Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Advanced Subsidiary
Unit 2: Development, Plants and the Environment

Monday 2 June 2014 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
WBI02/01

You must have:
Ruler

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 80.
- 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.*
- Candidates may use a calculator.

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 2 9 2 1 A 0 1 2 4

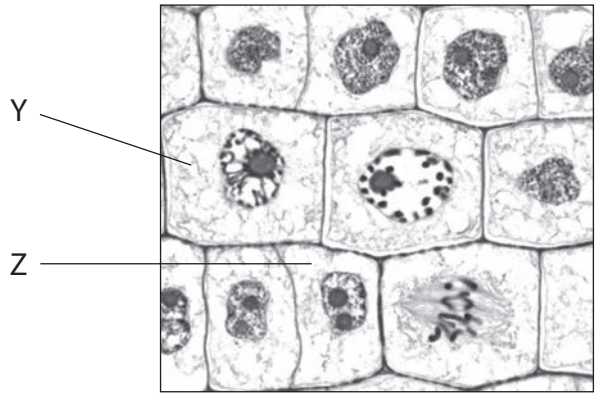
PEARSON

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 Growth and reproduction in flowering plants involve mitosis and meiosis.

(a) The photograph below shows cells of an onion root undergoing mitosis.



Magnification ×250

Place a cross ☒ in the box that completes each of the following statements.

(i) The stage of mitosis shown by the cell labelled Y is

(1)

☒ **A** anaphase

☒ **B** metaphase

☒ **C** prophase

☒ **D** telophase

(ii) The stage of mitosis shown by the cell labelled Z is

(1)

☒ **A** anaphase

☒ **B** metaphase

☒ **C** prophase

☒ **D** telophase

(iii) A root tip squash is used to observe cells undergoing mitosis.
To soften or macerate the tissue before staining the cells, the root tips may be placed in

(1)

- ☒ **A** ethanol
- ☒ **B** hydrochloric acid
- ☒ **C** propanone
- ☒ **D** sodium hydroxide

(b) Cells divide by meiosis to produce pollen inside the anthers of flowers.

Explain how meiosis causes genetic variation in the gametes.

(4)

(c) Describe the process of double fertilisation in flowering plants.

(2)

(Total for Question 1 = 9 marks)

2 Living organisms can be classified into groups according to their shared characteristics. Woese suggested that all living organisms can be placed into one of three groups: the Archaea, the Bacteria or the Eukaryota.

(a) Place a cross ☒ in the box that completes each of the following statements.

(i) The term introduced by Woese to describe each of the three groups, Archaea, Bacteria and Eukaryota is

(1)

☒ **A** class

☒ **B** domain

☒ **C** kingdom

☒ **D** phylum

(ii) The technique Woese used to classify organisms is

(1)

☒ **A** molecular genealogy

☒ **B** molecular phenology

☒ **C** molecular phylogeny

☒ **D** molecular taxonomy

(iii) Prokaryotic organisms are found in

(1)

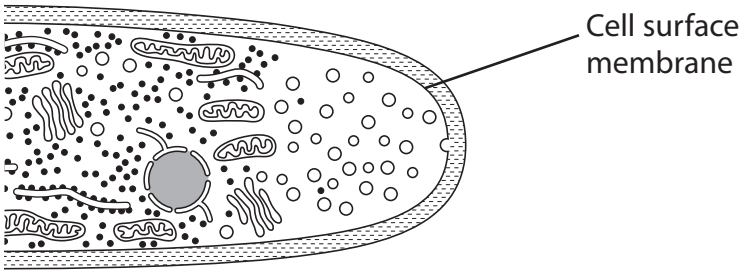
☒ **A** all three groups

☒ **B** two of the groups

☒ **C** one of the groups

☒ **D** none of the groups

(b) The diagram below shows the growing tip of a fungus. This is called a hypha.



(i) Using information in the diagram and your own knowledge, explain why Fungi are classified as belonging to the Eukaryota and not the Bacteria.

(2)

*(ii) Fungi feed by secreting digestive enzymes, which are synthesised at ribosomes.

Suggest how the structures shown in the diagram are involved in the processing and secretion of these enzymes.

(5)

(iii) Some of the enzymes produced by fungi can digest the cellulose in plant cell walls.

Describe the structure of cellulose in plant cell walls.

(3)

(Total for Question 2 = 13 marks)

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3 Height in humans is partly due to polygenic inheritance. Height in humans is an example of continuous variation.

(a) Explain what is meant by the term **polygenic inheritance**.

(2)

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(b) The table below shows the mean heights of adult men in Northern and Southern Europe from 1955 to 1980.

Year	Mean height of adult men / m	
	Northern Europe	Southern Europe
1955	1.78	1.72
1960	1.78	1.73
1965	1.79	1.74
1970	1.79	1.74
1975	1.79	1.76
1980	1.80	1.76

(i) The percentage change in mean height of adult men in Northern Europe from 1955 to 1980 is 1.12%.

Using the information in the table, calculate the percentage change in mean height of adult men in Southern Europe from 1955 to 1980. Show your working.

(3)

..... (%)

(ii) Using the information in the table, compare the changes in mean height of men from Northern Europe with those from Southern Europe between 1955 and 1980.

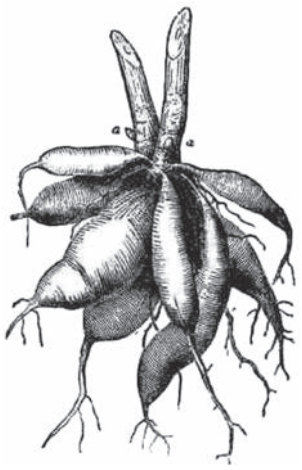
(3)

(iii) Suggest an explanation for the difference in height between the men from Northern and Southern Europe.

(2)

(Total for Question 3 = 10 marks)

4 The diagram below shows the roots of a sweet potato plant. These roots are harvested as a source of starch.



(a) Place a cross ☒ in the box that completes the following statement.

The organelle in which starch is stored is the

(1)

☒ **A** amyloplast

☒ **B** starch grain

☒ **C** starch vesicle

☒ **D** tonoplast

(b) Starch can be converted into biofuel. Varieties of sweet potato are being developed for biofuel production.

Suggest why this use of sweet potatoes is an example of a sustainable resource.

(2)

(c) In an investigation, three different levels of nitrate fertiliser were added to fields of sweet potato plants.

The table below shows the results of this investigation on the mass of roots produced in tonnes per hectare (tonnes ha^{-1}).

Nitrate fertiliser / kg ha^{-1}	Mass of roots produced / tonnes ha^{-1}
0	11.00
30	12.30
60	11.60
90	11.55

(i) Suggest why sweet potato plants need nitrate ions.

(2)

(ii) 'The optimum level of nitrate fertiliser for sweet potatoes is 30 kg per hectare.'

Suggest reasons why this statement may **not** be valid.

(3)

(d) Describe the structure of the plant tissue that transports nitrate ions from the roots to the stems of plants.

(2)

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(Total for Question 4 = 10 marks)

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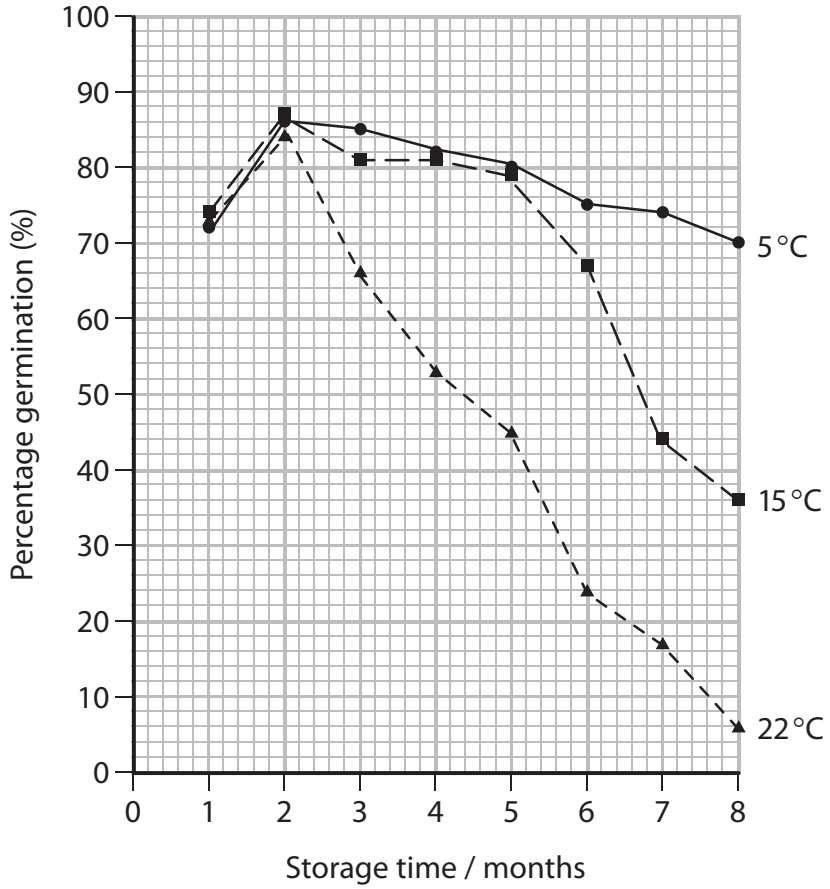
5 *Croton macrostachyus* is a tree found in many countries of western Africa. Seeds of this species were collected for storage in a seed bank.

An investigation was carried out to determine the optimum storage temperature for these seeds.

Seeds were stored at 5 °C, 15 °C and 22 °C for eight months. Samples of seed were germinated every month and the percentages of seeds that germinated were recorded.

The graph below shows the results of this investigation.



(a) (i) Using the information in the graph, describe the effect of storage time on percentage germination of seeds stored at 5 °C.

(2)

(ii) Using the information in the graph, describe the effect of storage temperature on the percentage germination of the stored seeds.

(2)

(b) Explain why seeds are dried before they are stored in a seed bank.

(2)

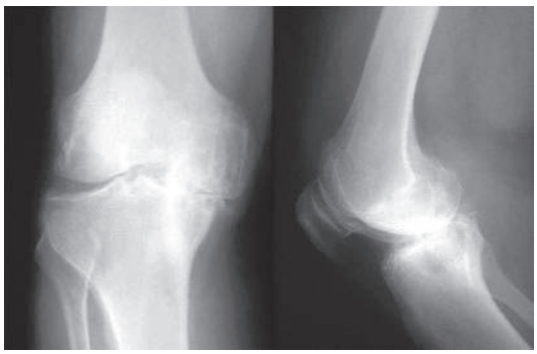
(c) Describe how seed banks could conserve the genetic diversity of endangered species.

(2)

(Total for Question 5 = 8 marks)

6 The photograph below shows X-ray images of knee joints with damaged tissue.

Scientists have used adult stem cells to repair damaged knee joints.



Magnification ×0.35

(a) Describe the properties of stem cells that enable them to repair the damaged tissues.

(2)

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(b) State **two** possible sources of stem cells.

(2)

1 .....

2 .....

(c) Describe the risks that may arise from the use of stem cells donated by other adults.

(2)

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*(d) Explain how adult stem cells can be used to produce the specialised cells needed to repair damaged knee joints.

(4)

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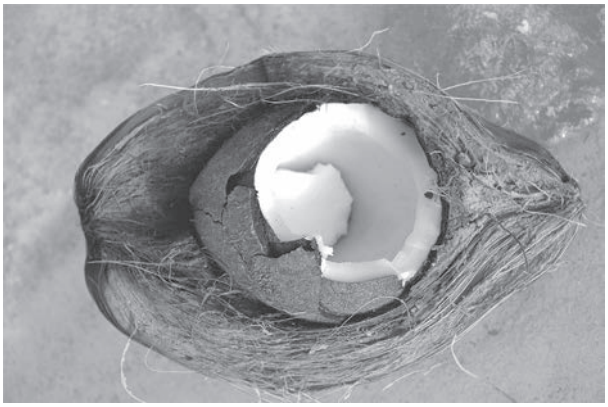
(Total for Question 6 = 10 marks)

7 The photograph below shows a coconut and the husk that surrounds it. The husk is made of coir fibres. There are two types of coir fibre: white fibre and brown fibre.



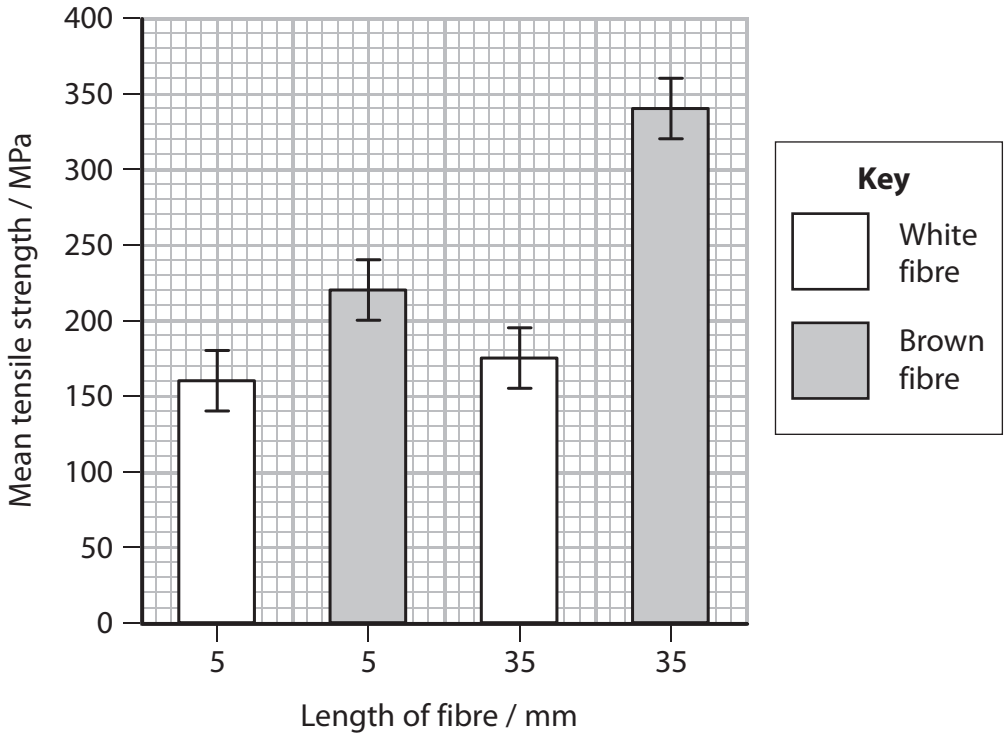
Magnification ×0.2

(a) Suggest how a valid investigation could be carried out to produce reliable data to compare the tensile strength of white fibres and brown fibres.

(4)

(b) The tensile strength of both white fibres and brown fibres was tested using fibres 5 mm and 35 mm long.

The results for the mean tensile strength of these fibres are shown in the graph below.



(i) Place a cross ☒ in the box next to the conclusion that can be drawn from the results shown in this graph.

(1)

☒ **A** Short fibres are always stronger than long fibres.

☒ **B** Long fibres are always stronger than short fibres.

☒ **C** White fibres are always stronger than brown fibres.

☒ **D** Brown fibres are always stronger than white fibres.

(ii) 'The length of the fibre has no significant effect on the tensile strength of the fibre.'

Explain how the information in the graph supports the statement.

(3)

(Total for Question 7 = 8 marks)

8 The photograph below shows a Tasmanian devil (*Sarcophilus harrisii*). This species is found in the wild only on the Australian island of Tasmania. This island is 240 km south of mainland Australia.

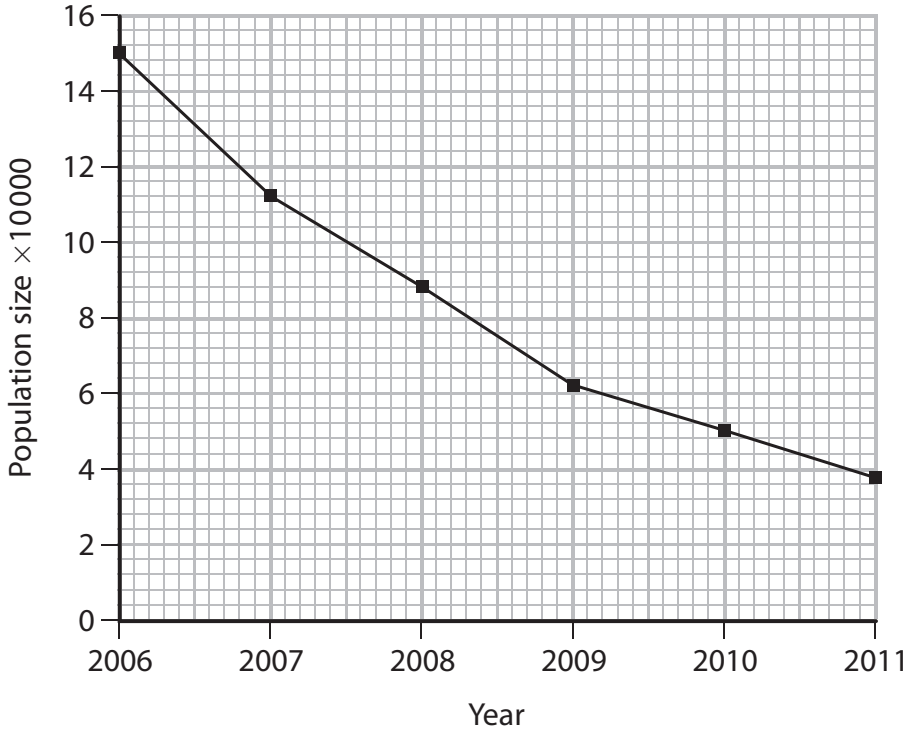
They feed by scavenging, eating the bodies of dead animals. They have very strong jaws and teeth for biting through fur, skin and bones. They feed mainly at night.

Magnification ×0.1

(a) Using the Tasmanian devil as an example, explain what is meant by the term **niche**.

(2)

(b) In 1995, there were almost 250 000 Tasmanian devils in the wild.
The graph below shows the population size of Tasmanian devils from 2006 to 2011.



Using the information in the graph, suggest what might happen to the population of Tasmanian devils in the wild after 2011.

(2)

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(c) The genetic diversity of the Tasmanian devil is one of the lowest of any known species of mammal.

(i) State what is meant by the term **genetic diversity**.

(1)

(ii) The Tasmanian devil is threatened by a contagious disease known as Devil Facial Tumour Disease (DFTD). This disease was first observed in 1996.

The disease is spread when the Tasmanian devils fight over food and bite each other.

Suggest how a low genetic diversity could affect the chances of survival of the Tasmanian devil as a species.

(3)

(iii) Six female Tasmanian devils have been found with immunity to DFTD.
A captive breeding programme has been set up using these six females.

Suggest how this captive breeding programme could lead to the development of a population able to survive this disease in the wild.

(4)

(Total for Question 8 = 12 marks)

TOTAL FOR PAPER = 80 MARKS