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

Monday 8 June 2015 – 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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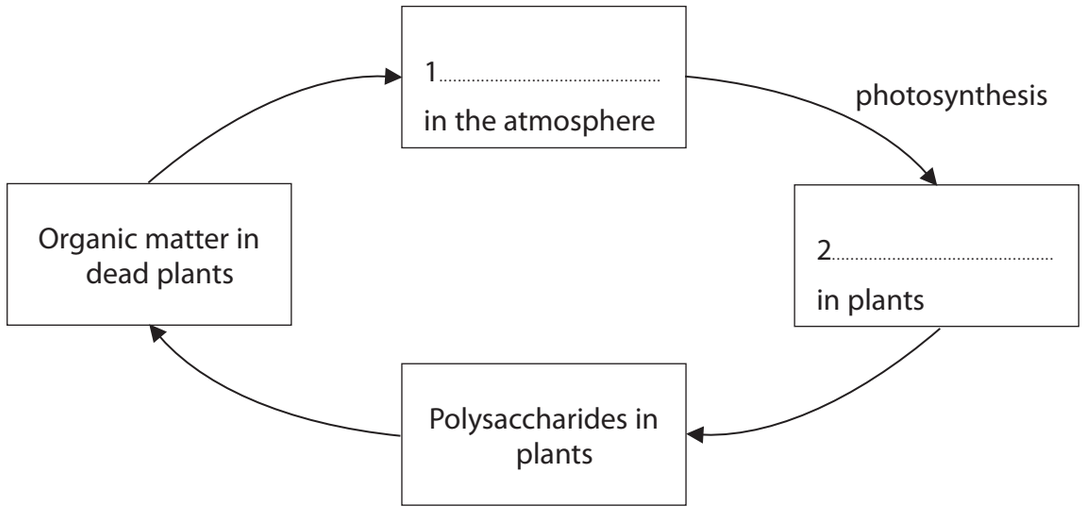
P 4 4 8 7 1 A 0 1 2 4

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 The diagram below shows part of the carbon cycle.



(a) Complete the diagram, by writing the appropriate word or words on the dotted lines.

(2)

(b) Explain the role of light in the photosynthesis stage of this cycle.

(5)

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(c) (i) Place a cross ☒ in the box next to the polysaccharides found in plants.

(1)

☒ **A** cellulose and glycogen

☒ **B** cellulose and starch

☒ **C** glycogen and starch

☒ **D** cellulose, glycogen and starch

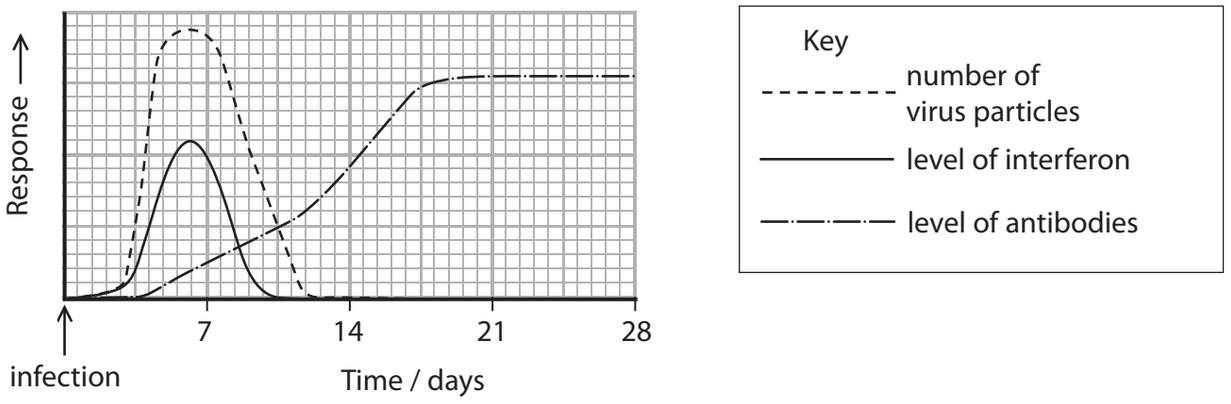
(ii) Describe how the carbon in these polysaccharides is returned to the atmosphere.

(4)

(Total for Question 1 = 12 marks)

2 The human body responds to a virus infection by producing interferon and antibodies.

The graph below shows the change in the number of virus particles, the level of interferon and the level of antibodies in a person in the weeks following an infection.



(a) Describe the structure of a virus.

(3)

(b) (i) Explain why there is a delay, following this infection, before the number of virus particles increases.

(2)

(ii) Explain the change in the number of virus particles from day 1 to day 5.

(2)

(c) Describe the role of interferon.

(2)

(d) Explain why there is a delay before the level of antibodies starts to rise.

(4)

(Total for Question 2 = 13 marks)

3 Lake Vesijärvi in Finland became polluted a few years ago. This resulted in the lake becoming overpopulated with cyanobacteria.

Large numbers of cyanobacteria make the water very green and cloudy.

(a) Cyanobacteria are photosynthetic, prokaryotic organisms. Cyanobacteria are classified in the domain Bacteria.

(i) Name **one** other domain.

(1)

.....

(ii) Put a cross ☒ in the box next to the term that completes the following statement.

Organisms can be classified as belonging to these domains using

(1)

☒ **A** dendrochronology

☒ **B** forensic entomology

☒ **C** molecular phylogeny

☒ **D** topography

(iii) Place a cross ☒ in the box next to the structures found in cyanobacteria.

(1)

☒ **A** chloroplasts, large (80S) ribosomes, nucleus

☒ **B** chloroplasts, small (70S) ribosomes, loop of DNA

☒ **C** large (80S) ribosomes, loop of DNA

☒ **D** small (70S) ribosomes, loop of DNA

(iv) Suggest why very green, cloudy water could be a problem for the organisms in Lake Vesijärvi.

(2)

(b) Scientists can alter the abundance of organisms in a habitat by removing or introducing organisms. This is called biomanipulation.

The effect of the pollution in Lake Vesijärvi was reversed by removing 80% of the roach from the lake. Other fish that eat roach were introduced into Lake Vesijärvi.

Roach are fish that eat zooplankton. Zooplankton eat cyanobacteria.

As a result of this biomanipulation, the water in Lake Vesijärvi became clear.

Explain why the water became clear.

(4)

(Total for Question 3 = 9 marks)

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4 Evolution can come about as a result of a change in the structure of DNA.

(a) The questions below refer to the structure of DNA.

(i) Put a cross ☒ in the box next to the term that completes the following statement.

Each DNA strand consists of mononucleotides joined together by bonds between

(1)

☒ **A** one deoxyribose sugar and one phosphate group

☒ **B** one ribose sugar and one phosphate group

☒ **C** two bases

☒ **D** two pentose sugars

(ii) Put a cross ☒ in the box next to the term that completes the following statement.

The mononucleotides in one DNA strand are joined together by

(1)

☒ **A** glycosidic bonds

☒ **B** hydrogen bonds

☒ **C** peptide bonds

☒ **D** phosphodiester bonds

(iii) The table below shows the percentages of bases in a sample of DNA.

Put **one** cross ☒ in the appropriate box, in each row, to show the percentage of bases in a sample of DNA that has 33% thymine.

(3)

Base	0%	17%	33%	34%
Adenine	☒	☒	☒	☒
Cytosine	☒	☒	☒	☒
Uracil	☒	☒	☒	☒

(b) There are two species of rhinoceros in Africa. The white rhinoceros and the black rhinoceros evolved from a common ancestor.

The photographs below show a white rhinoceros and a black rhinoceros.

©Tony Camacho/Science Photo Library

White rhinoceros

©Tony Camacho/Science Photo Library

Black rhinoceros

The white rhinoceros feeds on grasses. It has a shoulder height of 1.5 m to 1.8 m and has broad flat lips.

The black rhinoceros eats the leaves of shrubs. It has a shoulder height of 1.4 m to 1.7 m and has a pointed mouth.

(i) Calculate how many times bigger the white rhinoceros is than the black rhinoceros.

(2)

Answer .....

(ii) Suggest how these two species of rhinoceros evolved from their common ancestor.

(4)

(iii) Suggest why both species of rhinoceros can be found in the same region in Africa.

(2)

(Total for Question 4 = 13 marks)

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5 Gut flora help to protect the body from infection.

(a) (i) Explain the meaning of the term **infection**.

(2)

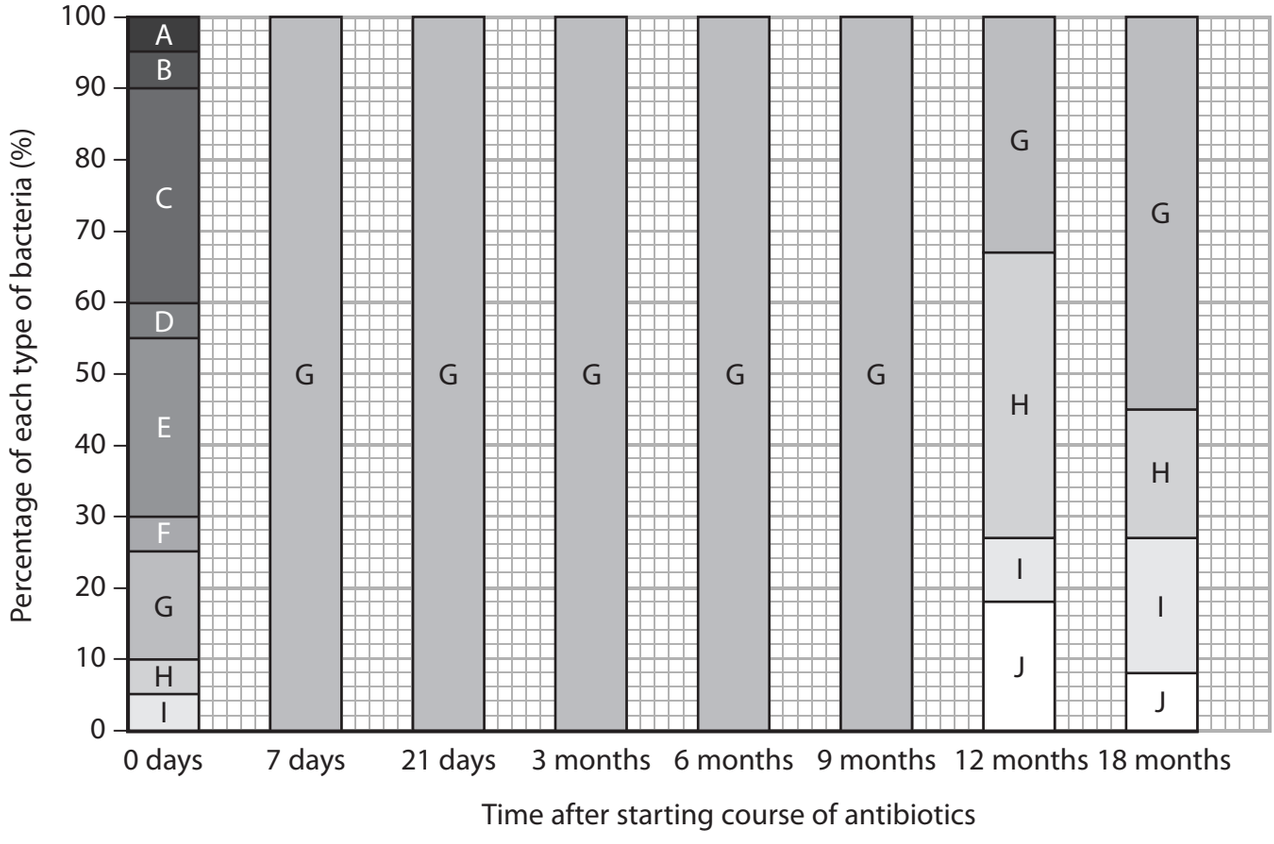
(ii) Explain how gut flora protect the body from infection.

(3)

(b) The diversity of the gut flora of a person was recorded. This person then took a course of antibiotics for seven days.

The percentage of each type of bacteria in the gut flora was recorded for a period of 18 months.

Each type of bacteria is represented by a different letter in the chart below.



(i) Explain the meaning of the term **antibiotic**.

(2)

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*(ii) Using the information in the graph, describe the effect of this course of antibiotics on the diversity of gut flora. Suggest explanations for this effect.

(6)

(Total for Question 5 = 13 marks)

6 Mount St. Helens is a volcanic mountain in the USA. The volcano erupted in 1980 and the mudflow and ash destroyed the surrounding countryside.

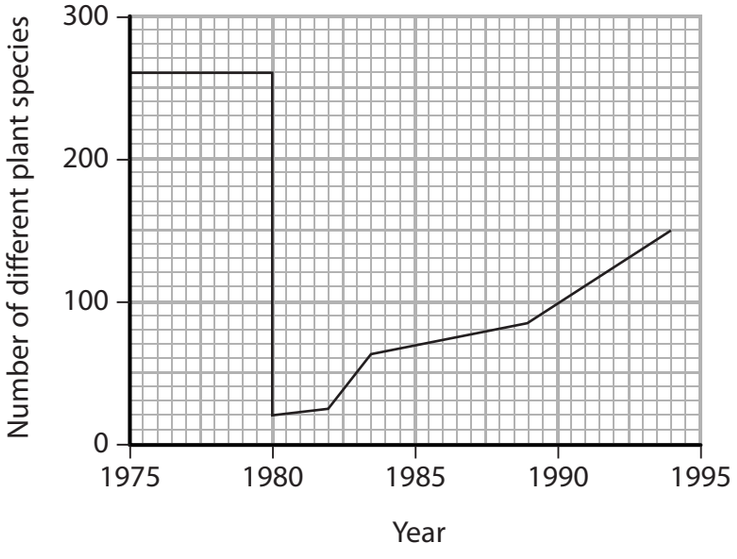
(a) The photographs below show Mount St. Helens before the eruption, the surrounding area after the eruption and 14 years later.

Mount St. Helens before the eruption

Surrounding area after the eruption

Surrounding area 14 years after the eruption

The graph below shows the number of different species of plants in the Mount St. Helens area before and after the eruption.



(i) Put a cross ☒ in the box next to the term that completes the following sentence.

The increase in the number of different plant species in the Mount St. Helens area following the eruption is an example of

(1)

☒ **A** deforestation

☒ **B** evolution

☒ **C** natural selection

☒ **D** succession

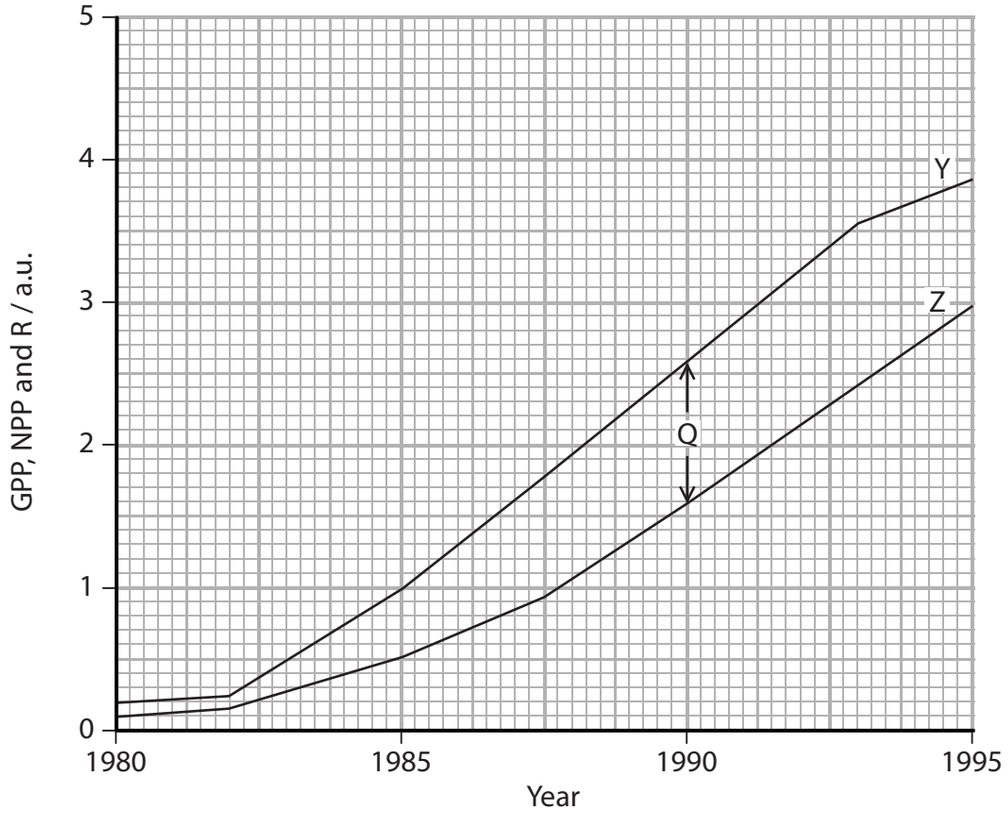
(ii) Using the information in the photographs and the graph, explain the changes in the number of different plant species in the Mount St. Helens area.

(4)

(iii) Suggest how further changes in the Mount St. Helens area could lead to the development of a climax community.

(3)

(b) The graph below represents the changes in gross primary productivity (GPP), net primary productivity (NPP) and plant respiration (R) in the Mount St. Helens area following the eruption.



Put a cross ☒ in the box next to the values represented by the lines Y and Z and the value Q.

(1)

☒ **A** line Y is NPP, line Z is GPP, Q is R

☒ **B** line Y is NPP, line Z is R, Q is GPP

☒ **C** line Y is GPP, line Z is NPP, Q is R

☒ **D** line Y is GPP, line Z is R, Q is NPP

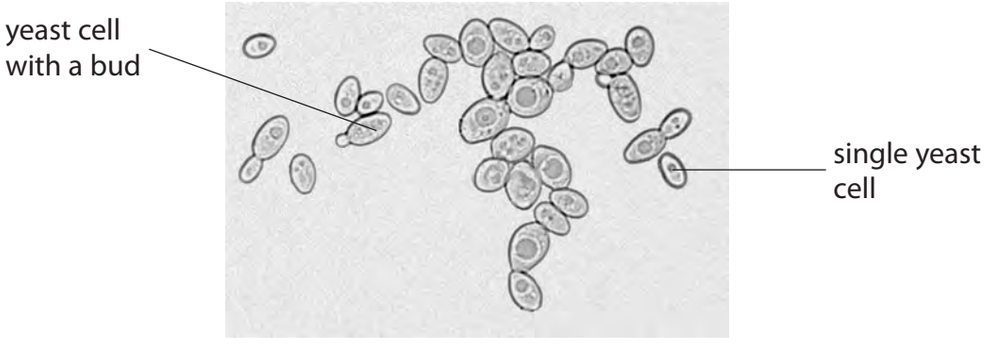
(Total for Question 6 = 9 marks)

7 Yeast is a single-celled fungus. It can reproduce asexually by a process called budding.

When the bud is big enough it separates from the original yeast cell.

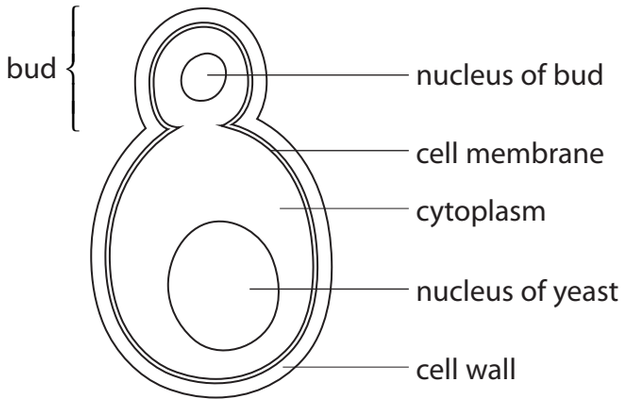
Yeast can be grown in a culture containing all the nutrients needed for growth. Small samples of the culture can be removed and the yeast observed using a light microscope.

The photograph below shows yeast budding, as seen using a light microscope.



Magnification ×1000

The diagram below shows a yeast cell with a bud.



(a) Suggest how the properties of the cell membrane enable the yeast cell to form a bud.

(3)

(b) Explain the role of the cell cycle in yeast budding.

(4)

*(c) Temperature affects the rate of asexual reproduction in yeast.

Suggest an investigation that could be carried out to study the effects of temperature on the rate of asexual reproduction in yeast.

(5)

(Total for Question 7 = 12 marks)

8 Infection with Human Immunodeficiency Virus (HIV) increases the risk of developing tuberculosis (TB). Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis*.

(a) The table below shows the results of a survey of patients who had TB in 2008 and in 2010.

It shows the number of patients with TB who believed that they were HIV negative and the number of patients who knew that they were HIV positive.

Year	Number of patients with TB × 10^3	
	HIV negative	HIV positive
2008	600	800
2010	1600	500

(i) Using the information in the table, calculate the percentage of patients with TB in 2008 who were HIV positive. Show your working.

(2)

Answer ..... %

(ii) Describe how the proportion of patients who were HIV positive in 2008 compares with the proportion of patients who were HIV positive in 2010.

(2)

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(iii) The actual numbers of these patients who are HIV positive may be higher than the numbers in the table. Suggest **two** reasons for this.

(2)

(b) Treating patients with TB is a problem because *Mycobacterium tuberculosis* is resistant to a number of antibiotics.

Give **three** ways in which hospital codes of practice can reduce the rate at which antibiotic resistance is increasing.

(3)

(Total for Question 8 = 9 marks)

TOTAL FOR PAPER = 90 MARKS

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