OCR
Oxford Cambridge and RSA

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Friday 26 November 2021 – Morning

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

J250/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 10 minutes

8342052558

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

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

J250/02

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 **20** 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 answer to each question in the box provided.

1 Which term describes **all** the different plants and animals that live in the same place?

A Community

B Ecosystem

C Habitat

D Trophic level

Your answer ☐ **[1]**

2 Cheetah hunt and kill zebra, then feed on the zebra meat.

Which term describes this feeding relationship?

A Competition

B Mutualism

C Parasitism

D Predation

Your answer ☐ **[1]**

3 Which is the correct combination of chromosomes that determine sex in humans?

A XX in a female

B XX in a male

C XY in a female

D YY in a male

Your answer ☐ **[1]**

4 Which statement describes a **positive** human interaction on an ecosystem?

A Drilling for oil under the North Sea.

B Growing one type of crop in a large area of land.

C Removing peat from bogs for fuel.

D Replanting hedgerows around fields.

Your answer ☐ **[1]**

5 What do white blood cells produce to defend the body against tuberculosis?

A Antibodies

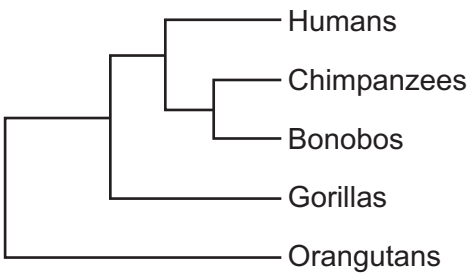
B Antigens

C Plasma

D Platelets

Your answer ☐ **[1]**

6 The diagram shows a phylogenetic tree produced using DNA analysis.



What does the phylogenetic tree show about the classification of humans?

A It shows bonobos and chimpanzees to be human's closest relations.

B It shows bonobos and orangutans to be human's closest relations.

C It shows gorillas and chimpanzees to be human's closest relations.

D It shows gorillas and orangutans to be human's closest relations.

Your answer ☐ **[1]**

7 Ecotourism provides benefits for people living in the areas that tourists visit.

Which statement does **not** benefit people living in the area?

A Building environmental and cultural awareness and respect.

B Providing financial benefits for overseas industry.

C Providing direct financial benefits for environmental conservation.

D Providing positive experiences for both visitors and local people.

Your answer ☐ **[1]**

8 Selective breeding in cattle can have risks.

Which outcome of selective breeding will have the **greatest** risk for the cattle?

A Greater muscle mass.

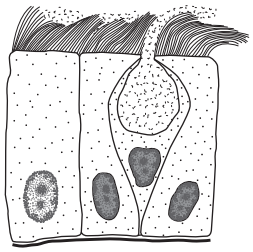
B Increased chance of genetic defect.

C Increased milk yield.

D Loss of horns.

Your answer ☐ **[1]**

9 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

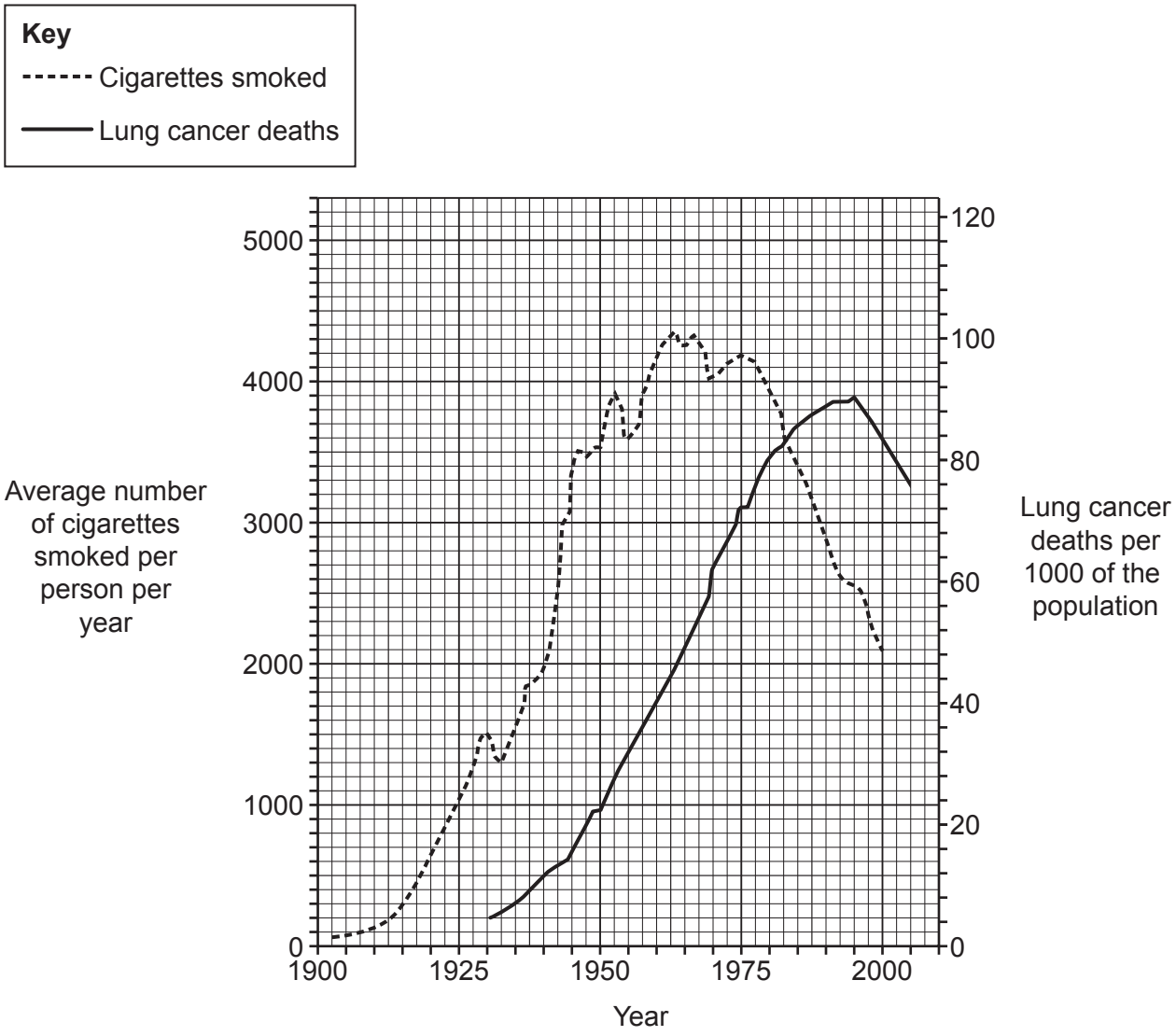
B Brain

C Lungs

D Small intestine

Your answer ☐ **[1]**

10 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]**

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PLEASE DO NOT WRITE ON THIS PAGE

SECTION B

Answer **all** the questions.

11 **(a)** Materials are cycled in the environment.

Complete these sentences about cycled materials.

Choose words from this list. You can use each word once, more than once or not at all.

decomposition **condensation** **nutrition**

photosynthesis **translocation** **transpiration**

Plants remove carbon from the atmosphere by the process of ..... .

Plants return water to the atmosphere by the process of ..... .

Nitrogen is returned to the soil by the process of ..... .

[3]

(b) Describe **two** ways that the water cycle is important to humans.

1 .....

.....

2 .....

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

(c) Abiotic and biotic factors can affect ecosystems.

Which two are biotic factors?

Tick (✓) **two** boxes.

Light intensity ☐

Food availability ☐

pH of soil ☐

Predators ☐

Temperature ☐

[2]

(d) The diagram shows a weather chart over 3 days.

Day	Saturday April 2	Sunday April 3	Monday April 4
	Partly cloudy  14 °C	Mainly sunny  16 °C	Mainly cloudy  12 °C
Feels like:	14	16	10
Low:	6°	9°	4°
24 Hr Rain:	-	~1 mm	-
Wind:	12 km / h	20 km / h	20 km / h
Hrs of Sun:	5	8	1

(i) The 24-hour rainfall for Sunday April 3 is **~1 mm**.

Explain what is meant by the term **~1 mm**.

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

(ii) Plants are an important part of ecosystems.

Which day would plants be **most** likely to take up water from the soil at the fastest rate?

Tick (✓) **one** box.

Saturday April 2 ☐

Sunday April 3 ☐

Monday April 4 ☐

Explain your answer.

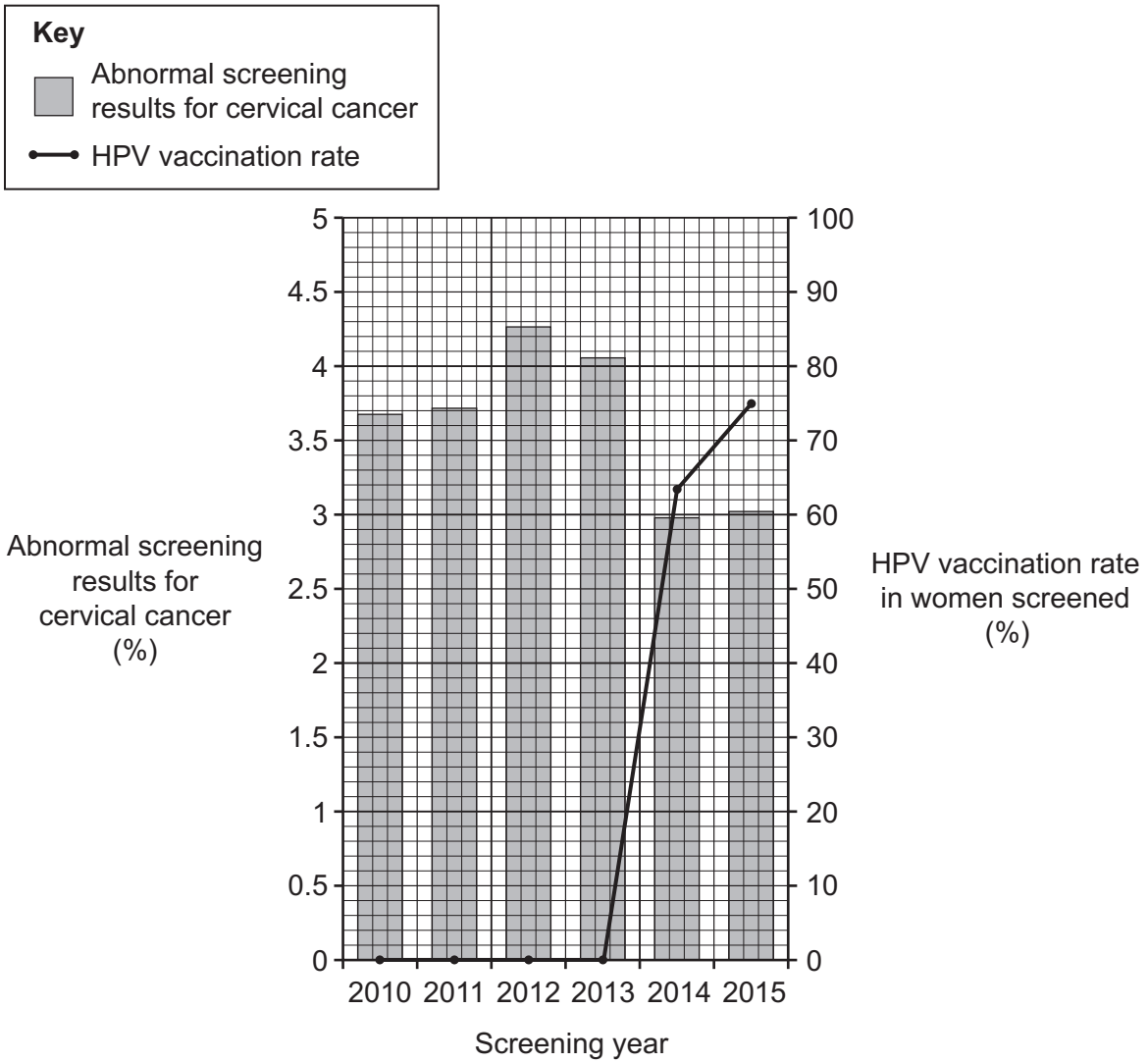
.....

.....

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

12 HPV (human papilloma virus) is a pathogen that causes cervical warts.

The graph shows data for HPV vaccination rates from a country where women are screened for cervical cancer.



(a) Use the graph to describe the relationship between the HPV vaccination and risk of cervical cancer.

.....

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

(b) Explain how the vaccine for HPV prevents the pathogen causing cervical warts.

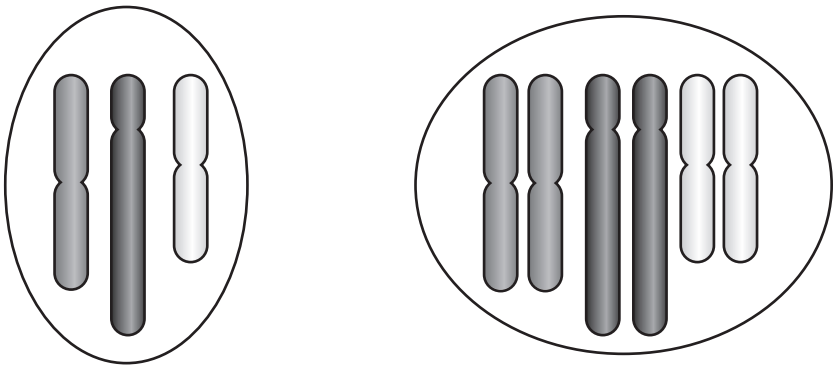
.....

.....

.....

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

13 **Fig. 13.1** shows two cells after cell division from an animal with a chromosome number of 6.



Cell A **Cell B**

Fig. 13.1

(a) **(i)** Complete **Table 13.1** by choosing words from this list to identify the **genetic term** used to describe cell **A** and cell **B**.

diploid **genotype** **haploid** **phenotype**

[2]

(ii) Give an explanation for each choice of word in **Table 13.1**. **[2]**

Cell	Genetic term	Explanation
A	.....	....
B	.....	....

Table 13.1

(b) Huntington's disease (HD) is an inherited disorder of the nervous system caused by a dominant allele.

A person with the allele for HD will not normally develop symptoms until they become an adult.

A female who does **not** have the allele for HD and a male who is heterozygous are expecting a baby.
What is the probability of the baby developing HD?

Complete the genetic diagram in **Fig. 13.2** to explain your answer.

D is the HD allele and **d** is the recessive allele.

		Male	
		D	**d**
Female	**d**		
	d		

Fig. 13.2

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

(c) Huntington's disease can cause death.

Fig. 13.3 shows the occurrence of HD by age when symptoms first appear.

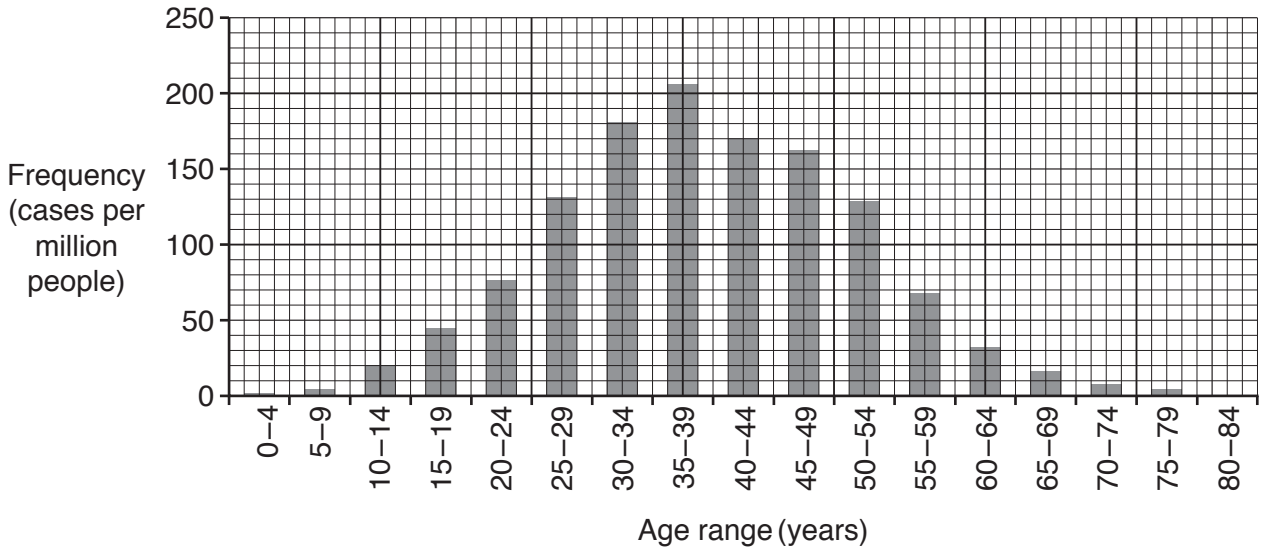


Fig. 13.3

What is the modal age range for the data shown in **Fig. 13.3**?

Modal age range = ... years **[1]**

(d) Early studies in the UK showed one in 15 000 have the HD allele.
There are 66 000 000 people in the UK.

Calculate the number of people in the UK with the HD allele.

Number of people = ... **[2]**

(e) Read the information about HD in the box.

- The HD allele is a dominant allele that can lead to death.
- Alleles that cause death rarely persist in populations.
- About 10% of people with HD acquire the HD allele from a newly formed mutation and not through inheriting it from their parents.

Use this information and the data in **Fig. 13.3** to suggest why the HD allele still persists in the human population.

.....

.....

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

14 This question is about diseases.

(a) (i) Complete the table to compare some different diseases.

Tick (✓) **five** boxes.

Tuberculosis has been done for you.

Disease	Communicable	Non-communicable	Affects plants	Affects humans	Caused by bacteria	Caused by a virus
Crown gall disease						
Type 1 diabetes						
Tuberculosis (TB)	✓			✓	✓	

[2]

(ii) TB is a disease of the lungs. TB is transmitted by breathing in when an infected person near you coughs or sneezes.

One way to prevent the spread of TB is vaccination.

Describe **two other** ways you could prevent the spread of TB.

1 .....

2 .....

[2]

(b) There are many diseases and disorders of the circulatory system.

(i) Some blood cell disorders can affect the function of white blood cells or red blood cells.

Suggest **two** effects on the body if either white blood cells or red blood cells are prevented from working efficiently.

1 .....

2 .....

[2]

(ii) Cardiovascular diseases affect the heart.

Which lifestyle factor can increase a person's chance of developing cardiovascular disease?

Tick (✓) **one** box.

Exercise ☐

Healthy diet ☐

Smoking ☐

Virus infection ☐

[1]

***(c)** The cornea is the front part of the eye that allows in light. The layers of cells in the cornea are similar to the cells in skin layers, the difference is that they have become transparent to allow the light through.

Scientists are now using stem cell technology for treating damage to the cornea to restore vision.

Describe how stem cells could be used in the treatment of damage to the cornea and any possible risks involved in this type of treatment.

.....

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.....

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

15 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 15.1 shows growing regions of the two variants.

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

Table 15.1

(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.

.....

.....

.....

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

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

.....

.....

.....

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

(c) **Fig. 15.1** shows the number of cyanogenic variant plants found in a total clover population of 200 at different altitudes.

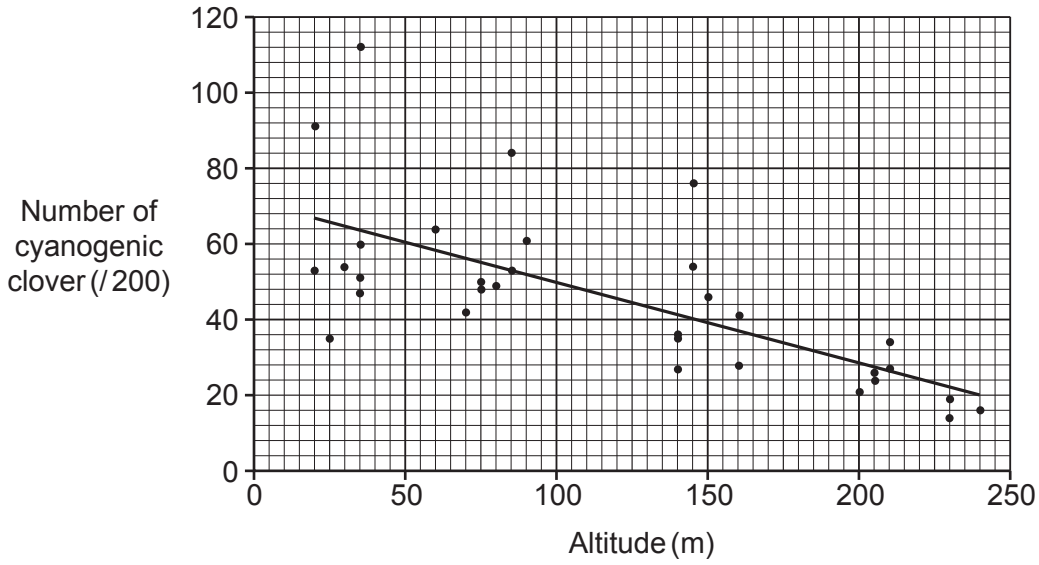

Fig. 15.1

(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.

.....

.....

.....

.....

.....

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

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).