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 1 June 2015 – 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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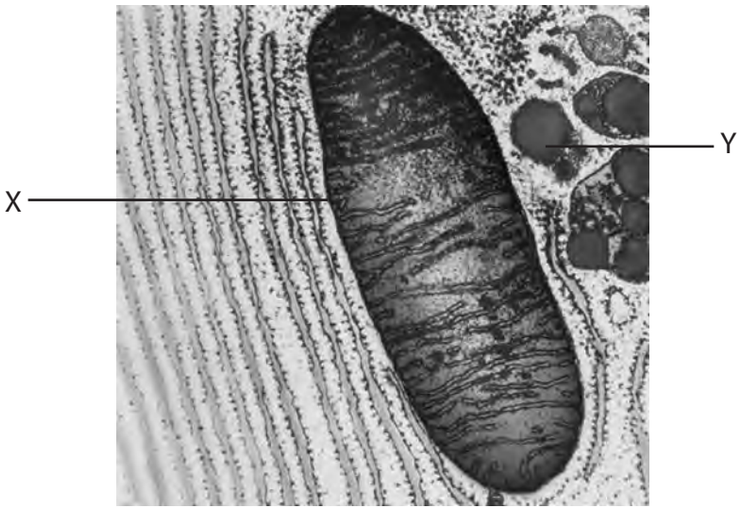
P 4 4 8 7 0 A 0 1 2 4

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 photograph below shows part of a cell from the pancreas of a bat, as seen using an electron microscope.



Magnification ×15 000

(a) Place a cross ☒ in the box next to the correct word or words to complete the following statement.

(i) The organelle labelled X is

(1)

☒ **A** an amyloplast

☒ **B** a chloroplast

☒ **C** a mitochondrion

☒ **D** a nucleus

(ii) Label the rough endoplasmic reticulum with the letter **R**.

(1)

(b) Inside the pancreas are cells that secrete proteins.

(i) Suggest the role of the rough endoplasmic reticulum in the transport of proteins within the pancreas cell.

(3)

(ii) The structure labelled **Y** in the photograph is a secretory vesicle that contains protein.

Describe the role of this vesicle in the cell.

(2)

(Total for Question 1 = 7 marks)

2 The root tip squash is a method used to observe mitosis in the cells of plant roots.

(a) The following statements describe features that can be seen in a cell during mitosis.

Place a cross ☒ in the box next to the correct word or words to complete each of the following statements.

(i) During mitosis, the chromosomes become visible as pairs of chromatids held together by

(1)

☒ **A** centrioles

☒ **B** centromeres

☒ **C** chromatin

☒ **D** spindle fibres

(ii) The chromatids are separated and pulled to opposite poles of the cell during

(1)

☒ **A** anaphase

☒ **B** metaphase

☒ **C** prophase

☒ **D** telophase

(iii) The nucleoli reappear during

(1)

☒ **A** anaphase

☒ **B** metaphase

☒ **C** prophase

☒ **D** telophase

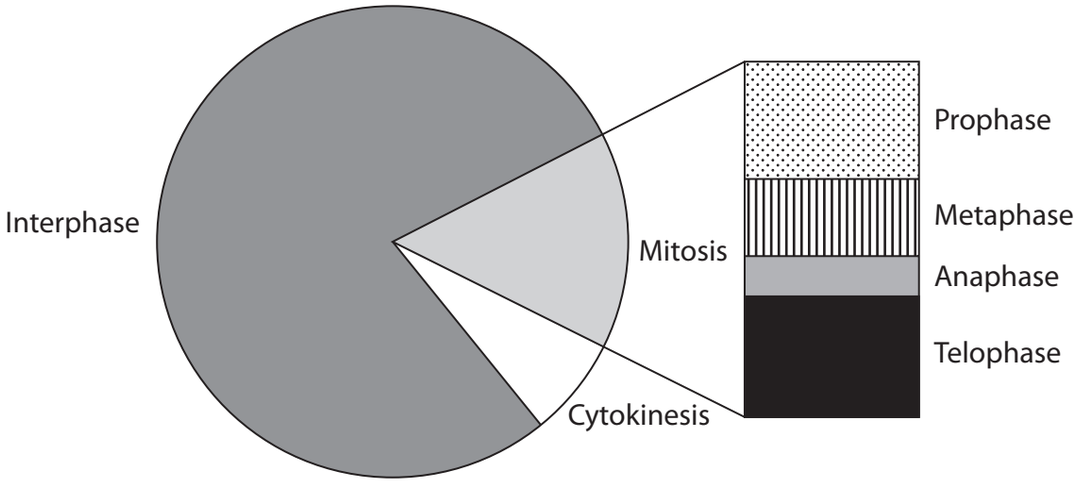
(b) Describe how to prepare a root tip squash so that chromosomes can be seen.

(4)

(c) A root tip squash was prepared and then observed using a microscope.

The number of cells at each stage of the cell cycle was counted.

The diagram below shows the proportion of cells observed at each stage of the cell cycle.



Using information in the diagram, suggest which stage of the cell cycle is the one least likely to be observed.

Give an explanation for your answer.

(3)

(Total for Question 2 = 10 marks)

3 Packaging materials can be made from plastics produced from oil or bioplastics. Bioplastics are made from either starch or cellulose.

(a) Starch and cellulose are both polysaccharides found in plants.

(i) The table below lists features of polysaccharides.

Complete the table by placing a cross in the appropriate box (☒) to indicate if each feature is present in cellulose, starch or both.

(4)

Feature	Cellulose only	Starch only	Both starch and cellulose
Polymer of α-glucose	☒	☒	☒
Polymer of β-glucose	☒	☒	☒
Contains 1,4-glycosidic bonds	☒	☒	☒
Contains 1,6-glycosidic bonds	☒	☒	☒

(ii) Describe how the structure of starch is related to its function in plants.

(4)

(b) The photograph below shows a bioplastic wrapper made from starch.

Suggest the advantages of using bioplastic wrappers instead of plastic wrappers made from oil.

(3)

(Total for Question 3 = 11 marks)

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4 The antimicrobial properties of a range of herb and spice plants were investigated.

Extracts were made from fresh leaves of basil, lemon balm, rosemary and thyme plants. An extract was also made from dried cloves.

The photograph below shows cloves, which are unopened flower buds.

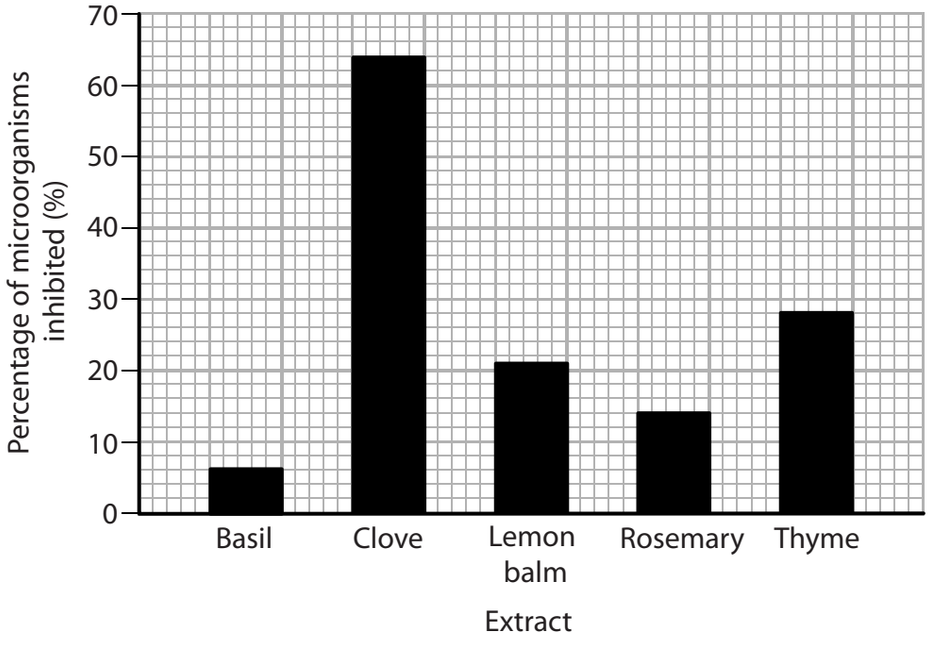
Magnification ×1.0

The extracts were made using ethanol as a solvent.

The extracts were tested on cultures of 14 different microorganisms, including bacteria and yeasts.

If the extract inhibited the growth of the microorganism it was classified as effective.

The graph below shows the effectiveness of each extract expressed as a percentage of all the microorganisms tested.



*(a) (i) Suggest how this investigation could have been carried out to produce reliable data.

(5)

(ii) Using the information in the graph, compare the effectiveness of these extracts.

(2)

(b) The microorganisms that the extracts were tested on included bacteria and yeasts. Yeasts are eukaryotic single-celled organisms.

Compare the structure of a bacterial cell with a yeast cell.

(4)

(Total for Question 4 = 11 marks)

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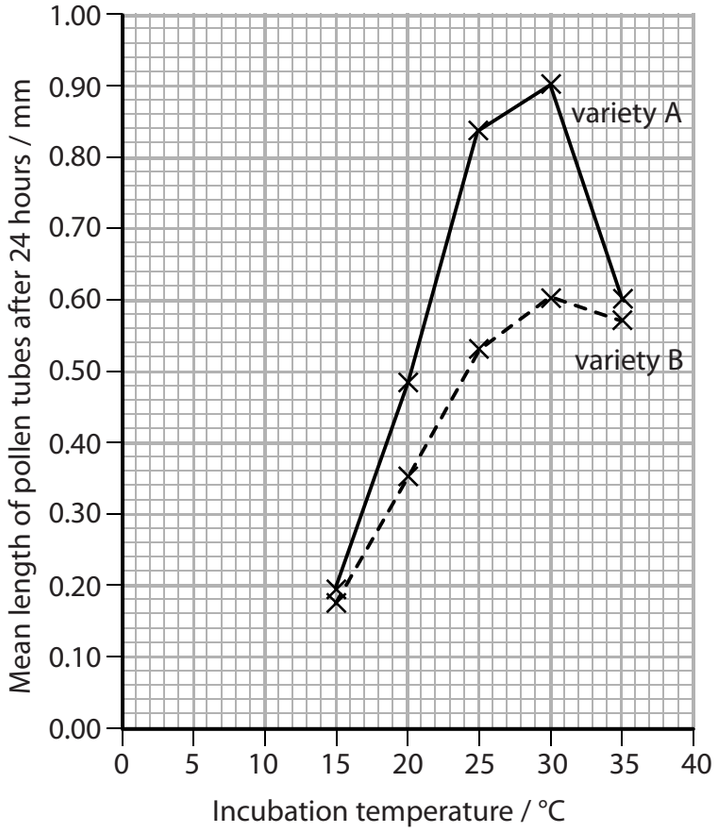
5 An investigation was carried out into the effect of temperature on pollen tube growth. Pollen grains from two different varieties of cotton plants were used, variety **A** and variety **B**.

Twenty pollen grains from variety **A** were placed in a solution of sucrose and incubated for 24 hours at 15 °C.

The lengths of the pollen tubes were then measured. This was repeated at four more temperatures.

The investigation was then repeated for pollen grains from variety **B**.

The results are shown in the graph below.



(a) (i) Name the independent and dependent variables in this investigation.

(2)

Independent variable .....

Dependent variable .....

(ii) Calculate the percentage change in pollen tube length for variety **A** when the temperature was increased from 15 °C to 30 °C.

Show your working.

(3)

Answer .....%

(iii) Use the information in the graph to compare the effect of temperature on the growth of pollen tubes of variety **A** with variety **B**.

(3)

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(b) Describe the function of the pollen tube.

(2)

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(c) Pollen grains contain gametes.

Explain the role of meiosis in the production of gametes.

(3)

(Total for Question 5 = 13 marks)

6 The photograph below shows part of the Western Ghats, a range of mountains in the west of India. The Western Ghats have one of the highest levels of biodiversity in the world.

(a) (i) Describe how the biodiversity of the Western Ghats could be measured.

(2)

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(ii) Nearly 77% of the amphibians and 62% of the reptile species discovered in the Western Ghats are not found anywhere else.

State the term used to describe species that are found living in the wild in only one part of the world.

(1)

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*(b) The photograph below shows a lion-tailed macaque, a mammal found only in the Western Ghats.

Magnification ×0.1

The lion-tailed macaque is one of the most endangered species in the world. There are fewer than 2500 individuals remaining in the wild.

Many zoos in Europe and India are involved in captive breeding programmes and reintroduction programmes for this species.

Suggest how these programmes can help to conserve the lion-tailed macaque.

(5)

(Total for Question 6 = 8 marks)

7 Flax (*Linum usitatissimum*) is grown in many countries as sources of fibres used to make linen cloth.

The photograph below shows part of a fibre from a flax plant, as seen using an electron microscope.

Magnification ×1000

(a) Suggest the type of tissue that forms fibres in flax plants.

(1)

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(b) Flax fibres have a high tensile strength that makes them useful for making cloth.

(i) Describe what is meant by the **tensile strength** of fibres.

(1)

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(ii) The concentration of calcium ions affects the tensile strength of plant fibres.

Suggest why calcium ions affect the tensile strength of plant fibres.

(2)

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(c) An investigation was carried out into the effects of mineral ion concentrations on the size of fibres produced by flax plants.

Seedlings of flax plants were grown in different concentrations of mineral ions.

A control group of plants was grown in a standard mineral ion concentration.

This solution contained a low concentration of mineral ions.

Seedlings in group 1 were grown with no mineral ions. Seedlings in group 2 were grown with mineral ion concentrations five times greater than the control group.

After eight weeks, fibres were extracted from the plants. The diameter and thickness of the cell walls of the fibres were then measured.

The results are shown in the table below with standard deviations shown as ±.

Group	**Diameter of fibre / μm**	**Cell wall thickness / μm**
Control	44.1 ± 0.6	4.6 ± 0.4
1 – no mineral ions	71.4 ± 0.9	5.1 ± 0.3
2 – high mineral ion concentration	44.3 ± 0.7	7.6 ± 0.5

(i) Use the information in the table to describe the effects of mineral ions on the flax fibres.

(3)

(ii) It was found that the plants grown in group 2 contained more chlorophyll than the control group.

Suggest an explanation for the difference in chlorophyll content of these two groups.

(2)

(Total for Question 7 = 9 marks)

8 In 2014, a scientific paper was published claiming that mature white blood cells from mice could be reprogrammed to become stem cells.

The process involved applying stress to the cells. This included exposing them to acidic conditions or applying physical pressure on cell membranes.

It was claimed that the stem cells produced could give rise to all cell types, including placental cells.

(a) (i) Give the property that these stem cells appeared to possess.

(1)

(ii) Describe how cells become specialised.

(3)

(iii) Suggest why it is difficult for a specialised cell to be reprogrammed to become a stem cell.

(2)

(b) Critical evaluation of this paper by the scientific community did not fully support the conclusions. There were calls for the paper to be withdrawn.

Suggest how the process of critical evaluation failed to support the conclusions of this paper.

(3)

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(c) Stem cells are required for the development of medical therapies.

Suggest **two** applications of the use of stem cell therapy.

(2)

1 .....

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2 .....

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(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

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