Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Science: Single Award

Unit 1 (Biology)
Higher Tier

[GSS12]

GSS12

TUESDAY 12 MAY 2015, AFTERNOON

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

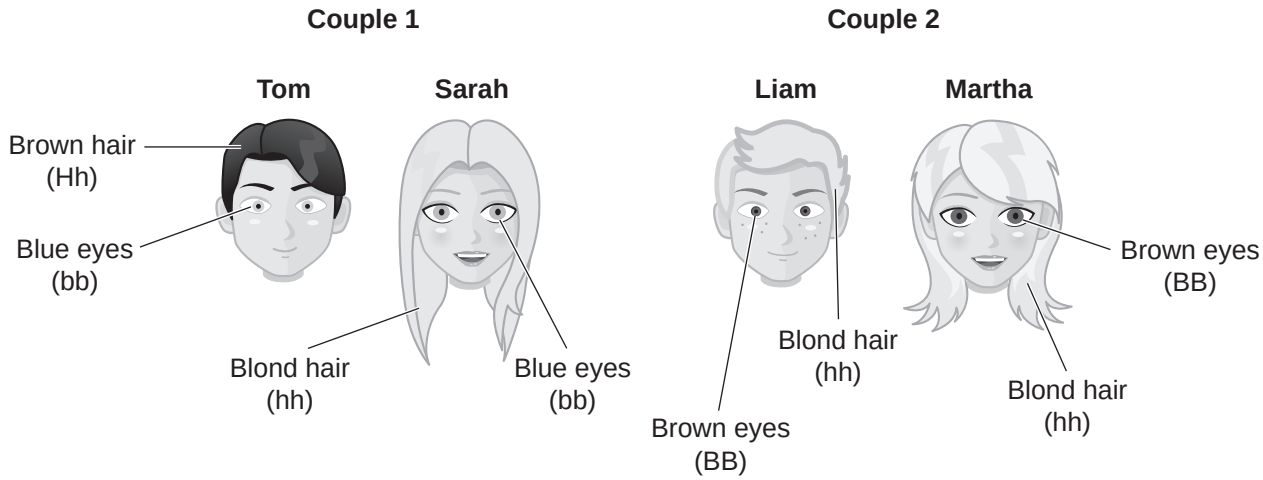
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

INFORMATION FOR CANDIDATES

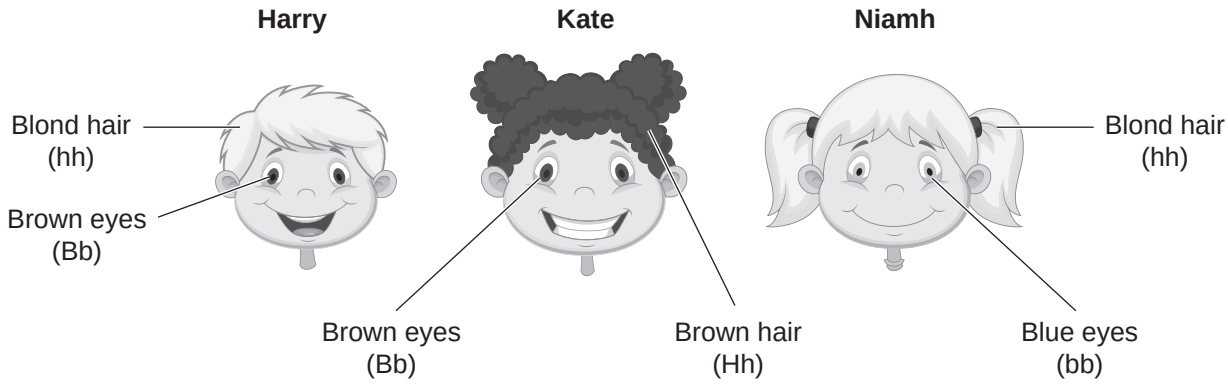
The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **10**.

9831

1 **(a)** The diagram below shows some characteristics of two couples.
For **hair colour**, the brown allele (H) is dominant.
For **eye colour**, the brown allele (B) is dominant.



(i) Which child below could be a child of Couple 1 (Tom and Sarah)?
Explain your answer.



Name of child _____

Explanation _____

_____ [2]

(ii) Explain why Harry could not be a child of Couple 2 (Liam and Martha).

_____

_____ [1]

(b) (i) The presence of a dominant allele, T, means a person can roll his or her tongue. Give the genotype of a person who is heterozygous for tongue rolling.

_____ [1]

(ii) Complete the Punnett square below to show how two parents, both of whom can roll their tongue, can have a child who cannot roll his or her tongue.

		t
T	T T	

[2]

(iii) How many of the offspring may be able to roll his or her tongue?

_____ [1]

(iv) Name the type of variation shown by tongue rolling.

_____ [1]

[Turn over

2 **(a)** The Ebola virus is spread through contact with body fluids such as blood and sweat. It spread rapidly through parts of Africa and killed over 8000 people.

No licensed vaccines are available at present to treat the virus. However, Canada agreed to send doses of an experimental vaccine to be used with patients who have the disease. This vaccine has been through two drug development stages but it has not been tested on humans.

(i) Using the information above, suggest why doctors and nurses are at risk of being infected while treating patients with the Ebola virus.

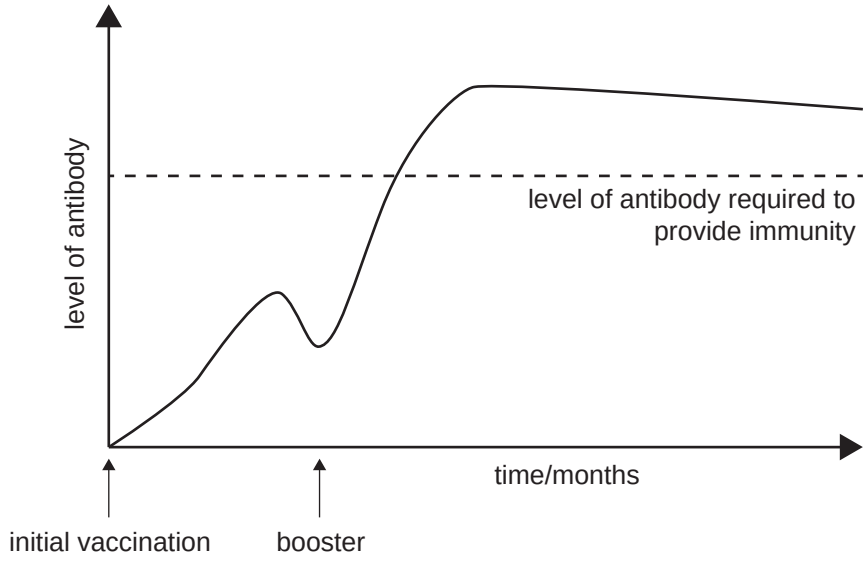
_____

_____ [1]

(ii) Name the **two** drug development stages, in the correct order, that the experimental vaccine has already been through.

_____ → _____ [2]

(b) The graph below shows how immunity is provided by a vaccination.



(i) Using the graph and your knowledge, name the type of immunity provided by a vaccination. Explain your answer.

_____

_____

_____ [2]

(ii) Suggest why the microorganisms in vaccinations must be dead or weakened.

_____ [1]

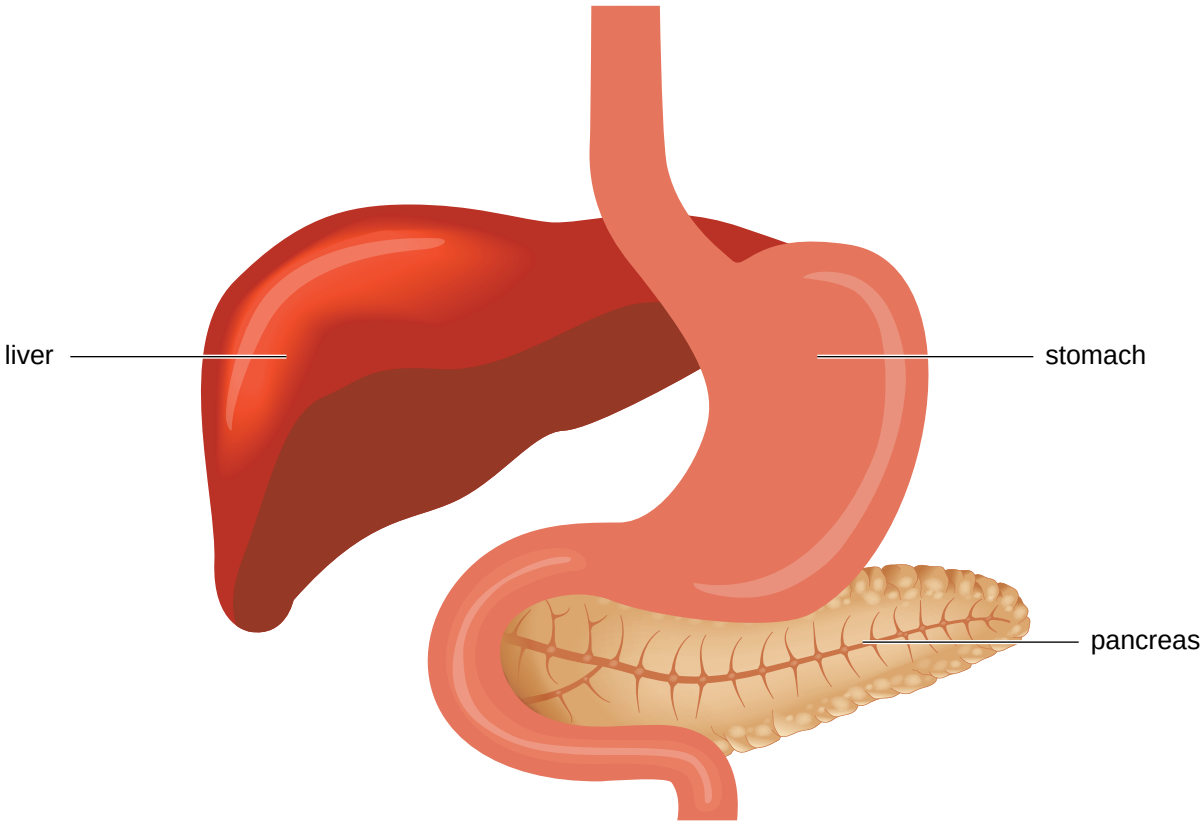
(iii) Suggest why a booster is sometimes given a few months after the initial vaccination.

_____

_____ [1]

[Turn over

3 **(a)** The diagram below shows some organs inside the human body.



(i) Place an **X** on the organ where the hormone insulin is produced. [1]

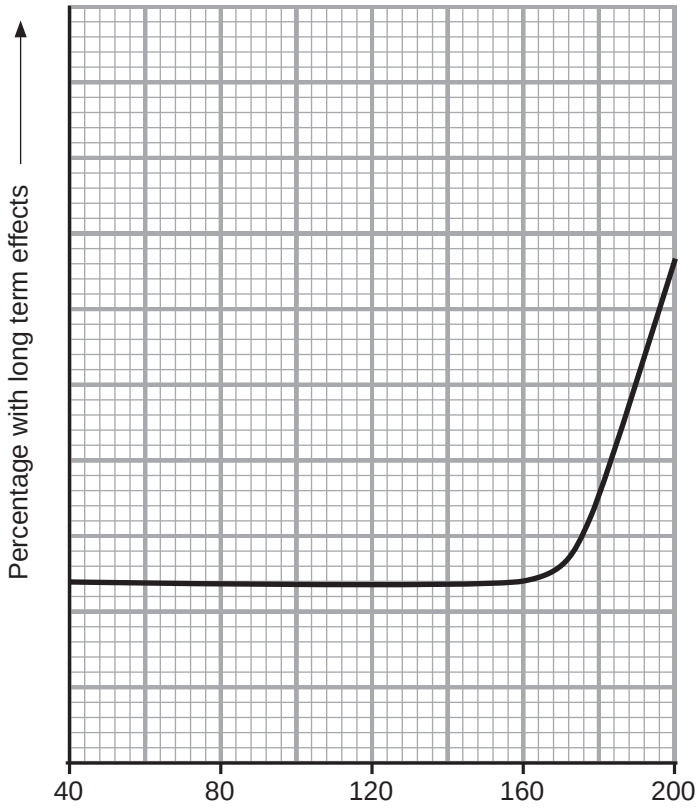
(ii) Describe and explain the effect insulin has on blood sugar levels.

_____

_____

_____ [2]

(b) Diabetes is a condition which can effect the average blood sugar level of a person. The graph below shows the relationship between the percentage of people with diabetes who have long term effects and their average blood sugar levels.



(i) Describe fully the trend shown by the graph.

_____

_____

_____ [2]

(ii) Suggest why people with diabetes need to check their blood sugar levels more than once during the day.

_____

_____ [1]

[Turn over

4 Protein is one of the main food types needed for a balanced diet. Describe how you would carry out an investigation to show that a particular food contained protein.

Your answer should include:

- a named source of protein and its function within the body
- the reagent used and the colour change which would take place

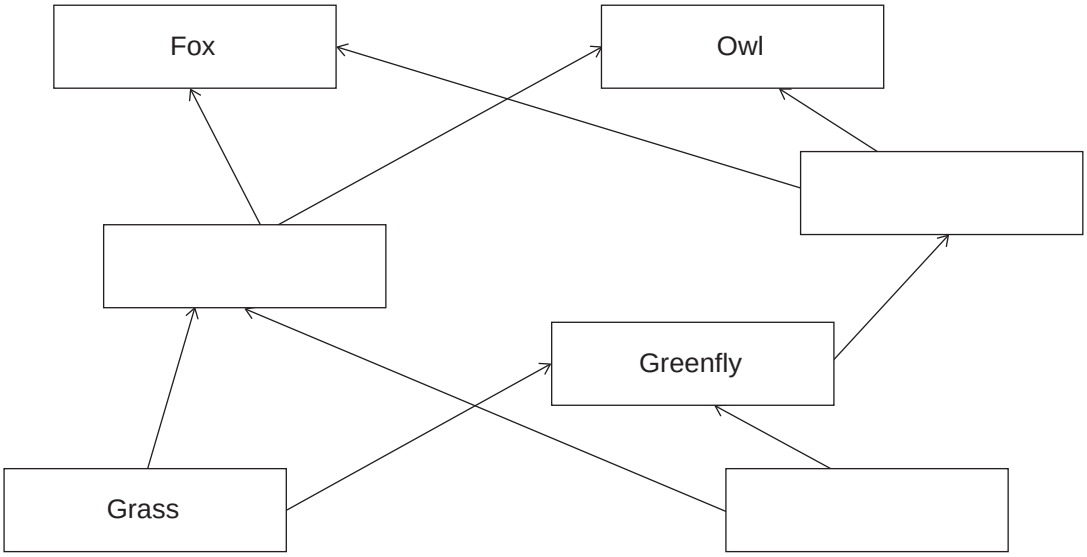
In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

5 **(a)** Food chains show the feeding relationships between organisms. When several food chains are interlinked they form a food web.

Consumer	What it feeds on
Fox	Mouse and Bluetit
Owl	Mouse and Bluetit
Bluetit	Greenfly
Mouse	Grass and Tree Leaves
Greenfly	Grass and Tree Leaves

(i) Using this information, complete the following food web.



[2]

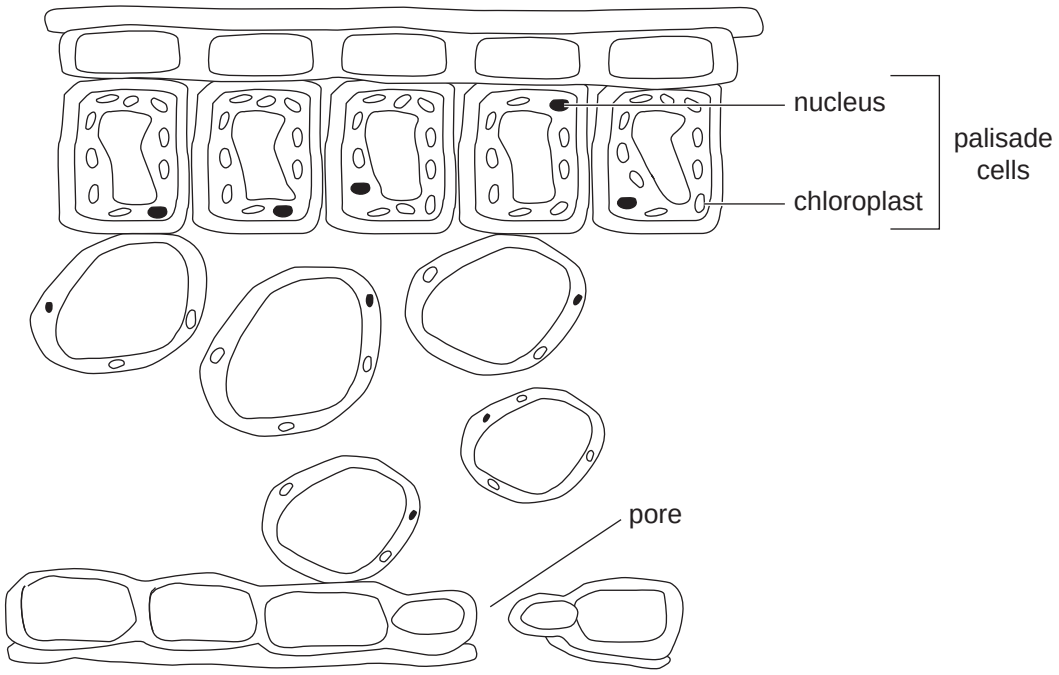
(ii) How many primary consumers are in this food web?

_____

[1]

[Turn over

(b) The diagram below shows a cross section of a leaf.



(i) Using the diagram, give **three** ways in which palisade cells are adapted to achieve maximum photosynthesis.

1. _____

2. _____

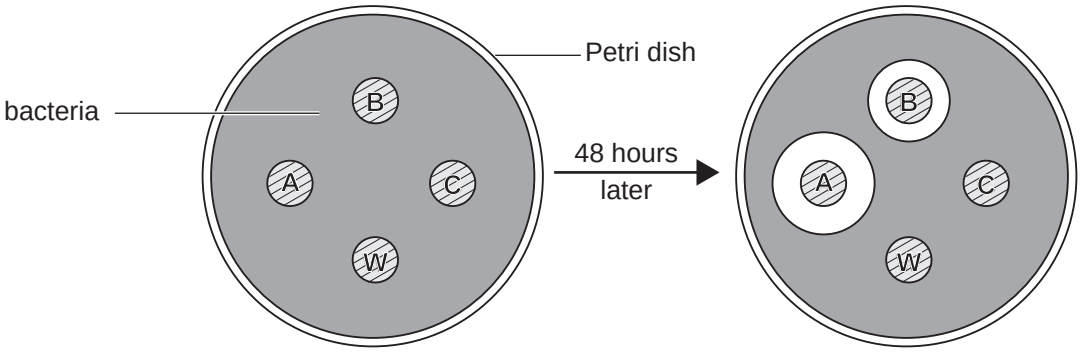
3. _____ [3]

(ii) Carbon dioxide is needed by palisade cells for photosynthesis.
Using the diagram, suggest how carbon dioxide reaches these cells.

_____

_____ [1]

6 **(a)** An investigation was carried out to see the effect of different antibiotics on bacteria.
Three disks (**A**, **B** and **C**) soaked in different antibiotics were placed in a Petri dish that contained bacteria.
One other disk soaked with water (**W**) was also added.
The results are shown below.



(i) Suggest why a disk with water was used in this investigation.

_____

_____ [1]

(ii) Which antibiotic, **A, B** or **C**, was most effective? Explain your answer.

_____

_____ [2]

(iii) Suggest **one** thing that needed to be done to ensure valid results.

_____ [1]

(b) Explain fully, in terms of changes within bacteria, how antibiotic resistance has developed.

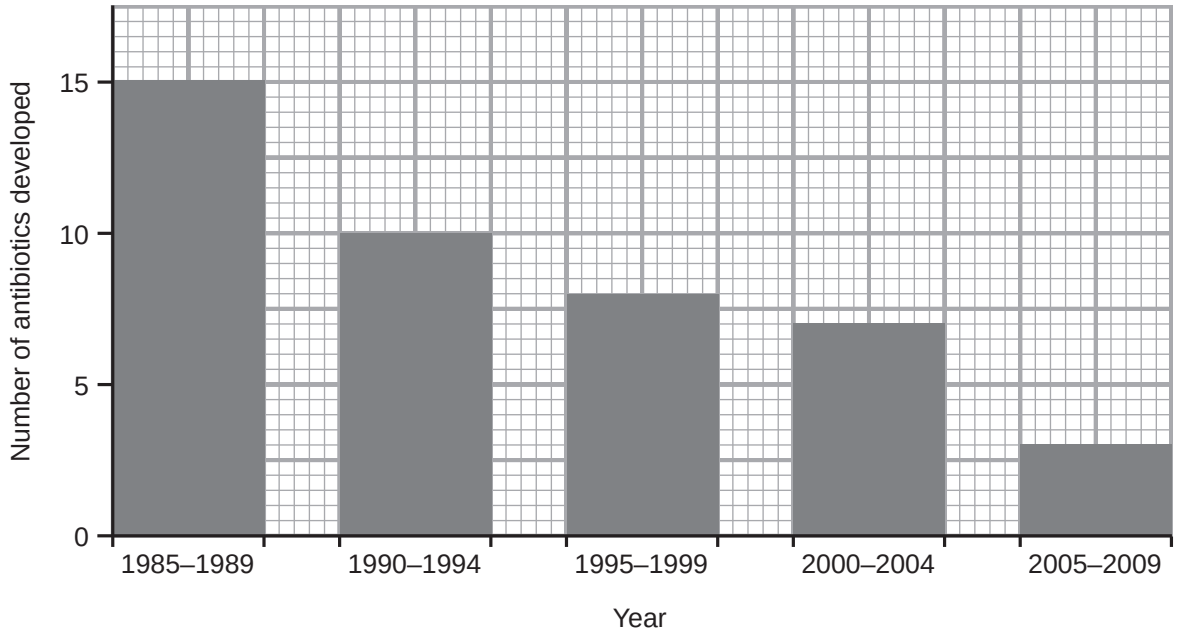
_____

_____

_____ [2]

[Turn over

(c) The graph below shows the number of antibiotics developed from 1985 to 2009.



(i) Calculate the percentage decrease in the number of antibiotics developed from 1985–1989 to 2005–2009.

(Show your working out.)

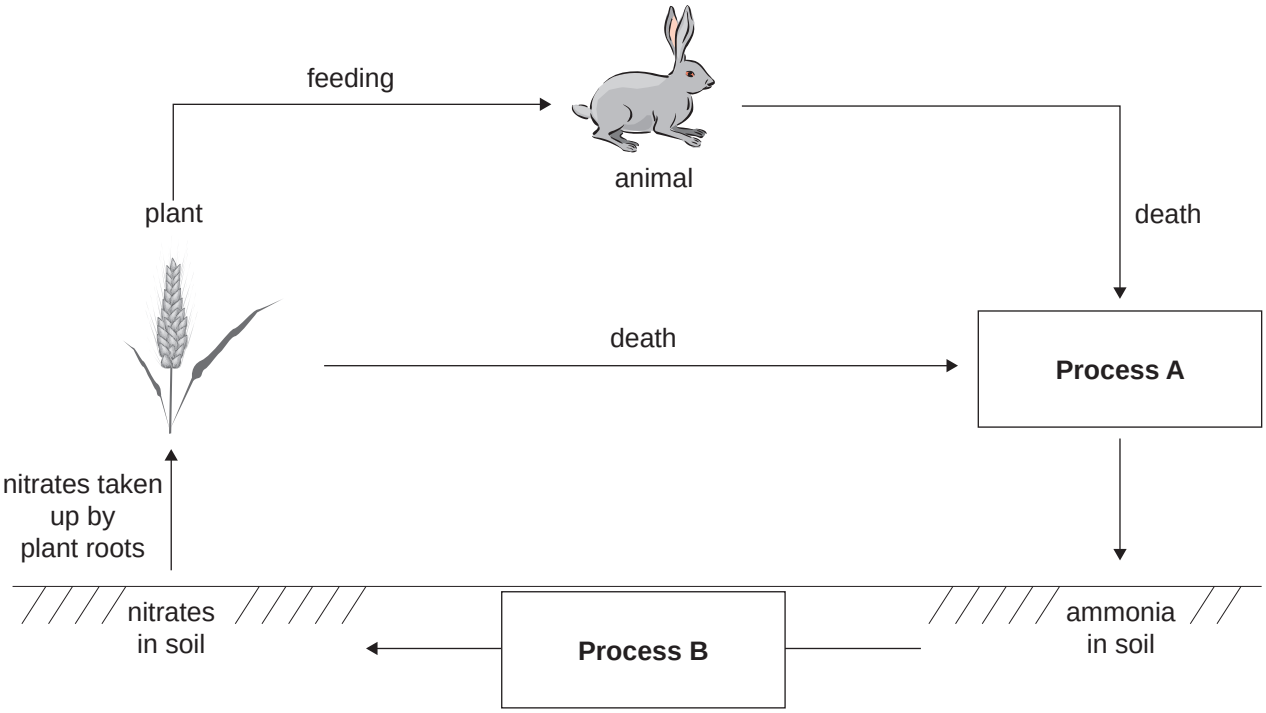
_____ % [2]

(ii) State the trend shown by the graph above.

_____

_____ [1]

7 **(a)** The diagram below shows a simplified nitrogen cycle.



(i) Name the processes labelled **A** and **B** in the diagram.

Process **A** _____

Process **B** _____ [2]

(ii) Suggest why harvesting (removing crop plants) reduces the level of nitrates in the soil.

_____

_____

_____

_____

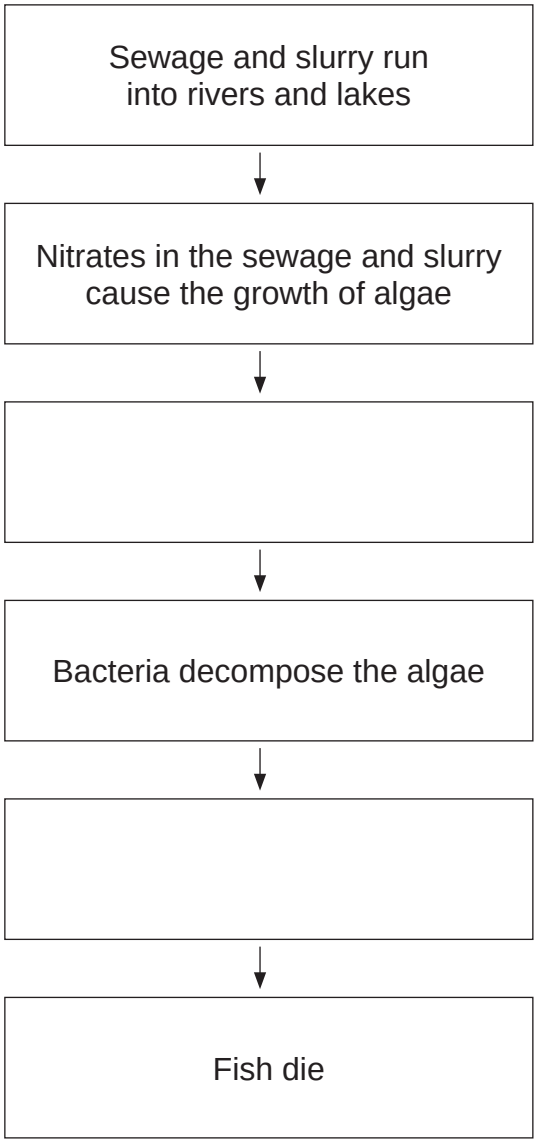
_____

_____ [3]

[Turn over

(b) Sewage and slurry from farms is rich in nitrates and can cause harmful pollution if it drains into waterways.

(i) Complete the flow chart below to show what happens when sewage and slurry run into rivers and lakes.



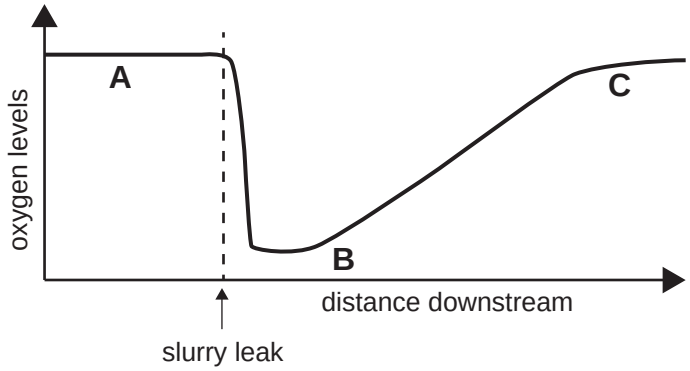
[2]

(ii) Give **one** measure we can take to reduce water pollution by nitrates.

_____

_____ [1]

(c) The graph below shows how oxygen levels change downstream in a river which has been polluted with farm slurry.



The presence of small animals in the river can be used to monitor the levels of pollution as shown in the table.

Small animals	**Pollution level**
Stonefly larvae Mayfly larvae	Low
Bloodworm Water louse	Medium
Sludge worm Rat-tailed maggot	High

Water samples were taken from two locations along the river, **A** and **B**.

(i) Using the information above suggest which small animals were present in:

1. water sample **A**

_____

2. water sample **B**

_____ [2]

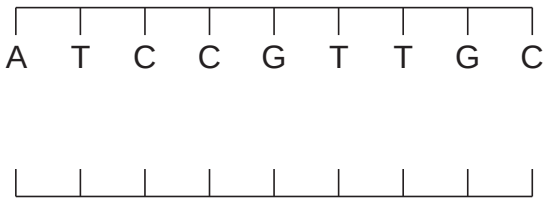
(ii) Suggest **one** reason why oxygen levels have recovered by location **C**.

_____

_____ [1]

[Turn over

8 **(a)** The diagram below shows 9 bases on a short section of a DNA coding strand.



(i) How many amino acids can be formed from this section of DNA?

_____ [1]

(ii) Each letter in the DNA coding strand represents a base. Which base is represented by the letter C?

_____ [1]

(iii) Complete the diagram by matching each base with its complementary base. [1]

(b) DNA sequencing is a method used to determine the order of the four bases in a strand of DNA. Recently, scientists in the UK gained the funding necessary to start sequencing the DNA of 100 000 people with cancer or a rare disease. The scientists are hoping that this will change the way these devastating diseases are diagnosed and allow for new drugs and therapies to be developed to treat these diseases.

The DNA sequencing project is also very important for the economy in the UK as it will create many new jobs. This will cost hundreds of millions of pounds. However, it is expected that around 400 000 NHS patients could benefit directly from the research. A big concern for anyone taking part in the research will be the way their personal information is used and whether it will be available to insurance companies and future employers.

(i) Using this information, give **one** advantage and **one** disadvantage to the individual taking part in the sequencing project.

Advantage _____

_____

Disadvantage _____

_____ [2]

(ii) Suggest why some patients who are extremely ill with cancer and rare diseases will choose to take experimental drugs even before they are licensed for use.

_____ [1]

In 1950 Erwin Chargaff discovered that although the arrangement of bases in DNA varied, there was always an equal amount of the bases which paired together.

Other scientists built on the work of Erwin Chargaff.

(c) Name the scientists who **next** built on this work and describe what they discovered about DNA.

Names _____ and _____

Discovery _____

_____ [2]

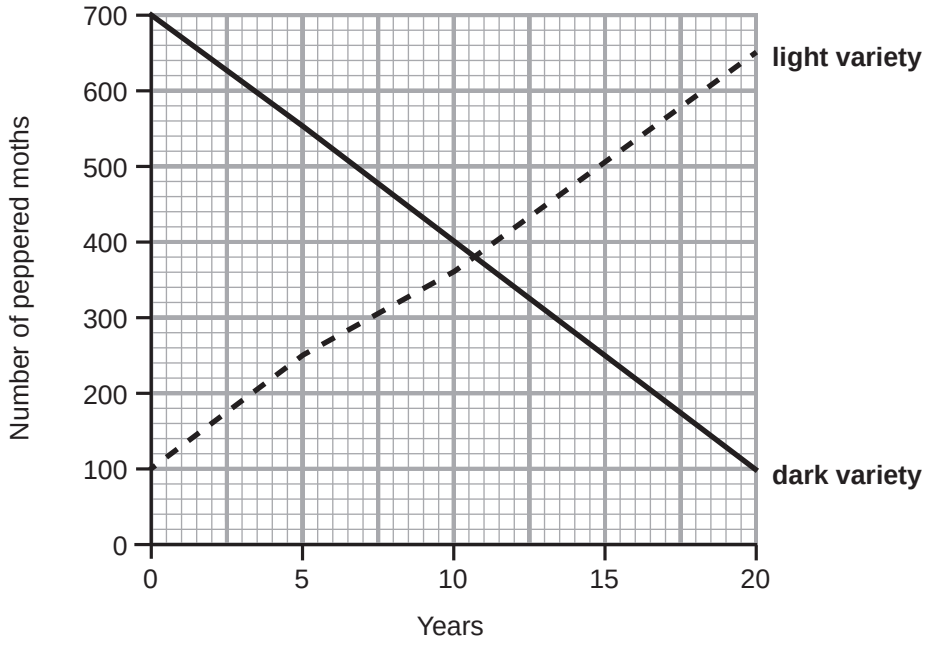
[Turn over

9 The peppered moth exists in two genetically distinct forms, the light and dark varieties as shown below.

Both types of moth spend a lot of time resting on tree trunks where they may be eaten by birds. Trees are easily blackened due to smoke (soot) pollution.

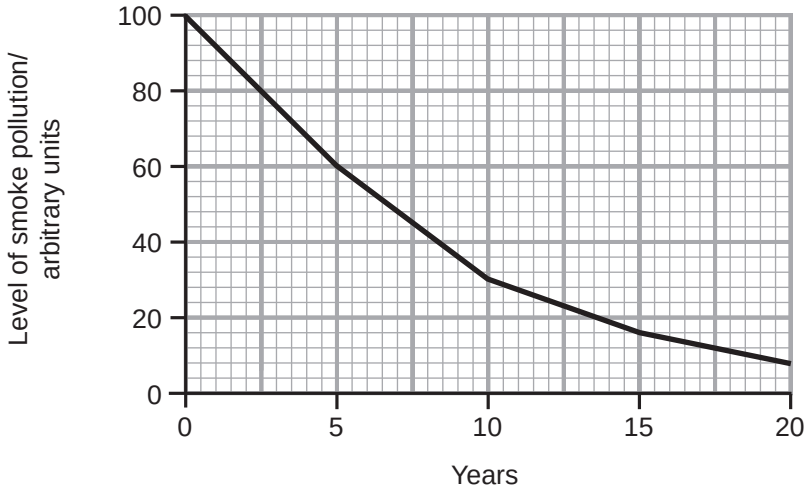
Graph 1 shows the number of each variety of peppered moth in a wood over 20 years.

Graph 1



Graph 2 shows the level of smoke pollution over the same period.

Graph 2



(a) Using all the information provided and your knowledge, describe and explain the change in the numbers of the dark variety of moth.

[3]

[Turn over

(b) Charles Darwin used the theory of natural selection to explain the process of evolution.

(i) Give **two** reasons why not everyone accepts the theory of evolution.

1. _____

_____

2. _____

_____ [2]

(ii) Explain fully what is meant by the term 'evolution'.

_____

_____

_____

_____ [2]

10 Describe and explain how Louis Pasteur showed that contamination of food is caused by microorganisms.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

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For Examiner's use only	
Question Number	Marks
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Examiner Number