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 AS

BIOLOGY (9610)

Unit 1 The Diversity of Living Organisms

Wednesday 7 January 2026 07:00 UK Time 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	
TOTAL	

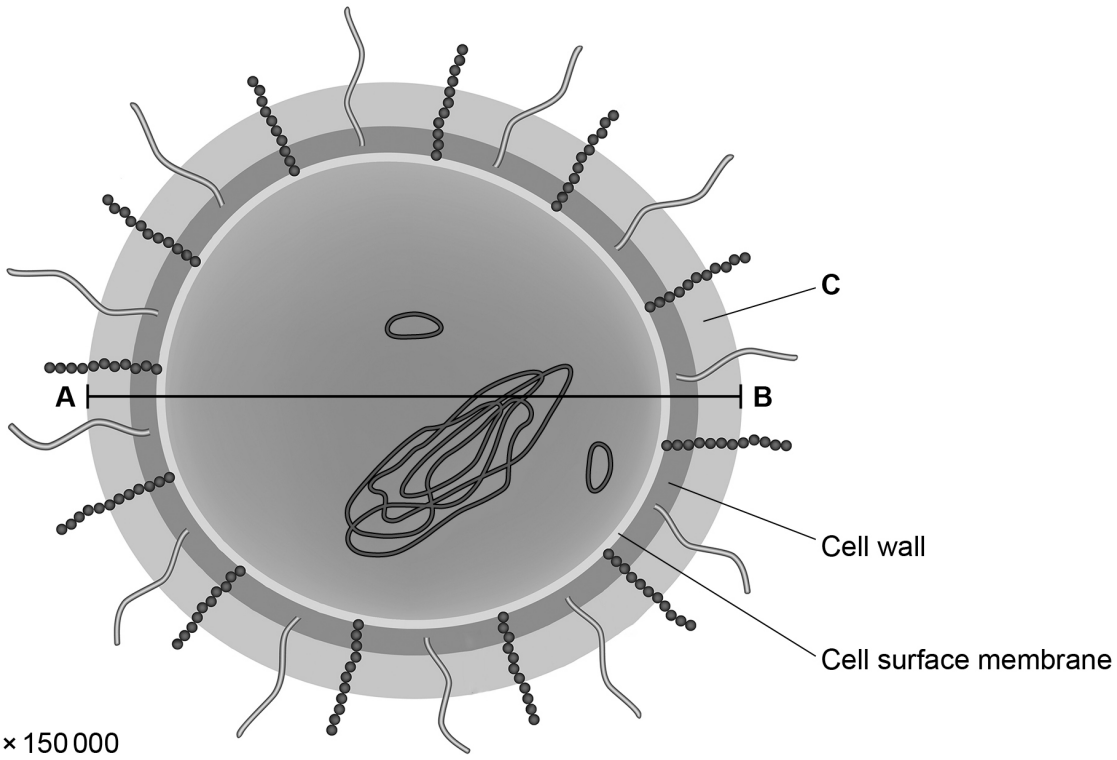
Answer **all** questions in the spaces provided.

Do not write outside the box

0 1 Some types of bacteria cause lung infections.

Figure 1 shows the structure of a bacterial cell.

Figure 1



0 1 . 1 Calculate the actual diameter of the bacterial cell between points **A** and **B** on **Figure 1**.

[2 marks]

_____ µm

Do not write outside the box

0 1 . 2 Name structure **C** in **Figure 1**.

[1 mark]

There are differences in the structure and location of DNA found in a bacterial cell and in a cell from a human lung.

0 1 . 3 Give **two** ways that the structure of DNA in a bacterial cell is different from the structure of DNA in a human lung cell.

[2 marks]

1

2

0 1 . 4 Give **two** ways that the location of DNA in a bacterial cell is different from the location of DNA in a human lung cell.

[2 marks]

1

2

Question 1 continues on the next page

Do not write outside the box

0 1 . 5 Lung infections caused by bacteria can be treated using antibiotics.

Antibiotics that stop bacteria from producing murein will kill bacteria but have **no** effect on human lung cells.

Give a reason why these antibiotics have **no** effect on human lung cells.

[1 mark]

0 1 . 6 Lung infections caused by bacteria can affect breathing.

Describe how humans breathe out.

[3 marks]

11

Do not write outside the box

0 2 A student uses a solvent to remove pigments from leaves. The student separates the pigments using paper chromatography.

0 2 . 1 Describe how the student separates the pigments using paper chromatography.

[4 marks]

0 2 . 2 The student does the chromatography near to an open window.

Suggest why carrying out chromatography close to an open window is important.

[1 mark]

Question 2 continues on the next page

Do not write outside the box

The student sets up two separate chromatography experiments, each with a different solvent.

Both experiments are left for the same time.

Solvent **1** separates four pigments. Solvent **2** separates five pigments.

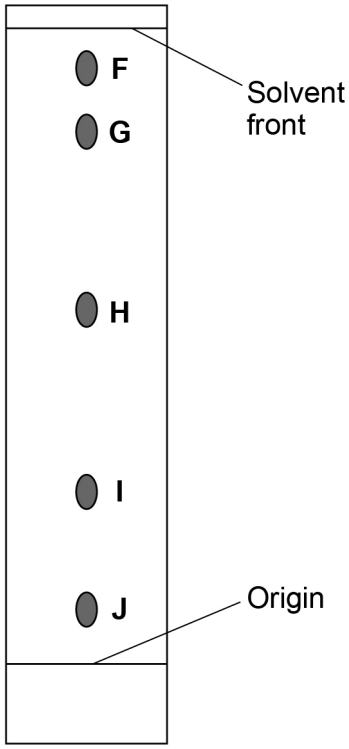
0 2 . 3 Suggest what causes the difference in the results using solvent **1** and solvent **2**.

[2 marks]

Do not write outside the box

Figure 2 shows the results using solvent **2**.

Figure 2



0 2 . 4 Give the letter of the pigment in **Figure 2** that is most soluble in solvent **2**.

Give a reason for your answer.

[1 mark]

Most soluble pigment _____

Reason _____

_____

0 2 . 5 Calculate the R_f value for pigment **H**.

[2 marks]

R_f = _____

Turn over ►

Do not write outside the box

0 2 . 6 The student tests the pigments to find out if they are proteins.

Name a biochemical test for proteins.

State the colour the student would expect to see if the pigments are proteins.

[2 marks]

Biochemical test _____

Expected colour _____

0 2 . 7 The student tests the pigments.

Suggest why the colour change the student sees might not be as expected.

[1 mark]

_____

_____

_____

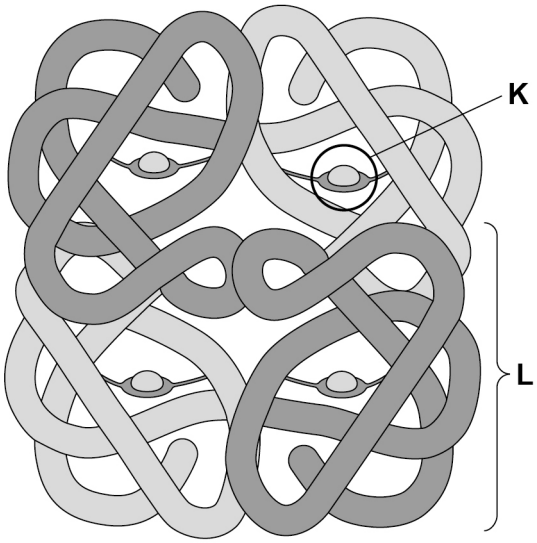
13

Do not write outside the box

0 3 Haemoglobin is a protein that transports oxygen in the blood.

Figure 3 shows one haemoglobin molecule.

Figure 3



0 3 . 1 Give evidence from **Figure 3** that haemoglobin has a **quaternary structure**.

[1 mark]

0 3 . 2 Name the group labelled **K** in **Figure 3**.

[1 mark]

0 3 . 3 Molecule **L** in **Figure 3** is a polypeptide chain containing 141 amino acids.

State the minimum number of nucleotides that code for molecule **L**.

[1 mark]

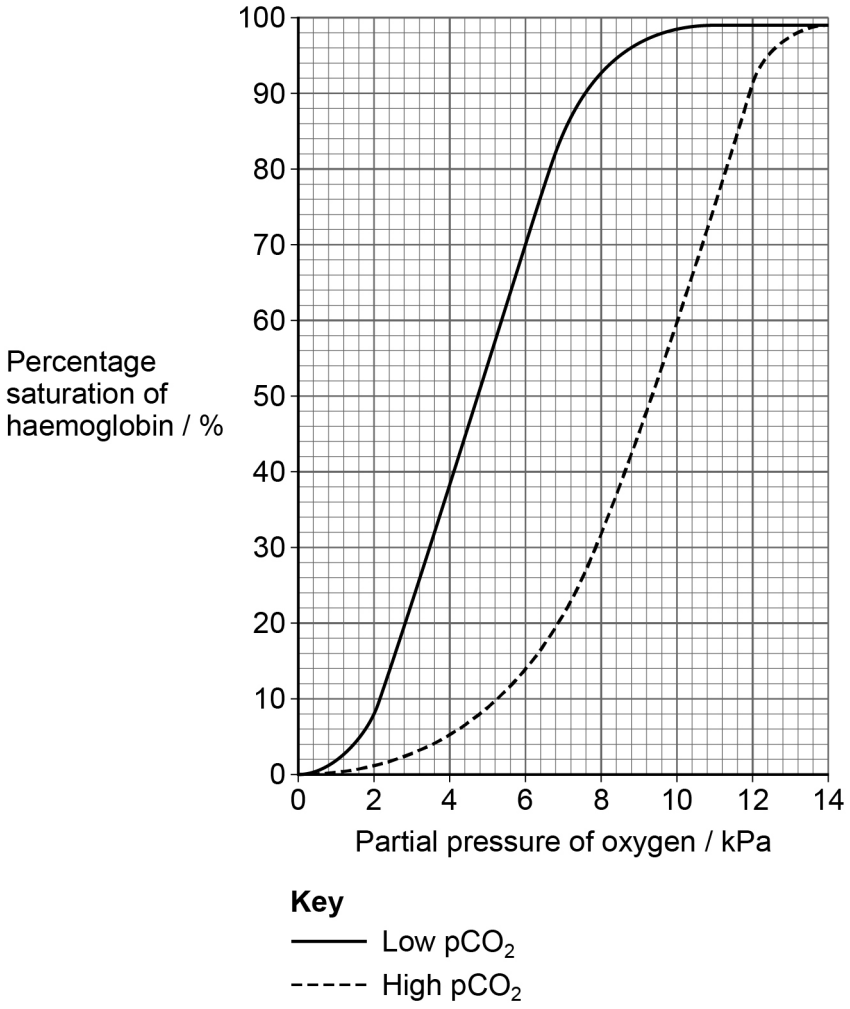
Question 3 continues on the next page

The concentration of a gas is often given as partial pressure.

The saturation of haemoglobin with oxygen is affected by the partial pressure of carbon dioxide (pCO_2).

Figure 4 shows an oxygen–haemoglobin dissociation curve at two values of pCO_2

Figure 4



Do not write outside the box

0 3 . 4 Use **Figure 4** to determine the difference in percentage saturation of haemoglobin with oxygen at **6kPa** in a:

- **low** pCO_2
- **high** pCO_2

[1 mark]

_____ %

0 3 . 5 The percentage saturation of haemoglobin with oxygen in low pCO_2 and high pCO_2 is different.

Explain why this is an advantage to active muscle cells.

[3 marks]

Question 3 continues on the next page

Do not write outside the box

0 3 . 6 When there is a high pCO_2 in the blood, CO_2 enters red blood cells and is converted into hydrogen carbonate ions (HCO_3^-) inside the red blood cells.

HCO_3^- ions leave the red blood cells and enter the plasma.

Describe how carbon dioxide enters the red blood cells and how HCO_3^- ions leave the red blood cells.

[4 marks]

Carbon dioxide

Ions

0 3 . 7 Haemoglobin molecules from different species have different shapes.

Suggest what causes the haemoglobin of one species to have a different shape from the haemoglobin of another species.

[2 marks]

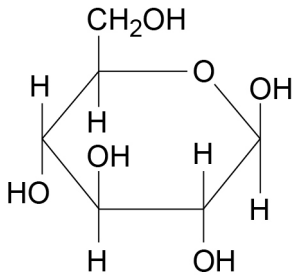
13

Do not write outside the box

0 4 Cellulose is a biological substance found in plant cells.

Figure 5 shows the monosaccharide found in cellulose.

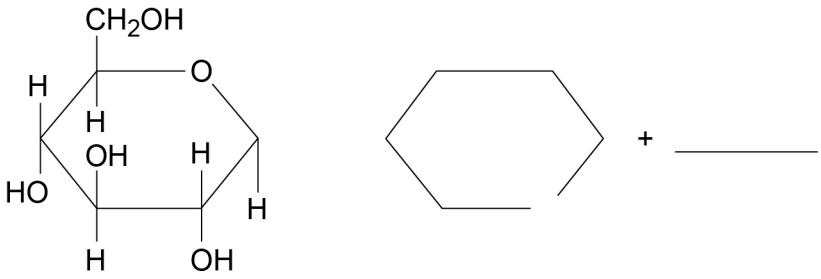
Figure 5



0 4 . 1 Complete **Figure 6** to show the **molecules** produced when two of these monosaccharides are joined by a glycosidic bond.

[2 marks]

Figure 6



Question 4 continues on the next page

Do not write outside the box

0 4 . 2 Describe how the structure of cellulose is related to its function.

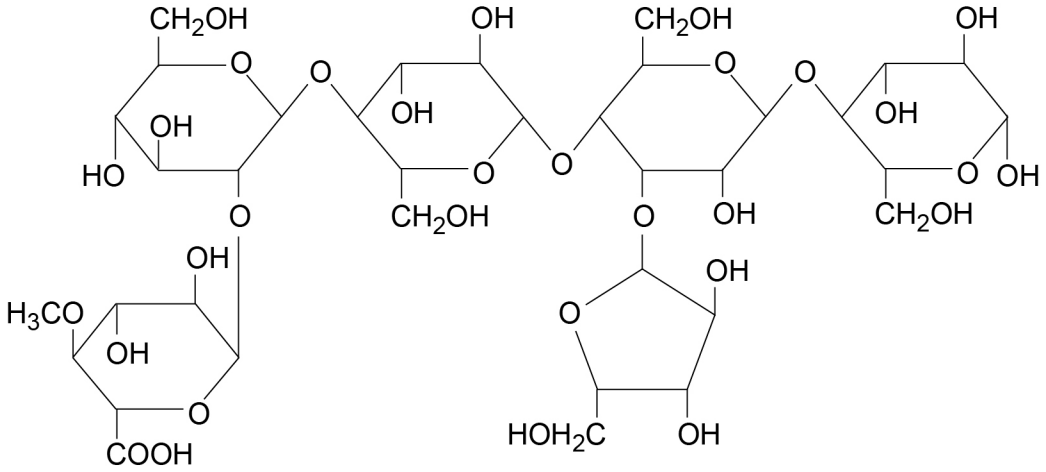
[4 marks]

Do not write outside the box

Hemicellulose is a substance formed from different monosaccharides with different numbers of carbon atoms.

Figure 7 shows part of a hemicellulose molecule.

Figure 7



0 4 . 3 Give **two** similarities and **one** difference between the structure of hemicellulose and the structure of cellulose.

Use information in **Figure 7** and your own knowledge.

[3 marks]

Similarity 1 _____

_____

_____

Similarity 2 _____

_____

_____

Difference _____

_____

_____

Question 4 continues on the next page

Do not write outside the box

Different biochemical tests are used to detect biological substances.

Each biochemical test has a specific colour change with one biological substance.

Five biological substances are tested.

Table 1 shows the results.

Table 1

	Observation when substance tested				
Biochemical test	**α-glucose**	**Cellulose**	**Pentose sugar**	**Substance X**	**Substance Y**
Emulsion	No colour	No colour	No colour	White emulsion	No colour
Schultz	Yellow	Purple	Yellow	Yellow	Yellow
Bial's	Brown	Brown	Green-blue	Brown	Brown
Iodine	Yellow-orange	Yellow-orange	Yellow-orange	Yellow-orange	Blue-black
Fehling's	Red	Blue	Blue	Blue	Blue

0 4 . 4 Use the information in **Table 1** to identify substance **X** and substance **Y**.

[2 marks]

Substance **X** _____

Substance **Y** _____

0 4 . 5 Identify the tests from **Table 1** that can be used to find if a sample contains cellulose or hemicellulose.

For **each** test give the colour of a positive result.

[2 marks]

Cellulose test _____

Colour _____

Hemicellulose test _____

Colour _____

Do not write outside the box

0 4 . 6 It is **not** possible to find out if a biological substance is found in some food samples using the biochemical tests in **Table 1**.

Suggest **two** reasons why.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

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 5 . 1 Compare the structure of a triglyceride and a phospholipid.

[3 marks]

Similarities _____

_____

_____

_____

_____

Differences _____

_____

_____

_____

_____

Question 5 continues on the next page

Different species of deer live in different environments with different mean ground temperatures.

Scientists investigate if the percentage of unsaturated and saturated fatty acids found in lipids is affected by the mean ground temperature.

The scientists:

- select **three** different species of deer (red, roe and fallow)
- take tissue samples from the upper leg and from the toes of each of the deer species
- measure the percentage of unsaturated and saturated fatty acids in the cell membranes in the tissue.

Figure 8 shows a red deer standing in snow. The sites where the scientists took the samples are also shown.

Figure 8

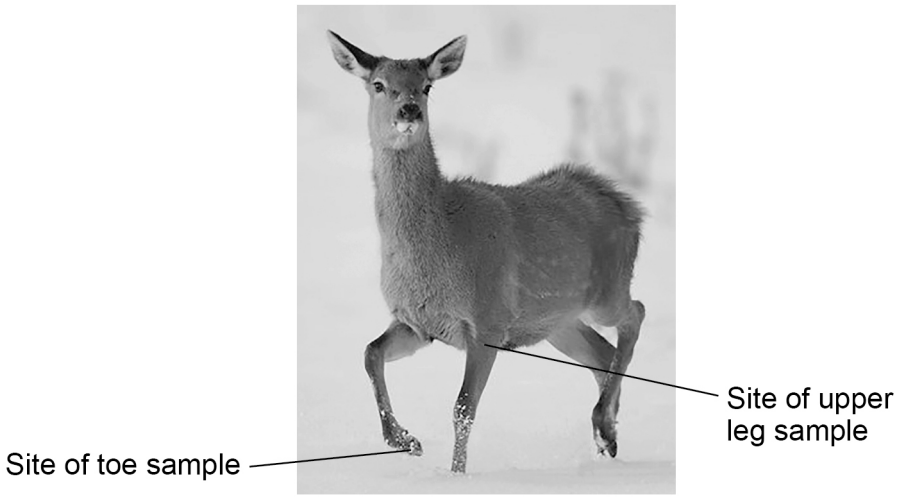


Table 2 shows the results.

Table 2

Species of deer	Percentage of each type of fatty acid in upper leg sample		Percentage of each type of fatty acid in toe sample	
	Unsaturated	**Saturated**	**Unsaturated**	**Saturated**
Red	28	72	81	19
Roe	27	73	73	27
Fallow	24	76	64	36

Do not write outside the box

0 5 . 2 The fatty acids in **Table 2** are recorded as a percentage value.

Explain why.

[2 marks]

0 5 . 3 Calculate the ratio of unsaturated to saturated fatty acids in the **toes** of red deer.

[1 mark]

Ratio = _____ : 1

0 5 . 4 Calculate how many times larger the ratio of unsaturated fatty acids to saturated fatty acids is in the toes of red deer compared to fallow deer.

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

[2 marks]

Number of times larger = _____

Question 5 continues on the next page

Do not write outside the box

Scientists predict that the ratio of different fatty acids in the toes of deer is affected by the mean ground temperature.

Figure 9 shows the mean ground temperature in winter in different areas of Britain.

Figure 9

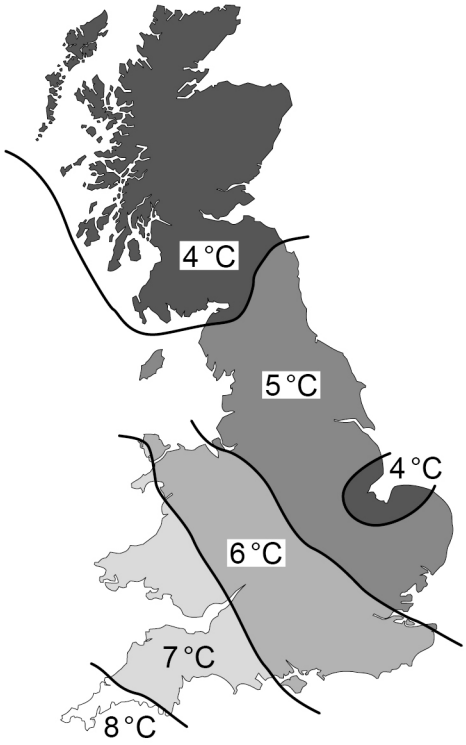
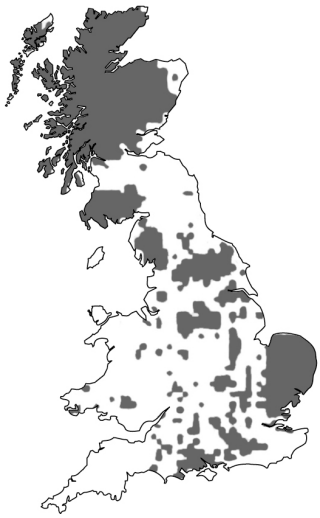
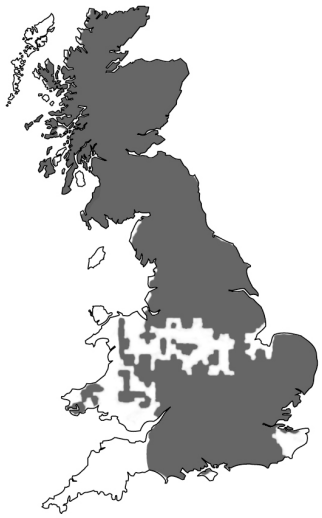


Figure 10 shows the distribution of the three species of deer. The grey areas on the maps show where the different species are found.

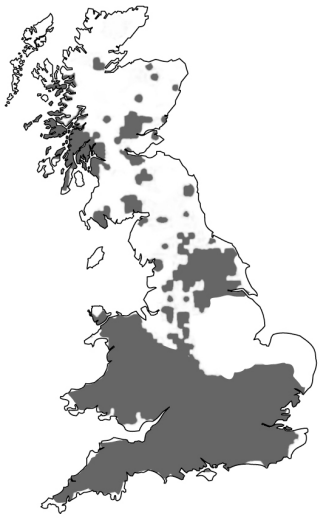
Figure 10



Red deer distribution



Roe deer distribution



Fallow deer distribution

Do not write outside the box

0 5 . 5 One of the scientists states:

'The lower the mean ground temperature in winter, the higher the proportion of unsaturated fatty acids in the toes of deer'.

Give **one** piece of evidence that supports the scientist's statement and one piece of evidence that does **not** support the statement.

Use information from **Figures 9** and **10** and from **Table 2** (on page 20).

[2 marks]

Supports _____

_____

_____

Does not support _____

_____

_____

0 5 . 6 In red deer, there is a higher proportion of unsaturated fatty acids in the cell membranes in the toes than in the cell membranes of the upper leg.

Suggest why.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

13

Turn over for the next question

Do not write outside the box

0 6 Read the following passage:

Hybrids are produced when two different species interbreed. Hybrids are not usually fertile, but in the cat family there are many examples of hybrids that are fertile. An example of a fertile hybrid is the liger. A liger is the offspring of a lion (*Panthera leo*) crossed with a tiger (*Panthera tigris*). Scientists believe that lions and tigers evolved from a common ancestor that lived 10.8×10^6 years ago.

The production of fertile offspring between different cat species is due to the similarities between cat genomes. Most cat species share the same chromosome structure and number. Gene loci are also very similar between all cat species, although not exactly the same.

Wild Asian leopard cats (*Prionailurus bengalensis*) can be interbred with domestic cats (*Felis catus)*. These two species last shared a common ancestor 6×10^6 years ago. Most male offspring from this cross are not fertile and so the female hybrids are bred with domestic cats. The offspring from this second cross are then bred again with domestic cats for two more generations to create Bengal cats.

Figure 11 shows an Asian leopard cat, a domestic cat and a Bengal cat.

Figure 11

Asian leopard cat

Domestic cat

Bengal cat

The genes of the Asian leopard cat are not spread throughout the Bengal cat DNA. This is because expression of some of the Asian leopard cat genes can cause the hybrids to die. Researchers found that 7% of the Bengal cat genome does not contain any Asian leopard cat genes. In general, Bengal cats contain less than 3% Asian leopard cat DNA.

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

Do not write outside the box

0 6 . 1 Domestic cats and Asian leopard cats are classified as different species.

However, some scientists believe they should be classified as the same species.

Give reasons for considering domestic cats and Asian leopard cats to be:

- the same species
- two different species.

Use **only** the information given.

[5 marks]

Same species _____

Different species _____

Question 6 continues on the next page

Do not write outside the box

0 6 . 2 ‘Most male offspring from this cross are not fertile’ (line 12).

Suggest why hybrid males are often **not** fertile.

[1 mark]

0 6 . 3 Scientists used the female hybrid produced by the original cross of an Asian leopard cat with a domestic cat. The scientists bred this female hybrid for three more generations with domestic cats to create Bengal cats (lines 13–15).

Calculate the expected percentage of Asian leopard cat DNA in Bengal cats.

[1 mark]

Percentage = _____

0 6 . 4 ‘In general, Bengal cats contain less than 3% Asian leopard cat DNA’ (lines 19–20).

Suggest why.

[2 marks]

Do not write outside the box

0 6 . 5 Suggest why Bengal cats are more likely to be fertile than ligers.

Use the information in the passage about common ancestors.

[1 mark]

10

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

Do not write outside the box

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

Do not write outside the box

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

Do not write outside the box

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

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