Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Advanced

Unit 4: The Natural Environment and Species Survival

Tuesday 12 January 2016 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
WBI04/01

You must have:
Calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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1/1/3/1/

P 4 6 9 3 4 A 0 1 2 4

PEARSON

Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Bacitracin is an antibiotic. It is one of a group of polypeptide antibiotics.

Bacitracin is affective against many types of bacteria, especially those that cause skin infections.

(a) (i) Place a cross ☒ in the box next to the name of the monomer of a polypeptide.

(1)

☒ **A** amino acid

☒ **B** fatty acid

☒ **C** glycerol

☒ **D** nucleotide

(ii) Name the type of reaction that joins the monomers together in the formation of a polypeptide.

(1)

.....

(iii) Place a cross ☒ in the box next to the two parts of the monomers that are joined together in this reaction.

(1)

☒ **A** NH_2 group and COOH group

☒ **B** NH_2 group and NH_2 group

☒ **C** NH_2 group and OH group

☒ **D** NH_2 group and R group

(b) Antibiotics affect bacteria.

(i) Below are some statements about bacteria.

1 Bacteria are eukaryotic organisms

2 Bacteria contain ribosomes

3 Bacteria have cellulose cell walls

4 Bacteria contain DNA and RNA

Place a cross ☒ in the box next to the correct pair of statements about bacteria.

(1)

☒ **A** 1 and 2

☒ **B** 1 and 3

☒ **C** 2 and 4

☒ **D** 3 and 4

(ii) Place a cross ☒ in the box next to the correct description of how antibiotics work.

(1)

☒ **A** antibiotics activate B cells

☒ **B** antibiotics join several bacteria together

☒ **C** antibiotics kill or prevent the growth of bacteria

☒ **D** antibiotics stimulate phagocytosis by macrophages

(c) Suggest how bacitracin is given to a patient with a skin infection.

Give a reason for your answer.

(2)

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.....

(d) State **two** ways in which hospital codes of practice have influenced the prescription of antibiotics.

(2)

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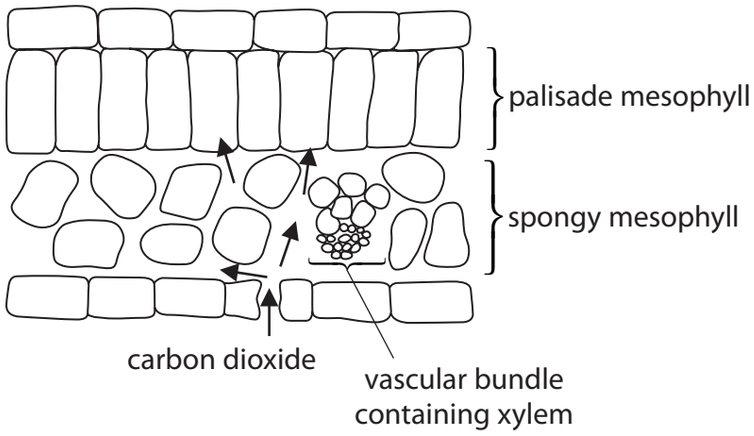
(Total for Question 1 = 9 marks)

2 The diagram below shows some of the tissues in a leaf.



(a) State what is meant by the term **tissue**.

(1)

(b) Spongy mesophyll is a site of gas exchange. The arrows on the diagram show the direction of movement of carbon dioxide during the day.

Using the information in the diagram and your own knowledge of the properties of gas exchange surfaces, suggest how spongy mesophyll is adapted for gas exchange.

(4)

(c) Photosynthesis takes place in palisade mesophyll.

Describe what happens to the carbon dioxide that enters this tissue.

(4)

(d) Xylem transports ions and water molecules to the leaf.

Describe the roles of these ions and water molecules in photosynthesis.

(3)

(Total for Question 2 = 12 marks)

3 Vitamin C is important for the body's defences against infection.

(a) Upper respiratory tract infections (URTIs) are caused by viruses.

A study was carried out to investigate the effect of vitamin C on the body's protection against URTIs.

One group of people was given vitamin C. Another group was given a placebo.

The table below shows the results of this study.

Group	Number of people in each group	Total number of URTIs in each group	Number of people in each group who developed an URTI	Mean duration of each URTI / days	Mean number of symptoms per group
Given vitamin C	23	14	10	2.5	16.1
Given a placebo	25	12	8	4.2	37.4

(i) Explain why one group was given a placebo.

(2)

(ii) Using the data in the table, describe the effects of vitamin C on URTIs.

(3)

(iii) Comment on the reliability of the data shown in this table.

(3)

*(b) The table below shows some effects of vitamin C on the body's defences against infection.

Defences against infection	Effects of vitamin C
Phagocytes	Improved chemotaxis (movement towards a chemical), phagocytosis and killing mechanism
B and T lymphocytes	Faster cell division
Interferon	Increased production

Using the information in the table and your own knowledge, suggest how vitamin C could help to protect people from URTIs.

(6)

(Total for Question 3 = 14 marks)

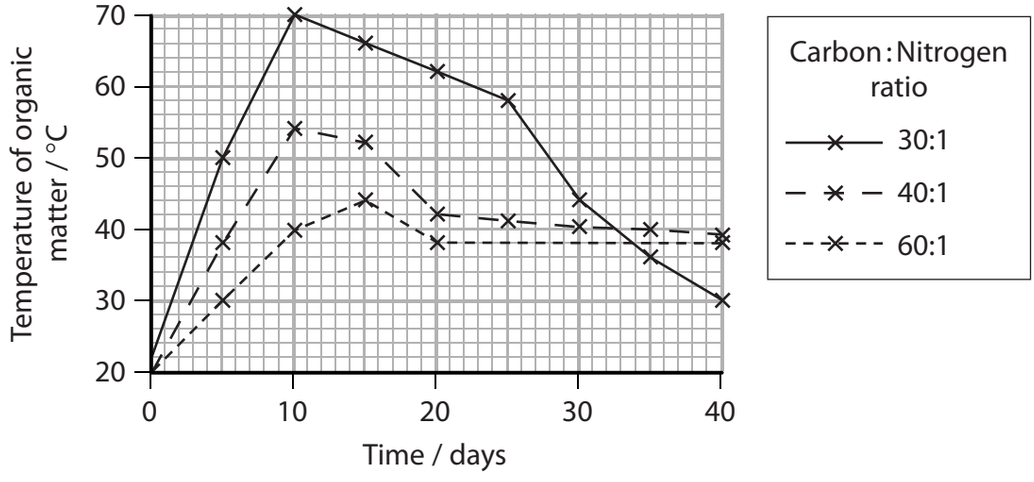
4 The decomposition of organic matter is affected by the presence of the elements carbon and nitrogen.

The carbon : nitrogen ratio represents the relative proportions of these elements present in organic matter.

The effect of three different carbon : nitrogen ratios, 30 : 1, 40 : 1 and 60 : 1, on the decomposition of organic matter was studied.

The extent of decomposition was monitored by measuring the temperature of the organic matter for 40 days.

The graph below shows the results of this study.



(a) Using the information in the graph, describe the effect of the carbon : nitrogen ratio on decomposition.

(2)

(b) Suggest why the temperature changed during this study.

(3)

(c) (i) Describe the importance of nitrogen in the decomposition of organic matter.

(2)

(ii) Suggest how the carbon : nitrogen ratio affects decomposition.

(2)

(Total for Question 4 = 9 marks)

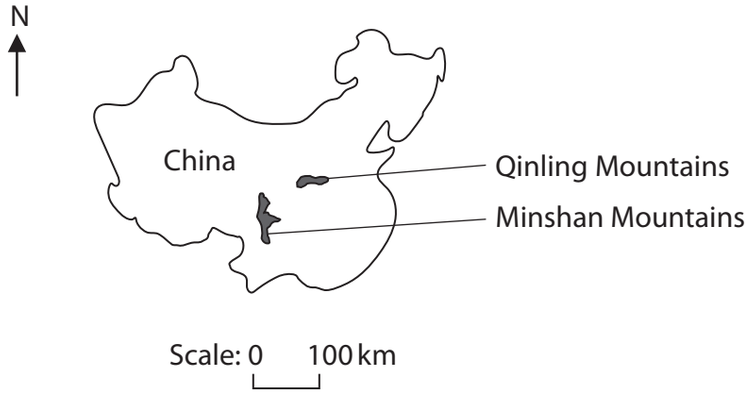
5 The photograph below shows a giant panda.

Magnification $\times 0.03$

The giant panda is an endangered species of bear, native to China.

Giant pandas were once found throughout the lowland forests of southeast China.

Now they are found only in isolated patches of forest in the mountains. The majority of giant pandas are found in the Minshan Mountains, the rest are in the Qinling Mountains, which are shown in the map below.



(a) Suggest why the giant panda has become endangered.

(2)

(b) The giant pandas in the Qinling Mountains are a subspecies.

Subspecies of giant pandas can still interbreed to produce fertile offspring but they have some differences in their phenotypes.

Suggest how a subspecies of giant panda evolved in the Qinling Mountains.

(4)

(c) Estimates vary of the number of giant pandas left in the wild.

Analysis of DNA found in giant panda faeces has shown that there may be more giant pandas than previously estimated.

(i) Suggest how this DNA could be prepared for analysis by gel electrophoresis.

(4)

(ii) Explain how the results of this DNA analysis can be used to estimate the number of giant pandas in the wild.

(3)

(Total for Question 5 = 13 marks)

6 Yellowstone National Park is situated in North America.

There were no wolves in this National Park after 1943. As a result, the population of elk increased. The elk had a disastrous effect on plant species, due to overgrazing.

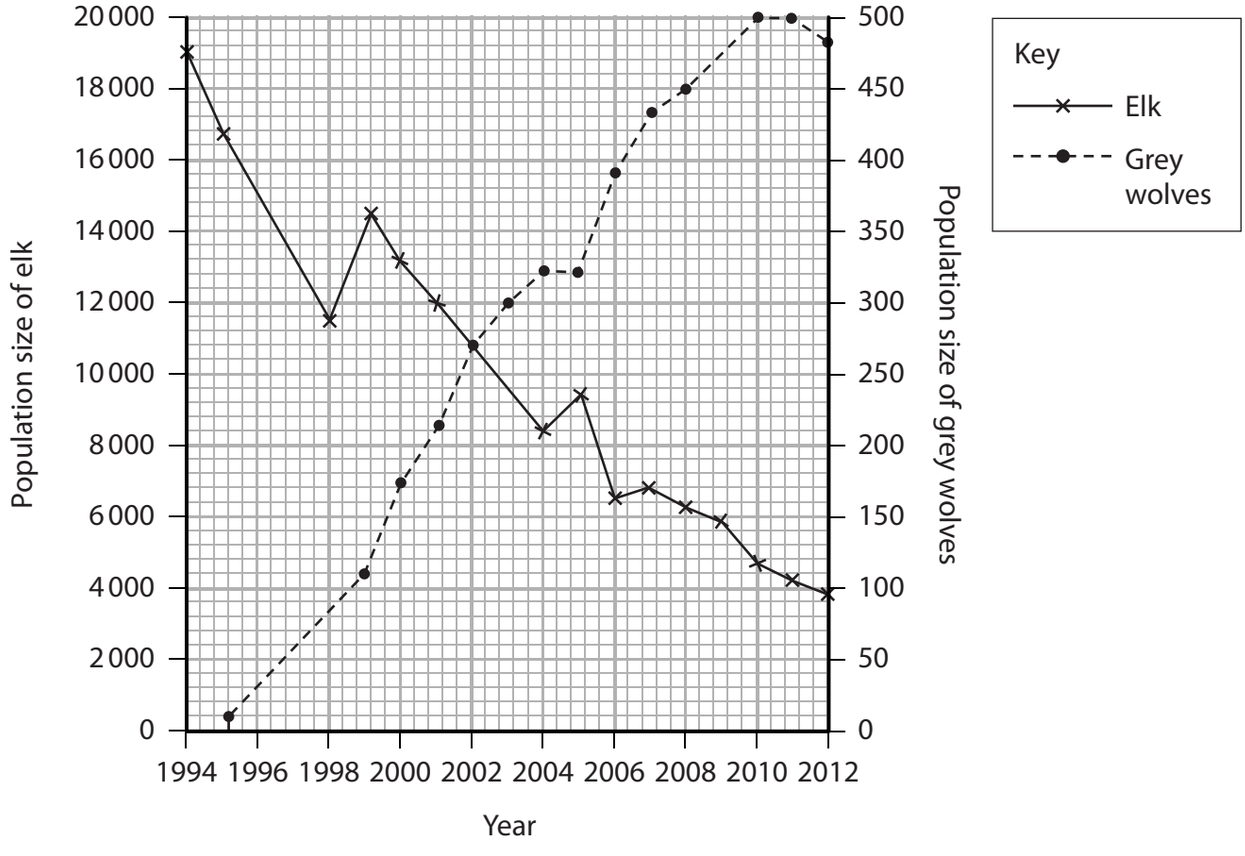
The photographs below show a grey wolf and an elk.

Magnification ×0.05

Magnification ×0.02

In 1995, the grey wolf was reintroduced into Yellowstone National Park. Grey wolves hunt in packs. Elk are the main prey of these wolves in Yellowstone National Park.

(a) The graph below shows the population sizes of elk and grey wolves in Yellowstone National Park since 1994.



(i) Using the information in the graph, describe the overall changes in the population sizes of elk and grey wolves between 1995 and 2010.

Give explanations for these overall changes.

(3)

(ii) Suggest **two** reasons for the decrease in the population of grey wolves between 2011 and 2012.

(2)

(b) (i) Explain why, since 1995, the areas of forest in Yellowstone National Park have increased.

(3)

(ii) Suggest how the populations of other animals in Yellowstone National Park might be affected by the reintroduction of the grey wolves.

Give explanations for your answer.

(4)

(Total for Question 6 = 12 marks)

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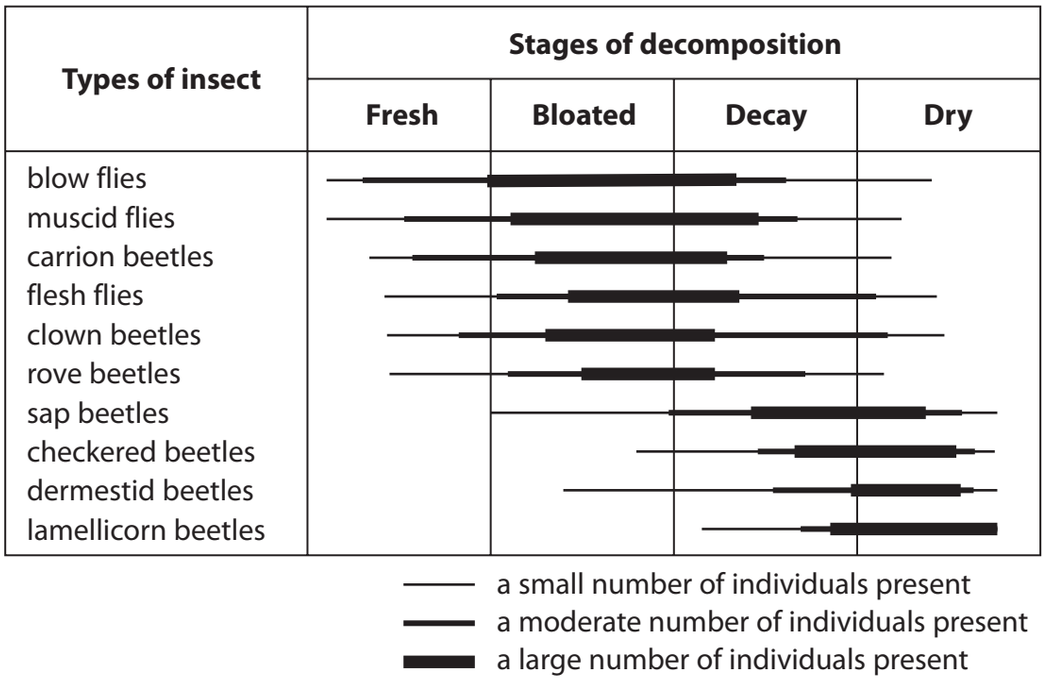
7 The time of death of a mammal can be estimated using a number of methods.

There are changes in the numbers and types of insects found on the body of a decomposing mammal.

These changes are shown below.



(a) Place a cross ☒ in the box next to the term that describes these changes in the types of insect on a dead mammal.

(1)

☒ **A** dendrochronology

☒ **B** pathology

☒ **C** rigor mortis

☒ **D** succession

(b) Place a cross ☒ in the box next to the term for studying insects on a dead mammal.

(1)

☒ **A** dendrochronology

☒ **B** forensic entomology

☒ **C** proteomics

☒ **D** succession

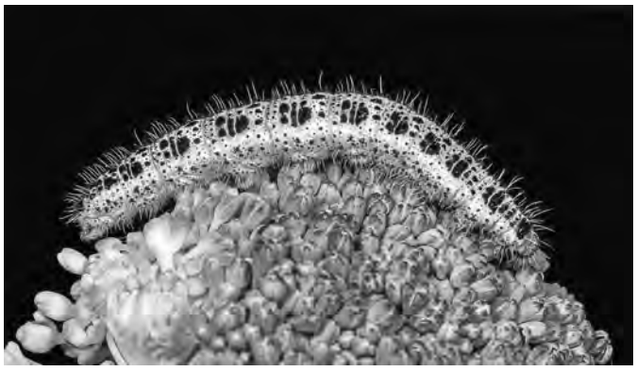
*(c) Explain how additional information about the insects and the body can be used to determine the time of death of this mammal.

(6)

(Total for Question 7 = 8 marks)

8 The Large White butterfly, *Pieris brassicae*, lays eggs on the leaves of plants such as cabbages and cauliflowers. The eggs hatch into caterpillars. The caterpillars then eat the leaves of the plants. Birds eat the caterpillars.

The photograph below shows this caterpillar.



Magnification $\times 2.0$

(a) An investigation was carried out to compare the growth rate of caterpillars feeding on cabbages with the growth rate of caterpillars feeding on cauliflowers.

Twenty eggs were placed on a cabbage and twenty eggs were placed on a cauliflower.

(i) Place a cross ☒ in the box next to the reason for using twenty eggs on each plant.

(1)

☒ **A** to find a correlation

☒ **B** to get a range of values for the independent variable

☒ **C** to make the investigation accurate

☒ **D** to produce reliable data

(ii) State **two** variables, other than the food source, that should be controlled in this investigation.

(2)

.....

.....

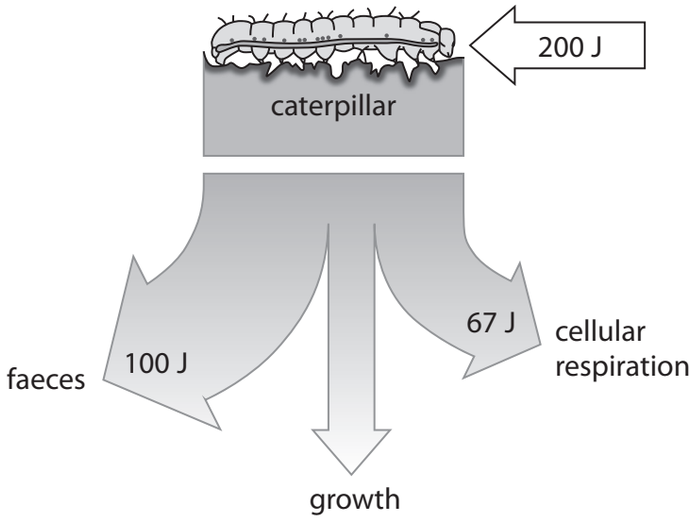
(iii) Describe how the growth rates of the caterpillars could be determined in this investigation.

(4)

(iv) Suggest why the food source of the caterpillars could affect their growth rate.

(3)

(b) The diagram below shows what happens to 200 J of energy eaten by a caterpillar.



Calculate the percentage of this energy available to any bird that eats this caterpillar.

Show your working.

(3)

Answer ..... %

(Total for Question 8 = 13 marks)

TOTAL FOR QUESTION PAPER = 90 MARKS