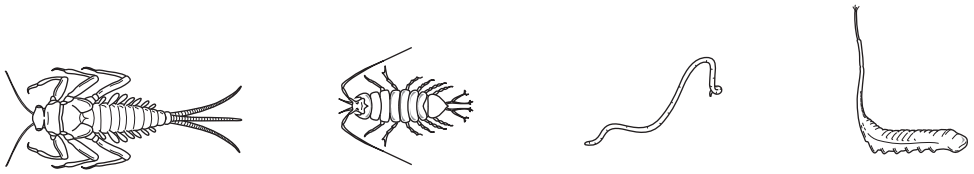


Fig. 6.1

The biomass of the different animals is shown in **Fig. 6.2**.

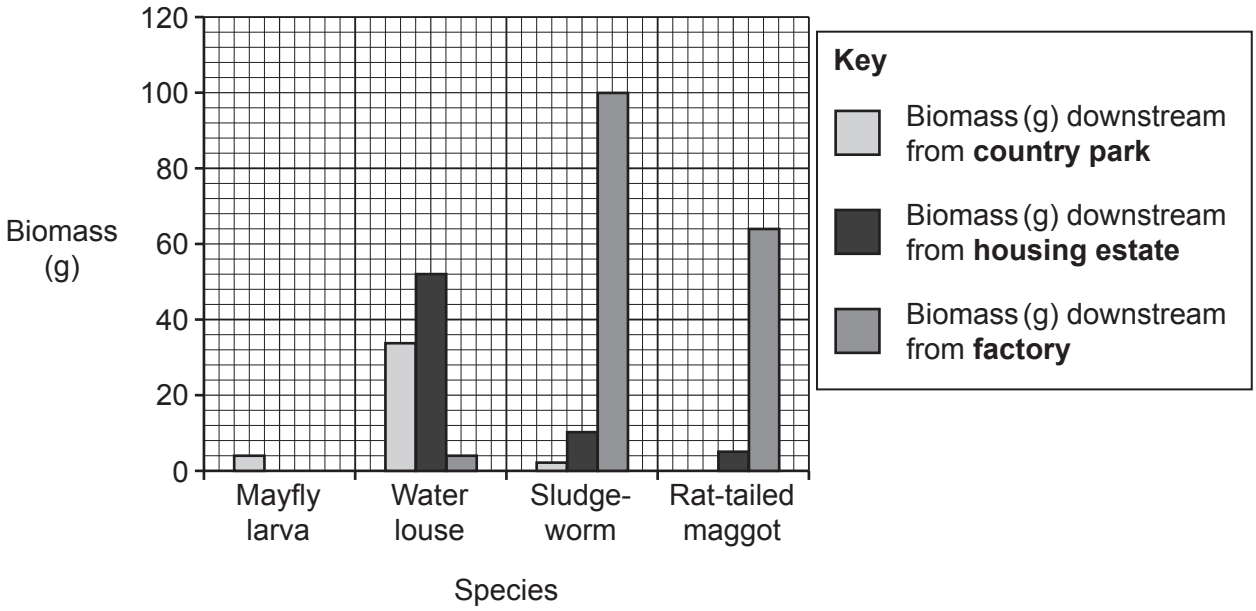


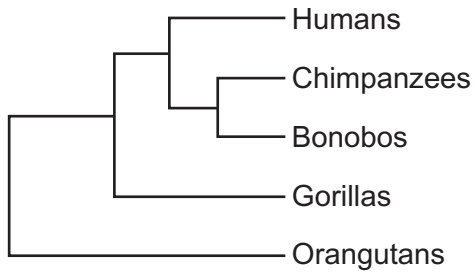
Fig. 6.2

Which row describes pollution levels downstream of a country park, housing estate and factory?

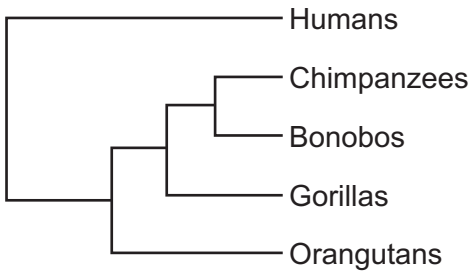
	Country park	Housing estate	Factory
A	high	medium	low
B	low	medium	high
C	low	medium	medium
D	low	high	high

Your answer ☐ **[1]**

7 Humans share 98.7% of their DNA with bonobos and 97% with orangutans. The phylogenetic trees, **P** and **Q**, represent developments in the classification of humans.



Phylogenetic tree P



Phylogenetic tree Q

Which row matches the developments in the classification of humans?

	Phylogenetic tree	After DNA analysis	Most scientifically accepted phylogenetic tree
A	**P**	✓	✓
	Q	✗	✗
B	**P**	✗	✗
	Q	✓	✓
C	**P**	✗	✓
	Q	✓	✗
D	**P**	✓	✗
	Q	✗	✓

Your answer ☐ **[1]**

8 Mutualism and parasitism involve two different organisms living together.

Which statement describes the difference between mutualism and parasitism?

A Both organisms benefit from living together in mutualism, only one benefits in parasitism.

B Both organisms benefit from living together in parasitism, neither benefit in mutualism.

C Neither organism benefits from living together in parasitism, both benefit in mutualism.

D One organism benefits from living together in mutualism, both benefit in parasitism.

Your answer ☐ **[1]**

9 One method of surgical treatment for cardiovascular disease involves inserting a metal or plastic tube into the coronary artery.

How will this surgical treatment help to improve the condition of a patient who has cardiovascular disease?

A It increases blood flow to the lungs.

B It increases oxygen supply to the heart muscle.

C It prevents blood flow through the damaged artery.

D It prevents oxygenated and deoxygenated blood mixing.

Your answer ☐ **[1]**

10 The human genome project mapped the human genome. This gave many benefits and risks.

Which statement is an ethical issue arising from the mapping of the human genome?

A Genes linked to different types of disease are identified and mapped.

B Human migration patterns can be traced to find the origin of our ancestors.

C Someone's genetic makeup can be used by life insurance companies to predict their risk of future illness.

D Treatments are developed due to understanding of inherited disorders.

Your answer ☐ **[1]**

SECTION B

Answer **all** the questions.

11 White clover plants have two variants.

Cyanogenic variants produce a toxin when their cells are damaged.
Acyanogenic variants do not produce a toxin.

The cells of clover plants can be damaged by freezing temperatures or by snails eating the leaves.
The toxin kills snails but also damages the plant.

Table 11.1 shows growing regions of the two variants.

Variant	Regions where most often found
acyanogenic	colder climates
cyanogenic	warmer climates

Table 11.1

(a) Complete the **hypothesis** to link each variant to the region it is most often found.

Acyanogenic variants are found in colder climates because .....

.....

.....

.....

Cyanogenic variants are found in warmer climates because .....

.....

.....

.....

[2]

(b) To investigate a hypothesis a field study is needed.

Sampling techniques are used to estimate the population size of each variant in different areas.

(i) Why are sampling techniques used instead of counting the total number of individual plants in each area?

.....

..... **[1]**

(ii) Two students investigate the variant plants living at altitudes of 0–250 metres.

The students use random sampling as a starting point of their investigation. They then go on to complete a transect.

Explain how random sampling differs from a transect.

.....

.....

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..... **[2]**

(iii) Explain why using a transect would **develop** and **improve** their investigation.

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..... **[2]**

(c) **Fig. 11.1** shows the number of cyanogenic variant plants found in a total clover population of 200 at different altitudes.

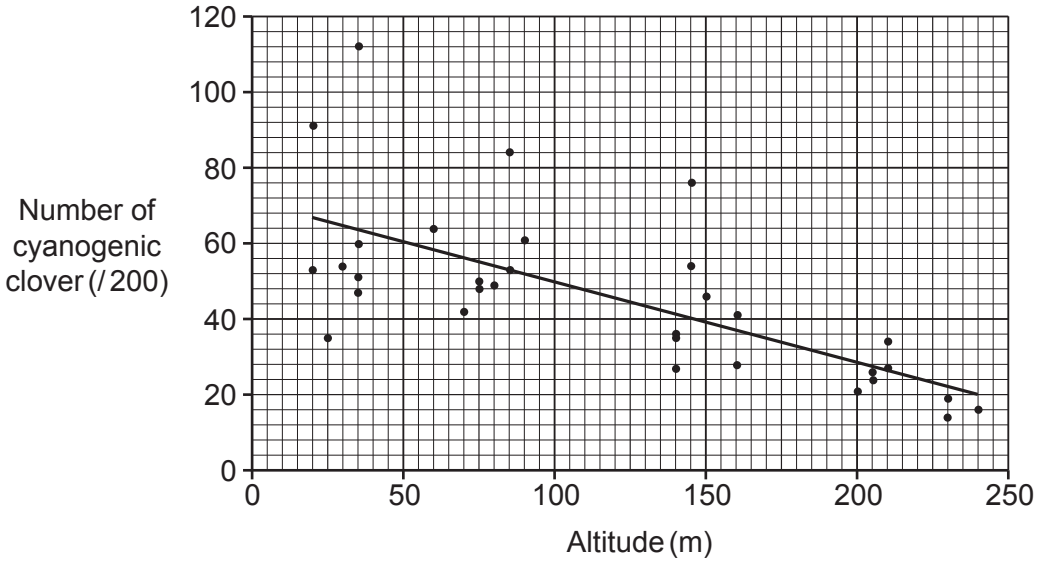

Fig. 11.1

(i) What conclusion can be made about the effect of altitude on the distribution of **cyanogenic** clover?

.....

..... **[1]**

(ii) Predict the altitude where you would expect to find mostly **acyanogenic** clover plants. Explain why most clover plants are acyanogenic at that altitude.

Altitude .....

Explanation .....

.....

[1]

(d) Use the theory of natural selection to explain how the **cyanogenic** variant of white clover plant could have developed.

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..... **[3]**

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PLEASE DO NOT WRITE ON THIS PAGE

12 **(a)** Materials cycle through the environment.

Complete these sentences about recycled materials.

Carbon inside carbohydrates is released back into the atmosphere by the process of

..... .

Water that collects in lakes can be returned to the atmosphere when the water

..... .

[2]

(b) The flowchart in **Fig. 12.1** shows bacteria involved in cycling nitrogen.

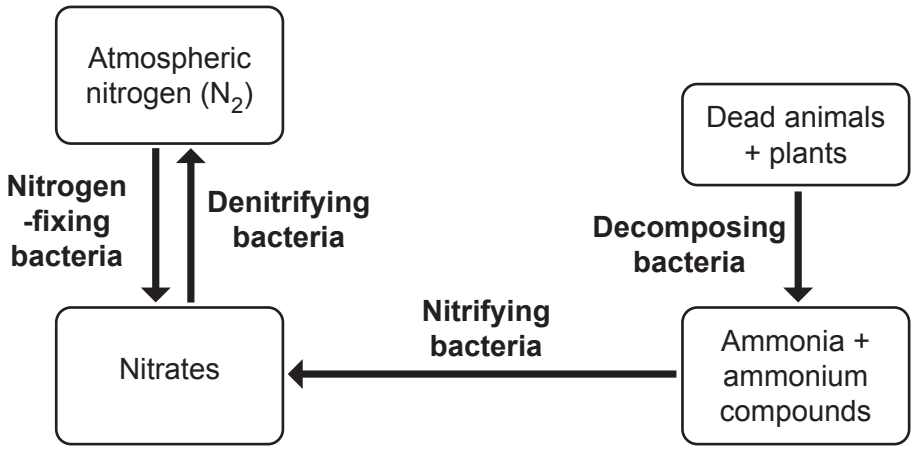

Fig. 12.1

(i) Identify which of the bacteria in **Fig. 12.1**, if present in large amounts, would make the soil poor for plant growth.

Tick (✓) **one** box.

Decomposing bacteria ☐

Denitrifying bacteria ☐

Nitrifying bacteria ☐

Nitrogen-fixing bacteria ☐

[1]

(ii) Explain why large amounts of these bacteria would make the soil poor for plant growth.

.....

..... **[1]**

(iii) Abiotic and biotic factors can affect the bacterial communities.

Which is a biotic factor?

Tick (✓) **one** box.

Ammonia + ammonium compounds	☐
Atmospheric nitrogen (N_2)	☐
Dead animals + plants	☐
Nitrates	☐

[1]

(c) Plants are an important part of any community.

Fig. 12.2 shows the effect of abiotic factors on the rate of photosynthesis by plants.

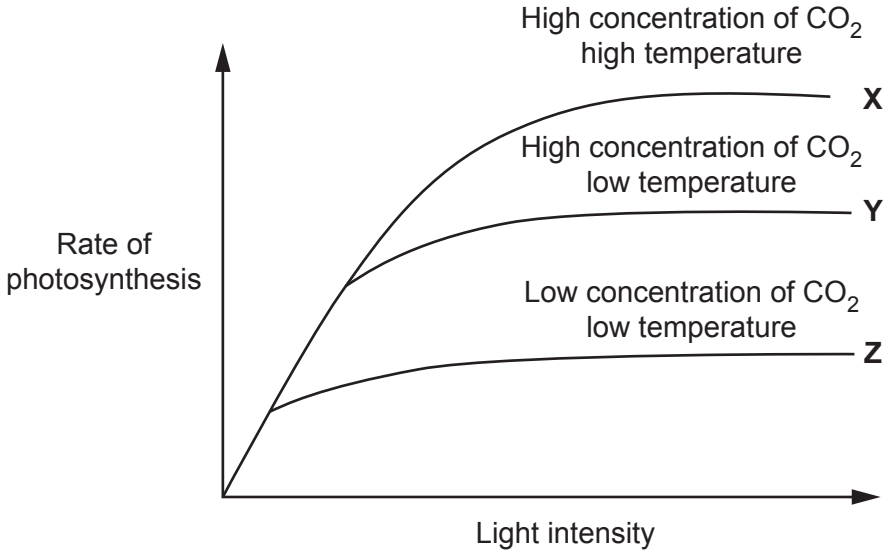

Fig. 12.2

Explain why lines **X**, **Y** and **Z** level out at different rates of photosynthesis.

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..... **[3]**

13 **(a)** Describe the relationship between health and disease.

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..... **[2]**

(b) **(i)** HPV (human papilloma virus) causes cervical warts.

Fig. 13.1 is a diagram representing the size of HPV as it would be seen using an electron microscope.

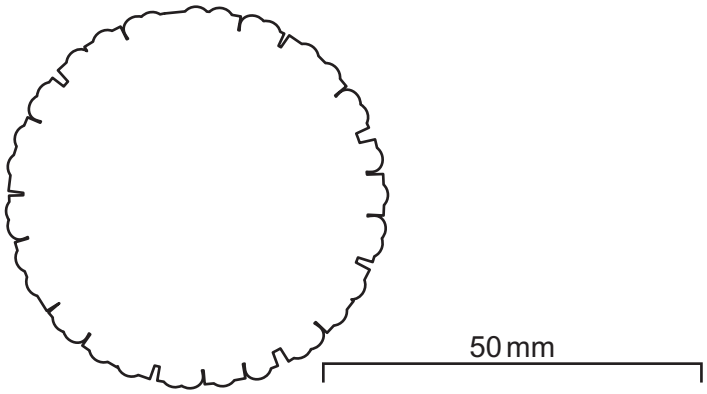

Fig. 13.1

The HPV shown in **Fig. 13.1** has a diameter of 50 mm. The actual HPV has a diameter of 55 nanometres.

Calculate the magnification of the HPV shown in **Fig. 13.1**.

Give your answer to **2** significant figures.

Magnification = × ..... **[3]**

(ii) Women can be given a vaccine to protect against HPV.

Explain why the vaccine produces an immune response to HPV but does not cause cervical warts.

.....

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..... **[2]**

(iii) **Fig. 13.2** shows data for HPV vaccination rates from a country where women are screened for cervical cancer.

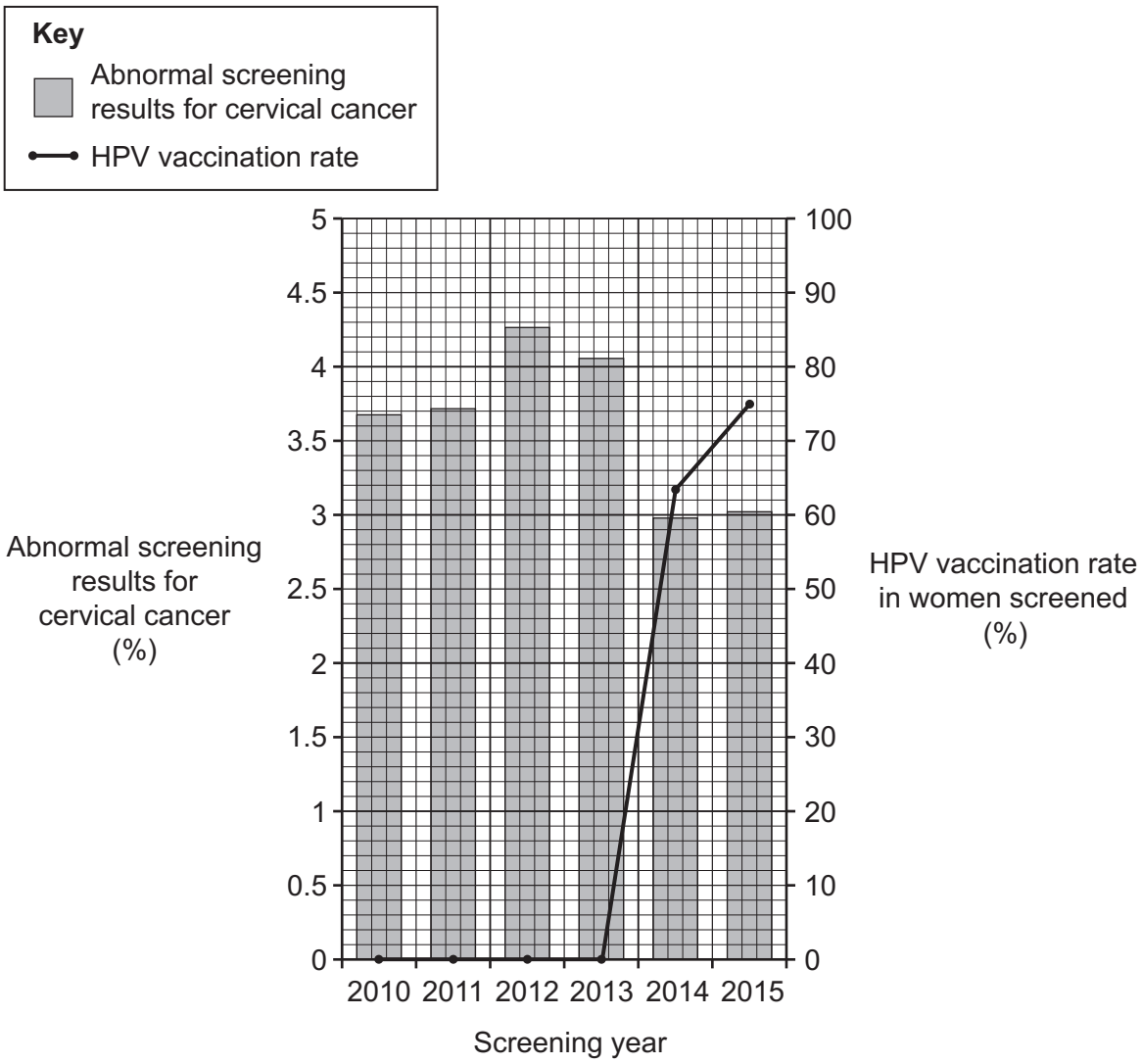

Fig. 13.2

Cervical cancer is a non-communicable disease. Non-communicable diseases are not usually prevented by vaccination.

Use the data in **Fig. 13.2** and your scientific knowledge to explain why a vaccination can be used to prevent cervical cancer.

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..... **[3]**

(c) Describe **two** ways scientists test new vaccines to ensure they are safe for humans.

1 .....

.....

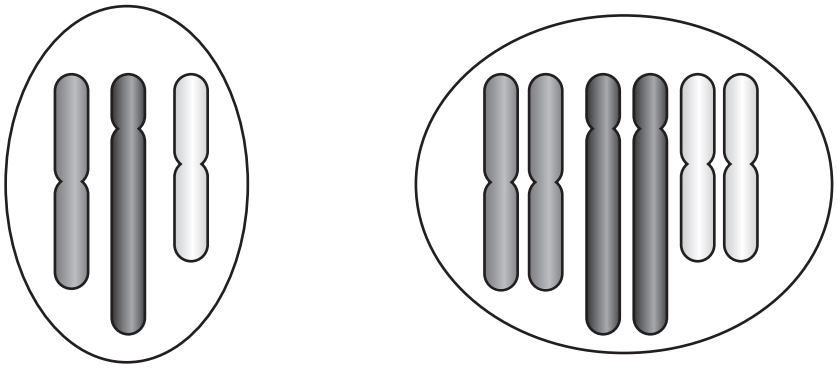
2 .....

.....

[2]

14 **(a)** The diagram shows two cells from a mosquito with a chromosome number of 6.

Different types of cell division produced **Cell A** and **Cell B**.



Cell A **Cell B**

Name the type of cell division that produced **Cell A** and explain its importance for the mosquito.

Type of cell division .....

Explanation .....

..... **[2]**

(b) Sexual reproduction is important for species as it results in differences within a species.

(i) Within a species of mosquito there are some mosquito that need blood to lay eggs and others that do not.

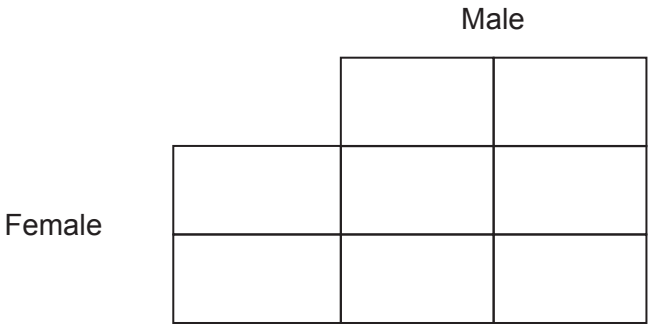
Why is this an example of discontinuous variation?

.....

..... **[1]**

(ii) What is the probability of a baby being male when humans sexually reproduce?

Complete the genetic diagram to explain your answer.



Probability = ... **[2]**

15 The cornea is a part at the front of the eye that allows in light.

(a) The cornea can be damaged by injury or disease. Treatment often requires a local anaesthetic. Local anaesthetics stop nerve impulses passing along the sensory neurone.

Use your knowledge of the structure of a reflex arc to explain why a person would not feel pain.

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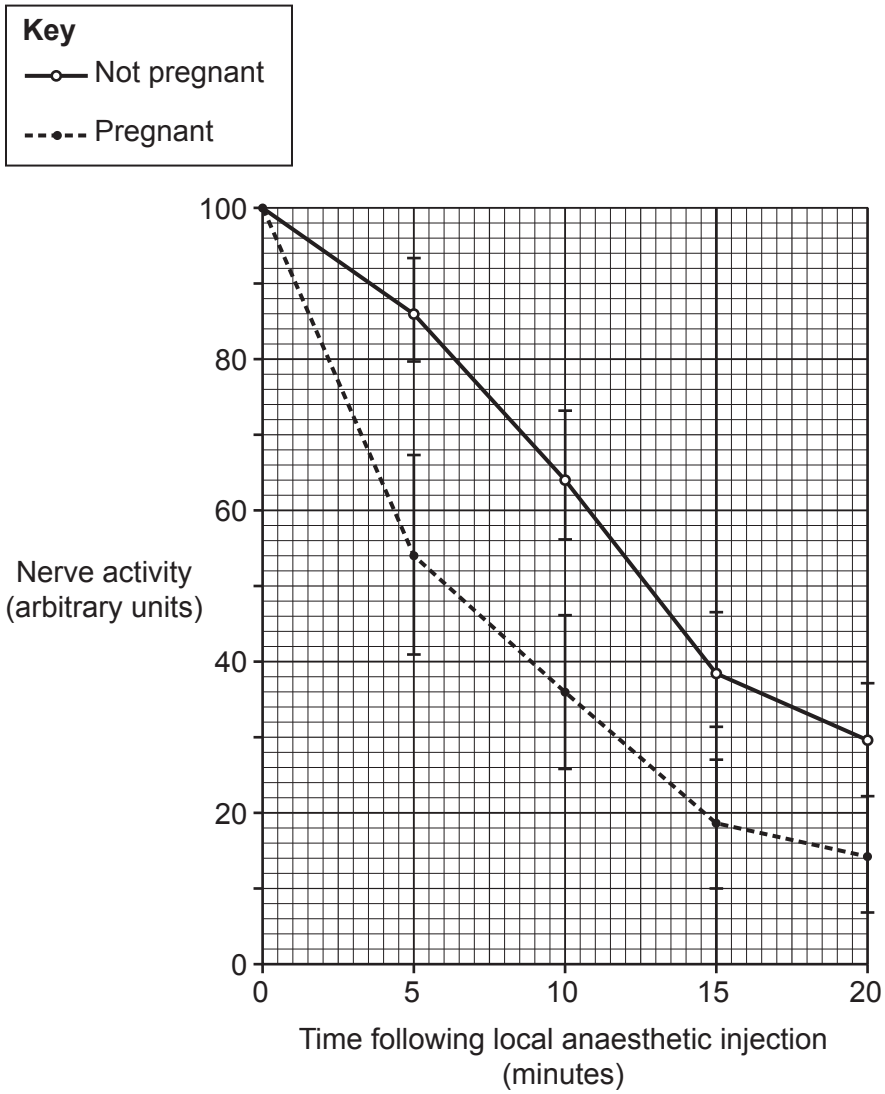
..... **[2]**

(b) Pregnancy can affect the response of neurones to local anaesthetics.

The graph shows the effect of a local anaesthetic on nerve activity in women.



(i) Look at the data over the first 10 minutes after injection.

Calculate the percentage decrease in nerve activity after 10 minutes when pregnant compared to not being pregnant.

Percentage decrease = ... % **[2]**

(ii) The data in the graph has range bars plotted. These give the highest and lowest values at each point.

Why is this an improvement when presenting this data?

.....

..... **[1]**

(c) Explain why stem cells taken from embryos are more suitable than those from adult bone marrow.

.....

.....

.....

..... **[2]**

(d)* Scientists can use embryo stem cell technology for treating damage to the cornea to restore vision.

Read the information in the box.

- Corneal cells are transparent to allow light to pass through.
- Corneal tissue does not have blood vessels in order to remain transparent.
- Corneal transplants from donor tissue are one way to restore vision after damage to the cornea.
- Corneal transplants are at risk of tissue rejection when blood vessels develop in the cornea.
- Scientists are able to genetically engineer donor corneal cells to prevent new blood vessel formation following transplantation.
- The genetically engineered cells produce a protein which prevents the formation of blood vessels.

Describe the main steps involved in genetically engineering donor corneal cells and identify any improvements and risks from this type of treatment.

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..... **[6]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).