Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Monday 15 October 2018

Morning (Time: 1 hour 30 minutes) | Paper Reference **WBI02/01**

Biology

Advanced Subsidiary

Unit 2: Development, Plants and the Environment

You must have:
Calculator, HB Pencil, 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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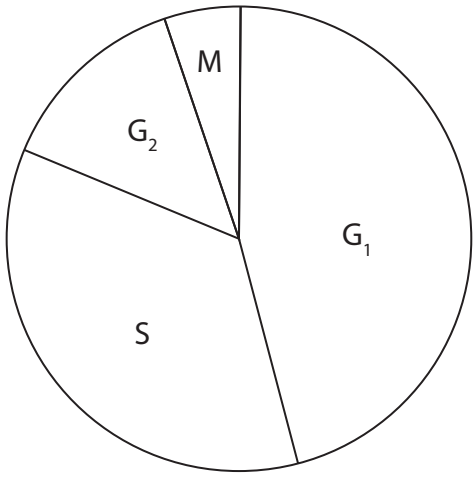
P 5 5 2 3 5 A 0 1 2 8

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 (a) The diagram below represents the cell cycle.



G_1, S and G_2 are phases of interphase.

(i) Put a cross ☒ in the box next to the duration of G_1 if interphase lasts 23 hours.

(1)

☒ **A** 300 minutes

☒ **B** 360 minutes

☒ **C** 660 minutes

☒ **D** 720 minutes

(ii) During the S phase, chromatids form.

Explain what is meant by the term chromatid.

(2)

(iii) During G_2, the cell prepares for mitosis and prophase begins.

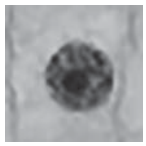
Put a cross ☒ in the box next to the appearance of a cell in prophase.

(1)

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(b) The stages of mitosis can be seen by preparing a root tip squash.

The list below gives some of the steps involved in preparing a root tip squash.
The steps are not listed in the correct order.

1. heat the root tip in acid
2. warm gently to intensify the stain
3. press down gently on the cells
4. cover with a glass coverslip
5. add the stain to the root tip
6. tease the cells apart

(i) Put a cross ☒ in the box next to the letter that shows the correct order for these steps.

(1)

☒ **A** 1, 5, 6, 4, 3, 2

☒ **B** 1, 6, 3, 4, 5, 2

☒ **C** 5, 2, 6, 1, 4, 3

☒ **D** 6, 1, 5, 4, 3, 2

(ii) Name a stain that could be used in this method.

(1)

.....

(Total for Question 1 = 6 marks)

2 Organisms can be grouped into domains.

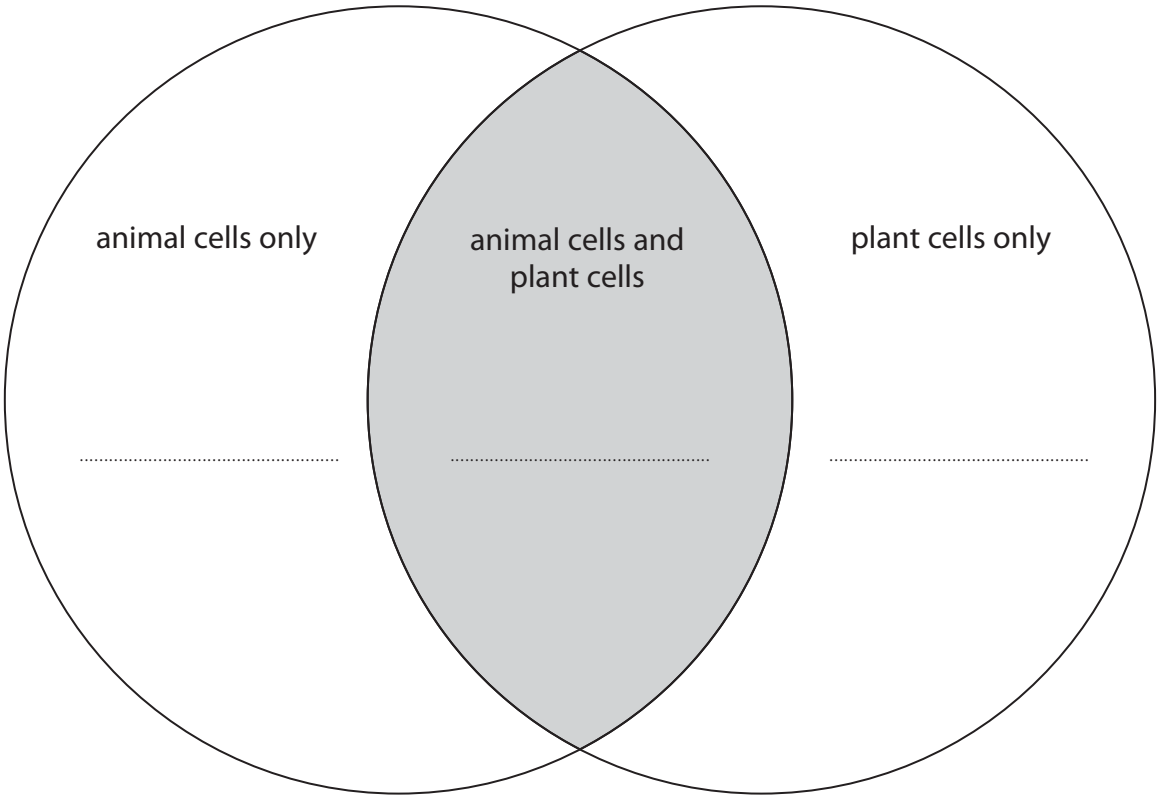
(a) Animals and plants belong to the domain Eukarya.

Some structures found in eukaryotic cells are found in both animals and plants. Other structures are found in either animal cells only or plant cells only.

A Venn diagram can be drawn to represent this information. Structures found in both animal and plant cells are written in the part of the diagram where the circles overlap.

Complete the Venn diagram below by writing the name of **one** structure in each part of the diagram.

(3)



(b) *Escherichia coli* belongs to the domain Bacteria. It is a prokaryotic cell.

Name **three** structures found in a prokaryotic cell but not in a eukaryotic cell.

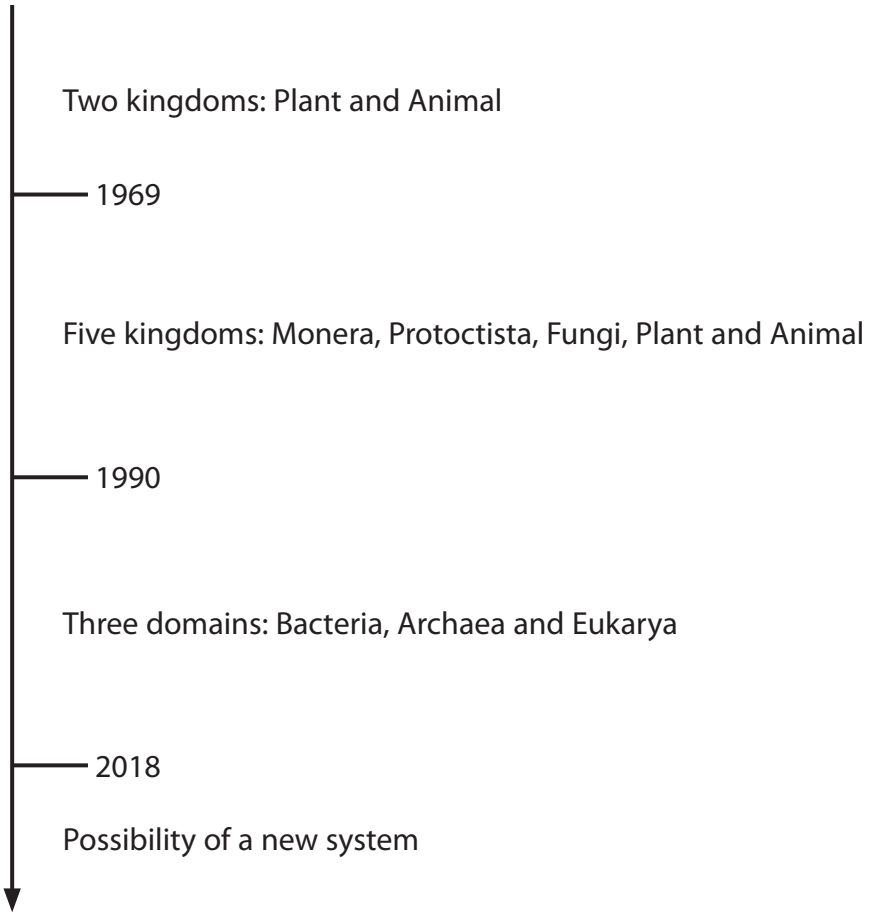
(3)

1 .....

2 .....

3 .....

(c) The timeline below shows how taxonomic groupings have changed.



Explain why the taxonomic groupings of living organisms have changed over the years and may continue to change.

(3)

(Total for Question 2 = 9 marks)

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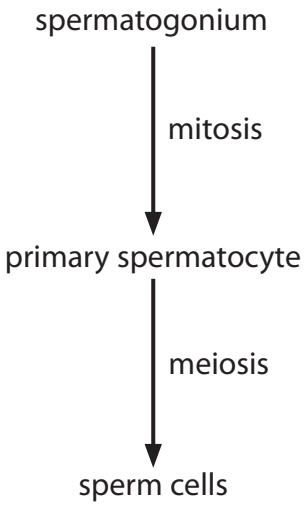
3 (a) The diagram below shows some of the stages in the production of sperm cells.



(i) A human spermatogonium has 46 chromosomes.

Put a cross ☒ in the box next to the row in the table that correctly shows the number of chromosomes in a primary spermatocyte and in a sperm cell.

(1)

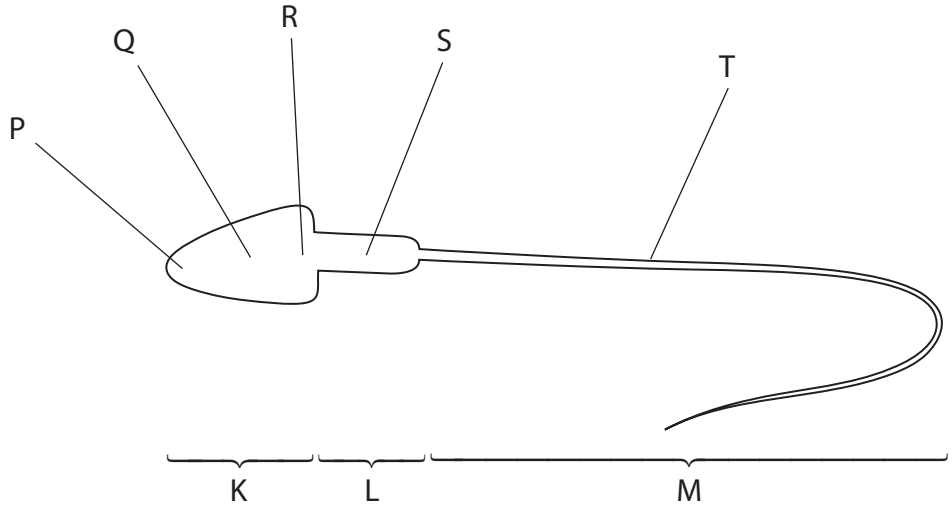
		Primary spermatocyte	Sperm cell
☒	**A**	23	23
☒	**B**	23	46
☒	**C**	46	23
☒	**D**	46	46

(ii) Primary spermatocytes are formed from a spermatogonium once there have been several divisions by mitosis.

Explain why several divisions of mitosis are involved in the production of sperm cells.

(2)

(b) The diagram below shows an outline of a sperm cell.



(i) Put a cross ☒ in the box next to the letter that shows the location of the acrosome.

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(ii) Put a cross ☒ in the box next to the letter that shows the location of the mitochondrion.

(1)

☒ **A** P

☒ **B** Q

☒ **C** S

☒ **D** T

(iii) The structure labelled K is 5 μm long.

The ratio of the length of structures K : L : M is 1.0 : 0.6 : 10.0.

Calculate the total length of a sperm cell.

Show your working.

(3)

.....μm

(Total for Question 3 = 8 marks)

4 Human skin colour is an example of polygenic inheritance.

The table below shows some information about human skin colour.

Human skin colour		Genotype
Description	**Numerical value**	
extremely dark	6	PP QQ RR
very dark	5	Pp QQ RR
dark	4	Pp Qq RR
intermediate	3	Pp Qq Rr
light	2	
very light	1	
extremely light	0	

(a) Complete the table to show a genotype of light, very light and extremely light skin colour.

(1)

(b) Using the information in the table, explain the meaning of each of the following terms.

(i) Polygenic inheritance

(2)

(ii) Phenotype

(2)

(iii) Continuous variation

(2)

(c) There is a negative correlation between skin colour and the risk of developing skin cancer as a result of exposure to ultraviolet light.

(i) State what is meant by the term negative correlation.

(1)

(ii) Suggest why skin cancer may result from an interaction between genotype and the environment.

(3)

(Total for Question 4 = 11 marks)

5 The table below shows four features of parenchyma, a tissue found in leaves.

Feature	Parenchyma	Xylem vessels
cell wall	cellulose	
cytoplasm	abundant	
vacuoles	large in size	
functions	1. starch storage 2. photosynthesis	1. 2.

(a) Complete the table to describe these features in xylem vessels.

(4)

(b) Explain why starch is a suitable storage molecule.

(3)

(c) Suggest why the cells in this parenchyma tissue depend on the functions of xylem vessels.

(3)

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(Total for Question 5 = 10 marks)

6 Conservation of rainforests is important because they have a very high biodiversity and some of the plants have medicinal uses.

The majority of the Amazon rainforest is located in Brazil.

(a) The rainforests of Brazil have a very high biodiversity.

Explain what is meant by the term **biodiversity**.

(2)

(b) A number of plants found in rainforests, in other parts of the world, are already known for their medicinal properties.

Little is known about the antimicrobial properties of plants in the rainforests of Brazil.

*(i) Describe how plants from these rainforests could be tested for their antimicrobial properties.

(5)

(ii) If some of these plants were found to have antimicrobial properties, they could be used to develop medicines for treating bacterial infections.

Describe what the next steps would be in the development of these medicines.

(4)

(c) Large areas of rainforest are being cut down. This is endangering a number of plants in the rainforests of Brazil.

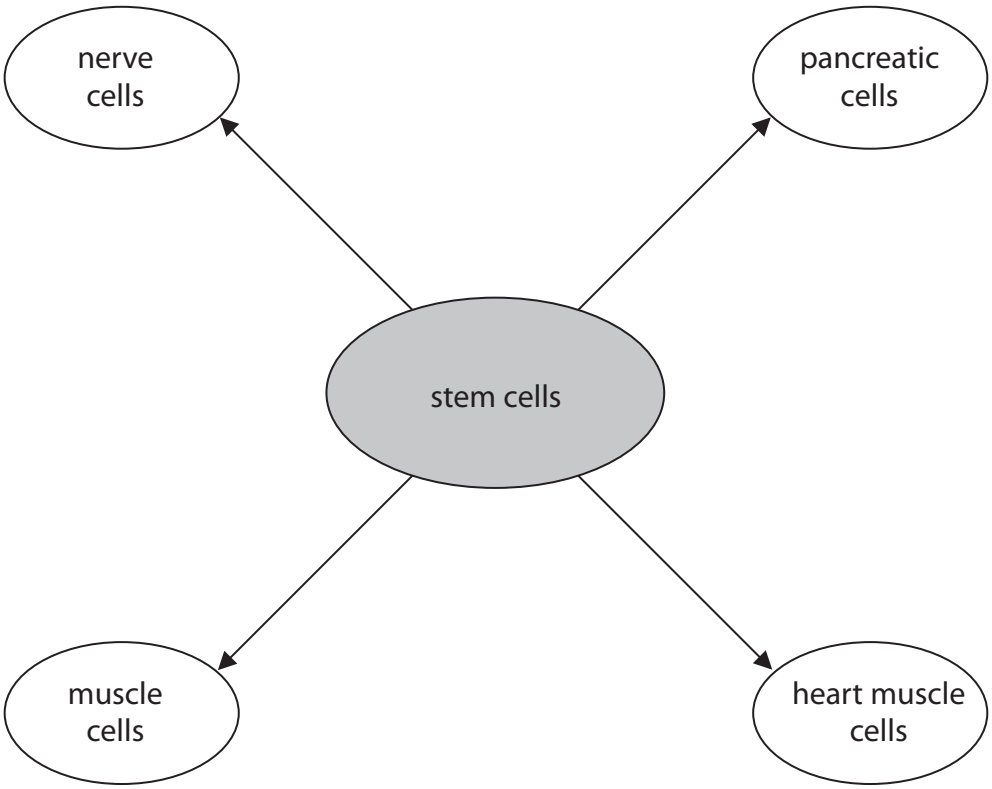
Describe **one** method that could be used to conserve endangered plant species.

(2)

(Total for Question 6 = 13 marks)

7 Stem cells have the potential to be used in the treatment of a number of diseases.

The diagram below shows some of the cells that have been made from stem cells.



The table below shows some proteins made by these cells.

Cells	Some proteins made by these cells	
nerve cells	ATP synthase	myelin basic protein
pancreatic cells	ATP synthase	insulin
heart muscle cells	ATP synthase	myosin
muscle cells	ATP synthase	myosin

(a) Compare stem cells that are totipotent with stem cells that are pluripotent.

(2)

*(b) Using the information in the diagram and the table, explain how the four different cell types are formed from the stem cells.

(6)

(c) Discuss how regulatory authorities control the use of embryonic stem cells in research.

(3)

(Total for Question 7 = 11 marks)

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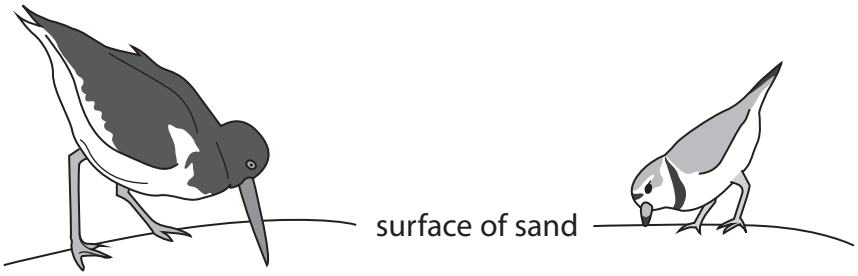
8 Wading birds are found along coasts. They walk through shallow sea water looking for food.

(a) The photographs below show two species of wading bird, an oystercatcher and a plover. Below each photograph is a diagram to show how each bird feeds.

Oystercatcher

Plover

Magnification ×0.2



(i) Put a cross ☒ in the box next to the row in the table that correctly identifies the types of adaptation shown by these birds.

(1)

		Walk in sea water	Have feathers
☒	**A**	anatomical	physiological
☒	**B**	behavioural	anatomical
☒	**C**	behavioural	physiological
☒	**D**	physiological	anatomical

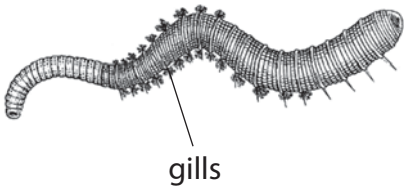
(ii) These two species of birds are found in the same habitat.

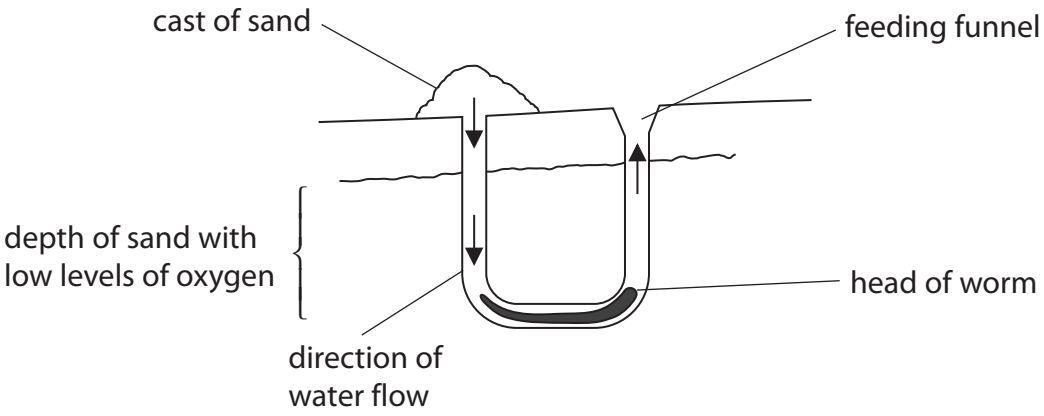
Using the information in the photographs and diagrams, explain why this is possible.

(3)

(b) Some wading birds feed on lugworms found on the coast.

Lugworms are approximately 12 cm long. They have external gills for gas exchange and live in U-shaped burrows in the sand, as shown in the diagrams below.

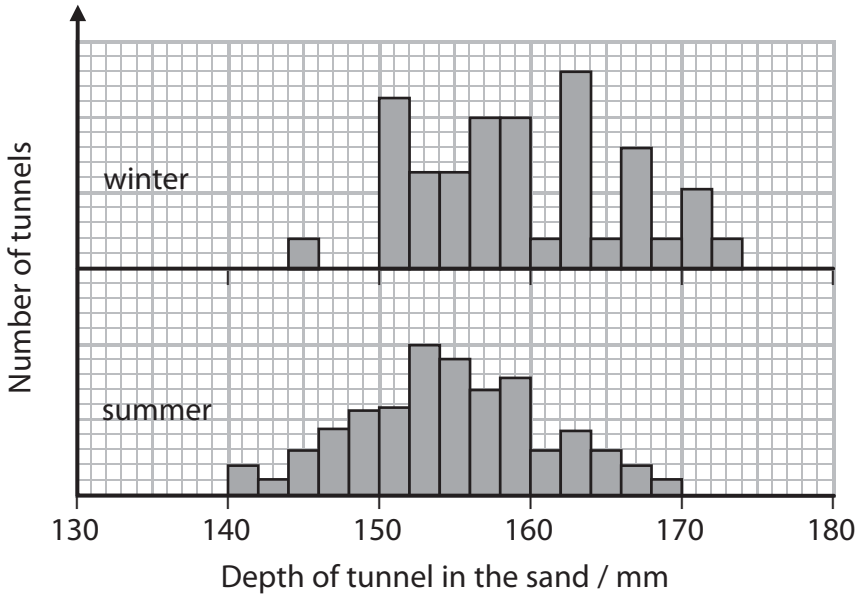




(i) Using the information in the diagrams, suggest why lugworms are able to live in the sand.

(3)

(ii) The graph below shows the number of tunnels of different depths in the sand at one location on the coast during the winter and the summer.



Using the information in the graph, compare the data for the tunnels in the winter with that for the tunnels in the summer.

(2)

(iii) Godwits are large wading birds with long beaks. These birds visit this location in the winter.

Later in the winter:

- some of the godwits change their diet
- some of the godwits fly to different locations.

Suggest why some godwits change their diet and some godwits fly to other locations.

(3)

(Total for Question 8 = 12 marks)

TOTAL FOR PAPER = 80 MARKS