



Year 12 Entrance Examination

Biology

November 2025

Name:

School:

Time allowed: 45 minutes

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.
- 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 **40**.
- The marks for each question are shown in brackets [].

ADVICE

- Read each question carefully before you start your answer.

Section A:/10

Section B:/10

Section C:/20

Total/40

Section A

Write your answer to each question in the box provided.

- 1 Which structures are found in a human sperm cell?

	cell membrane	cell wall	haploid nucleus
A	✓	x	x
B	✓	x	✓
C	✓	✓	✓
D	x	✓	✓

key

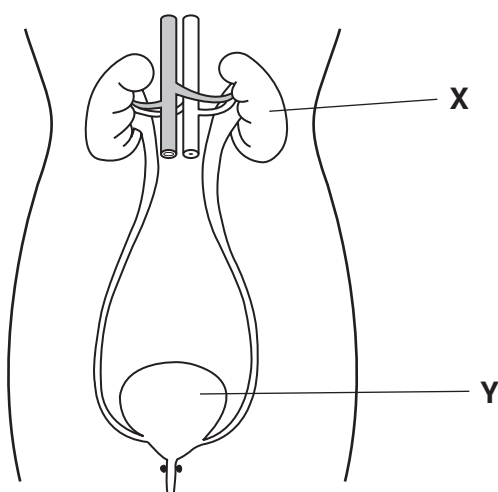
✓ = present

x = not present

Your answer

[1]

- 2 The diagram shows some of the structures found in the human abdomen.



What type of structures are **X** and **Y**?

	X	Y
A	organ	organ
B	organ	organ system
C	organ system	tissue
D	tissue	organ system

Your answer

[1]

3 The temperature of an enzyme-controlled reaction is increased by 10°C.

How does this affect the rate of reaction?

- A** It always increases the rate.
- B** It always decreases the rate.
- C** It may increase or decrease the rate.
- D** It has no effect on the rate.

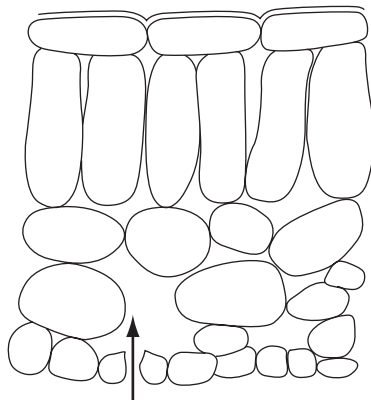
Your answer

[1]

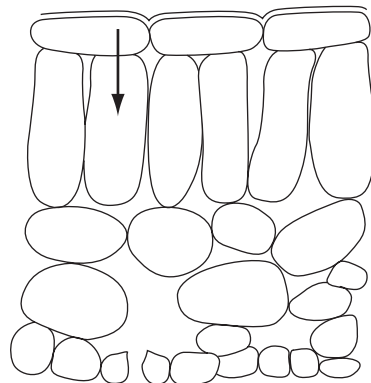
4 The diagrams show the arrangement of cells in a section of a green leaf.

Which arrow represents the diffusion of the most oxygen during bright sunlight?

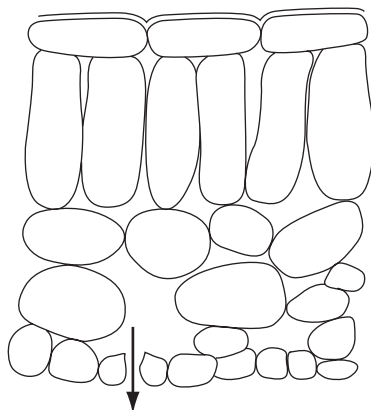
A



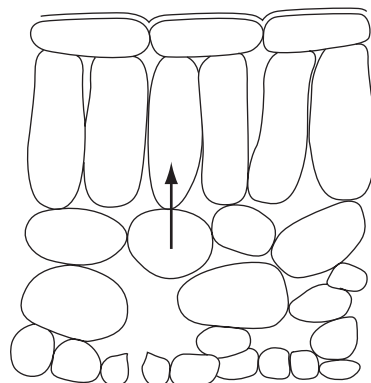
B



C



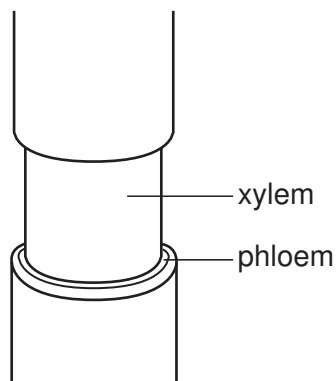
D



Your answer

[1]

- 5 The diagram shows the stem of a plant. A strip of the outer tissue including the phloem has been removed.



How is transport in the plant affected?

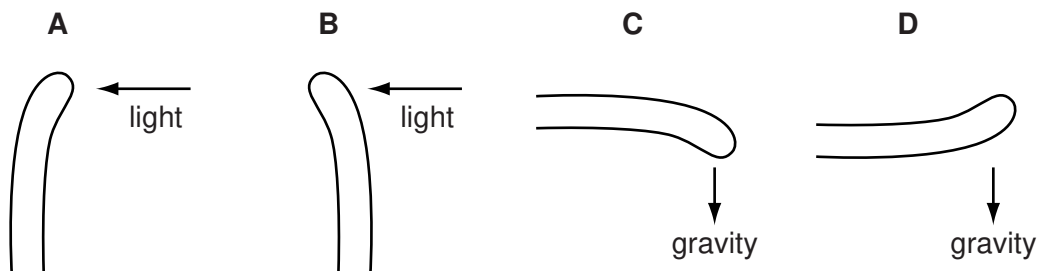
- A** Amino acids and sucrose cannot pass to the roots.
- B** Dissolved salts cannot pass to the leaves.
- C** Water cannot pass to the leaves.
- D** Water cannot pass to the roots.

Your answer ☐

[1]

- 6 The diagram shows shoots of maize seedlings.

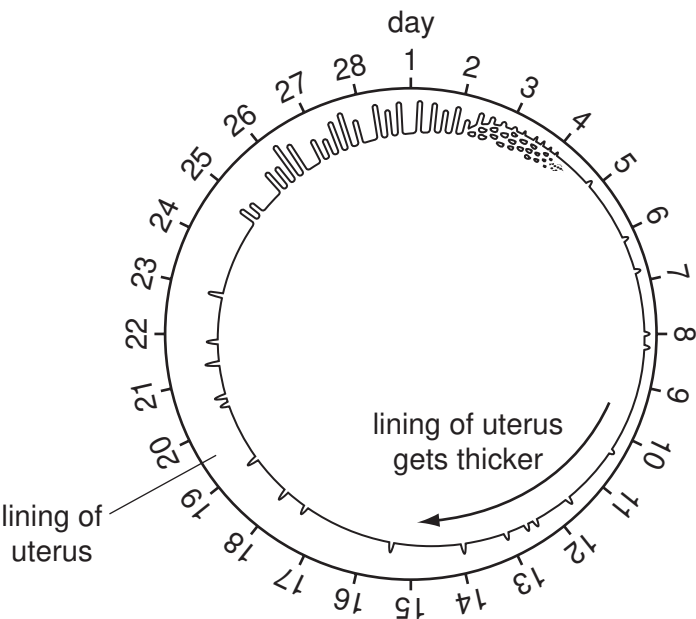
Which shoot shows negative geotropism?



Your answer ☐

[1]

7 The diagram shows the changes that occur to the uterus lining during the menstrual cycle.



When do the following stages occur in this cycle?

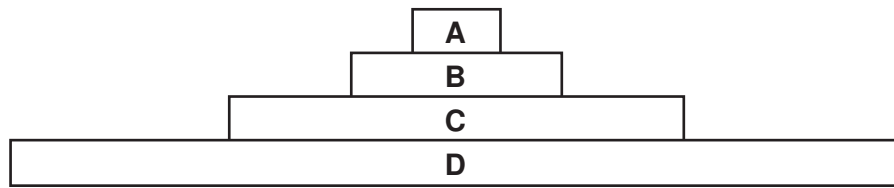
	bleeding	lining starts to break down	uterus lining thickens
A	days 13 – 14	days 6 – 25	days 1 – 4
B	days 1 – 4	days 26 – 27	days 6 – 25
C	days 6 – 25	days 1 – 4	days 26 – 27
D	days 1 – 4	days 13 – 14	days 6 – 25

Your answer

[1]

8 The diagram shows a pyramid of biomass for all organisms in an ecosystem.

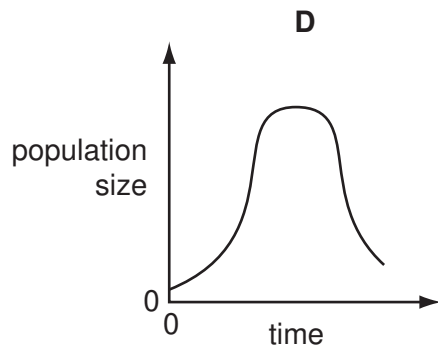
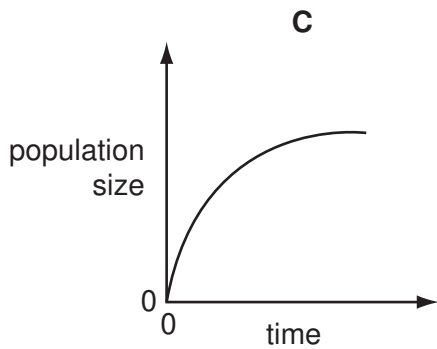
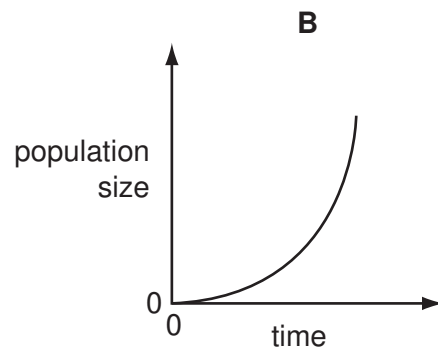
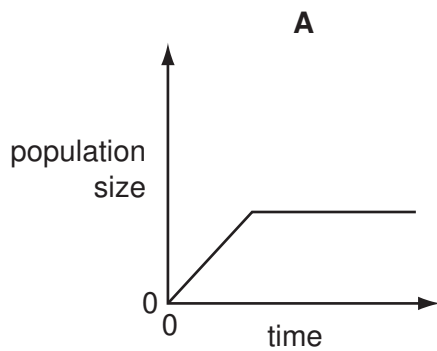
Which organisms are herbivores?



Your answer

[1]

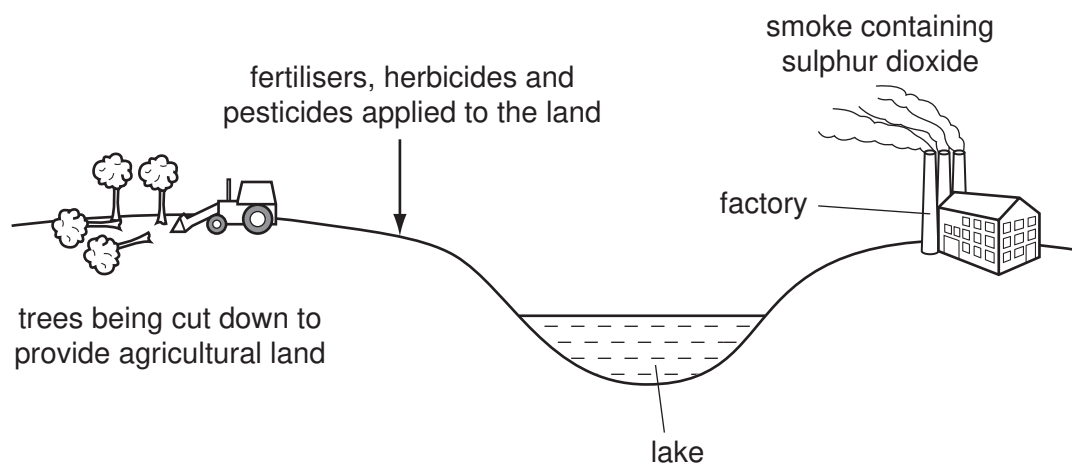
9 Which graph shows the growth of a population where there are no limiting factors?



Your answer

[1]

10 The diagram shows an area being developed for industry and agriculture.



Which would be the most likely to cause an initial increase in plant life in the lake?

- A fertilisers
- B herbicides
- C pesticides
- D smoke

Your answer

[1]

Section B

Write your answer to each question in the box provided.

- 11** The table below shows the proportions of undigested and digested carbohydrates, fats and proteins in three regions of the digestive system.

type of nutrient	mouth	stomach	small intestine
1			
2			
3			

Key

 undigested food

 digested food

Which row of the table below correctly identifies the types of nutrient **1**, **2** and **3**?

	1	2	3
A	protein	fat	starch
B	starch	protein	fat
C	protein	starch	fat
D	fat	protein	starch
E	starch	fat	protein
F	fat	starch	protein

Your answer

[1]

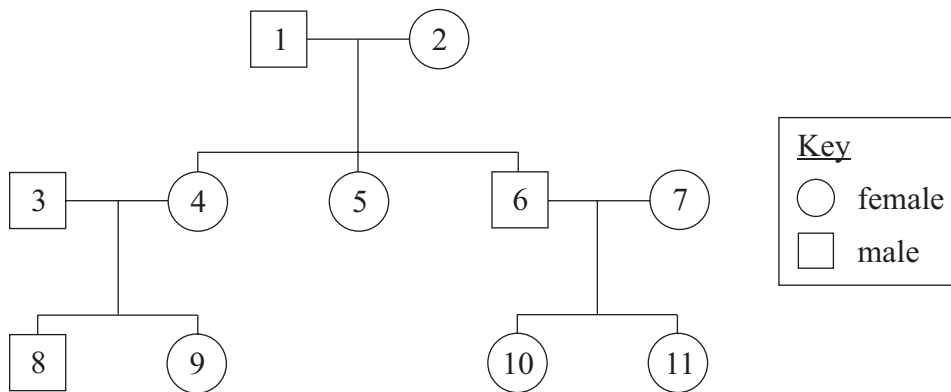
- 12** Which set of events occurs during exhalation?

	volume of thorax	diaphragm becomes	pressure in thorax	ribs pivot
A	decreases	more convex	increases	down and outwards
B	increases	less convex	decreases	up and outwards
C	decreases	more convex	increases	down and inwards
D	increases	more convex	decreases	up and inwards
E	decreases	less convex	increases	down and outwards
F	increases	less convex	decreases	up and inwards

Your answer

[1]

- 13 The diagram shows a family tree.



The grandfather, individual 1, carries a recessive allele on his X chromosome.
 Which other individuals could have inherited this allele?

- A 3,4,5,6
- B 3,4,5,7
- C 4,5,6,8
- D 4,5,8,9
- E 5,8,9,10
- F 6,8,9,11

Your answer

[1]

- 14 Which row of the table shows what occurs in the eye when you watch a bird flying away from you?

	ciliary muscles	suspensory ligaments	lens becomes
A	contract	loosened	more convex
B	relax	tightened	less convex
C	contract	tightened	less convex
D	relax	loosened	more convex
E	contract	loosened	less convex
F	relax	tightened	more convex

Your answer

[1]

- 15** During the fetal stage an opening, the foramen ovale, exists in the septum between the two atria. This allows blood to flow from the right atrium to the left atrium.

The opening should close during birth. If this fails to happen, which **one** of the following is the **main** problem to the health of the baby?

- A** Blood in the aorta would not be fully oxygenated.
- B** The heart beat rate would decrease.
- C** The amount of blood pumped at each stroke would fall.
- D** The pulmonary vein would only contain deoxygenated blood.
- E** The volume of blood pumped to the lungs will increase.

Your answer

[1]

- 16** The amount of water in urine is controlled by the hormone ADH.

Which sequence of events will occur when you need to keep water in your body?

	blood concentration is:	ADH production	nephron action	urine concentration becomes:
A	dilute	falls	less water reabsorbed	dilute
B	concentrated	rises	more water reabsorbed	concentrated
C	dilute	rises	less water reabsorbed	dilute
D	concentrated	falls	more water reabsorbed	concentrated
E	dilute	falls	more water reabsorbed	concentrated
F	concentrated	rises	less water reabsorbed	dilute

Your answer

[1]

17 The statements are about respiration.

- 1 Aerobic respiration releases more energy per unit mass of glucose than anaerobic respiration.
- 2 Aerobic respiration in muscles causes an oxygen debt to occur.
- 3 Aerobic respiration forms carbon dioxide as the only waste product.
- 4 Reduced aerobic respiration will limit the active uptake of mineral ions in the kidney tubules.
- 5 When there is little oxygen available to muscles only anaerobic respiration occurs.
- 6 Anaerobic respiration forms lactic acid as the only waste product.

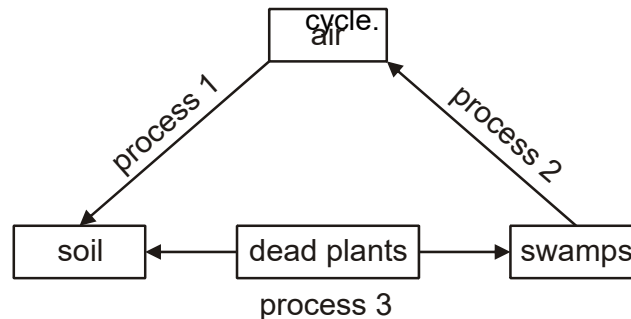
Which statements are correct?

- A** 1, 2 and 3 only
B 4, 5 and 6 only
C 1, 3 and 5 only
D 2, 4 and 6 only
E 1, 4 and 6 only
F 2, 3 and 5 only

Your answer

[1]

18 The diagram below shows part of the nitrogen



Which row of the table correctly identifies processes 1, 2 and 3?

	<i>process 1</i>	<i>process 2</i>	<i>process 3</i>
A	decomposition	nitrification	nitrogen fixation
B	decomposition	nitrogen fixation	nitrification
C	denitrification	nitrification	nitrogen fixation
D	denitrification	nitrogen fixation	decomposition
E	nitrification	decomposition	denitrification
F	nitrification	denitrification	decomposition
G	nitrogen fixation	decomposition	denitrification
H	nitrogen fixation	denitrification	decomposition

Your answer

[1]

19 Signals travelling along a reflex arc pass from one neuron to the next neuron by the release of transmitter molecules. The statements below are about this process.

- 1** The signal is transmitted across the synapse by osmosis.
- 2** Transmitter molecules are released once the signal has been transmitted across the synapse.
- 3** The release of transmitter molecules is triggered by the signal.
- 4** The signal is transmitted across the synapse by diffusion.

Which of the above statements are correct?

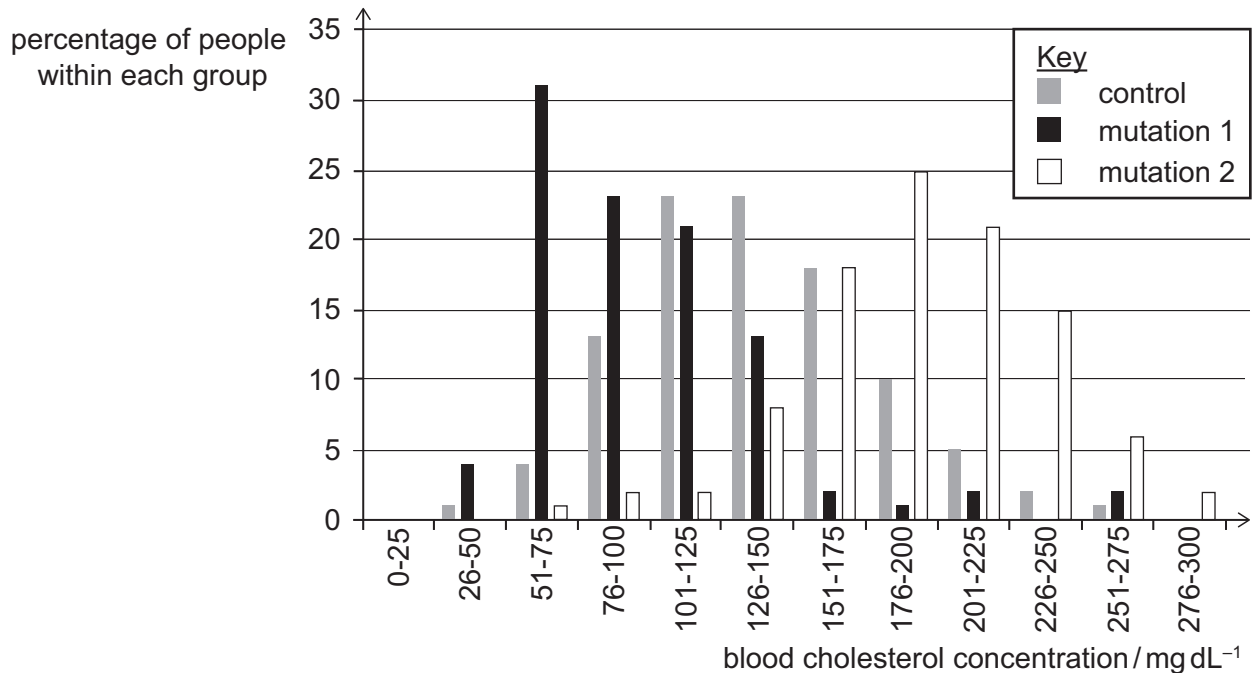
- A** 1 and 2 only
- B** 1 and 3 only
- C** 1 and 4 only
- D** 2 and 4 only
- E** 3 and 4 only

Your answer

[1]

- 20** A study was carried out into the effect of liver protein Z on the risk of developing coronary heart disease, which is often associated with high blood cholesterol. Z binds to another protein in the membrane of liver cells that transports cholesterol from the blood into cells. This binding blocks the function of the transport protein.

Blood cholesterol levels were measured in three different groups of people. One group was a control group and contained no mutations in the gene for Z. The second group all had the same mutation in the gene (called mutation 1). This mutation occurs in the final section of the gene. A third group all had a different mutation in the gene (called mutation 2), but this was in the first section of the gene. The results are shown in the graph.



Which of the following can be correctly concluded from these results?

- 1 Changes in the first section of protein Z stop it from binding to the cholesterol transport protein.
 - 2 Mutation 1 could result in an increase in the concentration of cholesterol inside liver cells.
 - 3 Of the three groups, people in the control group are least likely to develop coronary heart disease.
- A** none of them
- B** 1 only
- C** 2 only
- D** 3 only
- E** 1 and 2 only
- F** 1 and 3 only
- G** 2 and 3 only
- H** 1, 2 and 3

Your answer

[1]

Section C

21. A student investigated the effect of alcohol on the permeability of membranes in plant cells. The student wanted to find the minimum concentration of alcohol at which all the cells became permeable to the stain Evans Blue. Evans Blue stains the nucleus of the cell.

The student followed this method:

- The student placed samples of onion epidermis into different concentrations of ethanol.
- After five minutes a few drops of Evans Blue stain was added to each sample.
- After a further five minutes, the samples were viewed using a light microscope.
- The student observed 20 cells and recorded how many contained a blue nucleus.

Table 21.1 shows the student's results.

Concentration of ethanol (%)	Number of cells with a blue nucleus	% cells with blue nucleus
0	1	5
10	4	20
20	16	80
30	20	100
40	20	100

Table 21.1

- i. Identify **one** limitation of the method the student followed.

[1]

- ii. On evaluating the results, the student decided to use a narrower range of ethanol concentrations.

Suggest what range of ethanol concentrations the student should use and give a reason for your choice.

[2]

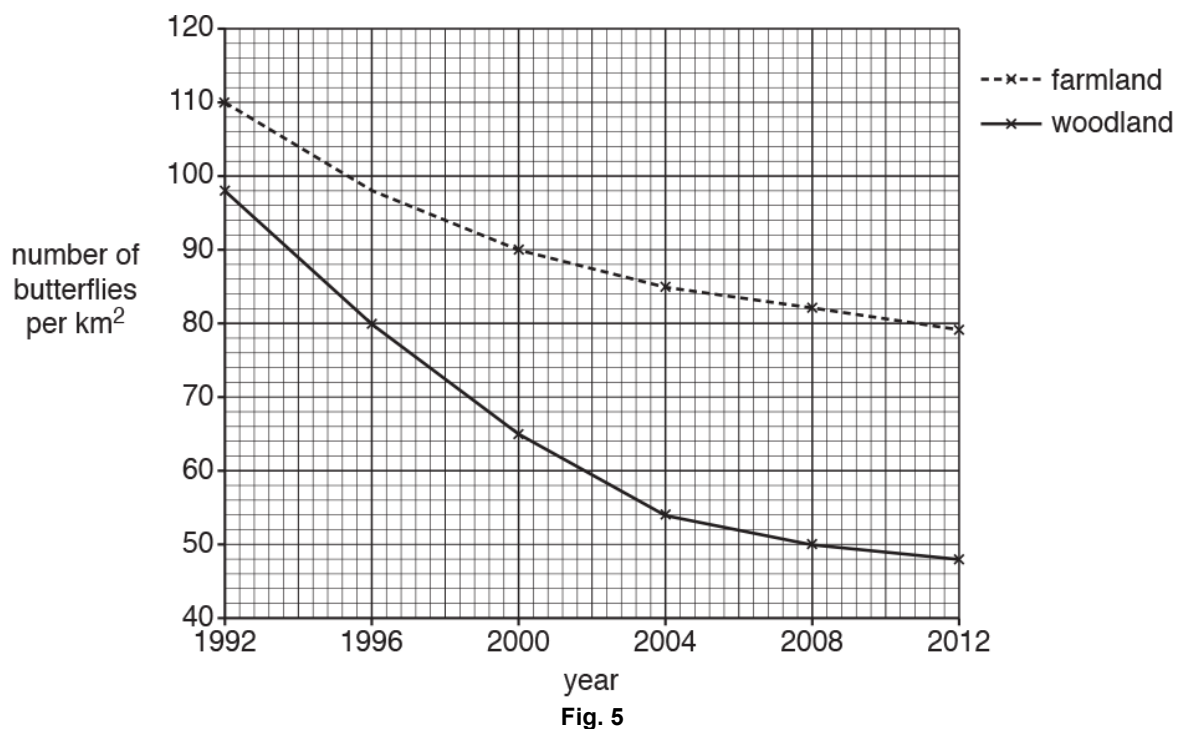
- iii. How would using a narrower range of alcohol concentrations improve the investigation?

[1]

22. A study was carried out on butterflies in two different habitats in the north of England. The two habitats were farmland and mixed deciduous woodland.

- Surveys were completed in 1992 and then at four year intervals.
- Data were collected from butterfly transect sites in both habitats. Using this data, the total butterfly population in each habitat was estimated.
- In 2012, the general populations of butterflies in these two habitats reached historical lows as a result of the prolonged cold and wet weather.
- Between 1992 and 2012 the woodland had become overgrown due to lack of active management. In particular the number of open spaces in the woodland had decreased.

The data in Fig. 5 shows the total butterfly populations per square kilometre in both habitats between the years 1992 to 2012.



- i. Calculate the total percentage decrease in the number of butterflies on farmland between 1992 and 2012.

Show your working. Give your answer to the nearest whole number.

Answer.....[2]

- ii. Using the data given in **Fig. 5**, compare the changes in the number of butterflies on farmland and on woodland between 1992 and 2012.

[2]

- iii. Both habitats experienced the same weather conditions.

Suggest a reason **for the difference** in the rates of decline in butterfly numbers in woodland and farmland.

[1]

- iv. A student made the following statement:

'These data show that the change in butterfly numbers was caused by changes in weather conditions in England.'

Comment on the validity of this statement.

[2]

- v. State **one** variable that scientists should control when carrying out surveys such as this.

[1]

23. Measles, Mumps and Rubella are communicable diseases. They can be prevented by the use of the MMR vaccine which is administered to children.

The table below shows some data on the number of children given the MMR vaccine and the incidence of measles between 2012 and 2014.

MMR vaccinations		
Date	Country	Number of vaccinations administered
2013 (Oct to Dec)	England	171,855
2014 (Jan to March)	England	162,193
Confirmed cases of measles		
Date	Country	Number of confirmed cases
2012	England and Wales	2,032
2013	England	1,414
2014	England	102

- i. Using the data provided in the table, calculate the percentage decrease in the number of vaccinations administered in England between 2013 and 2014.

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

Percentage decrease = [2]

ii. Student **A** studied the data in the table and made the following statement:

'The MMR vaccination programme is not working because although the number of children vaccinated has reduced, measles incidence has also reduced.'

In response, student **B** stated:

'You cannot tell this from the data provided here.'

With reference to the data in the table, discuss whether student **B** is correct.

[3]

iii. A student made the following statement about the influenza (flu) vaccination programme:

'The flu vaccination programme involves giving the same flu vaccine to different age groups and to medically vulnerable people every year, as it is for the same disease.'

Discuss the accuracy of the student's statement.

[3]

END OF QUESTION PAPER