Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Friday 24 May 2019

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 6 1 4 3 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 The structure of a plant cell depends on the function of that cell.

(a) State **one** difference between the function of sclerenchyma fibres and the function of xylem vessels.

(1)

.....

.....

(b) The table below shows some features of plant cells.

For each feature, put **one** cross ☒ in the appropriate box, in each row, to show whether the feature is found in the cells of sclerenchyma fibres and xylem vessels, sclerenchyma fibres only, xylem vessels only or not found in either.

(4)

Feature	Sclerenchyma fibres and xylem vessels	Sclerenchyma fibres only	Xylem vessels only	Not found in either sclerenchyma fibres or xylem vessels
absence of end walls between adjacent cells	☒	☒	☒	☒
cell membrane	☒	☒	☒	☒
lignified cell wall	☒	☒	☒	☒
pits	☒	☒	☒	☒

(Total for Question 1 = 5 marks)

2 The stomach is involved in the digestion of protein.

The lining of the stomach is formed from a number of different types of cell.

Chief cells are one type of cell in the lining of the stomach.

These cells produce a protein called pepsinogen, which is released into the stomach.

(a) Explain the meaning of the term **cell**.

(2)

(b) Explain the role of each of the following organelles in chief cells.

(i) Rough endoplasmic reticulum (rER)

(2)

(ii) Golgi apparatus

(2)

(c) Gastric stem cells are also present in the lining of the stomach.

These stem cells are responsible for renewing the cells in the lining of the stomach.

Give **two** differences between gastric stem cells and chief cells.

(2)

1 .....

.....

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2 .....

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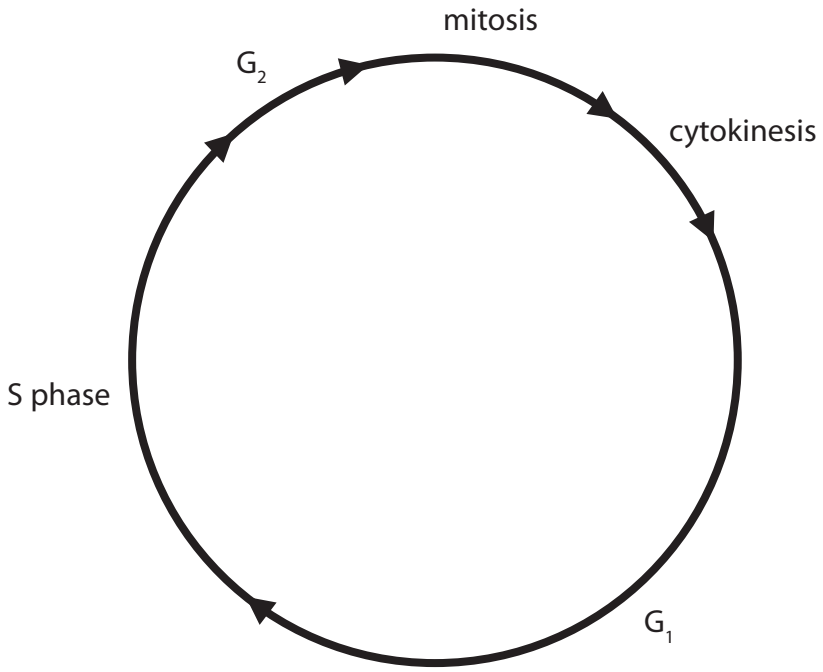
(Total for Question 2 = 8 marks)

3 The diagram below shows some of the stages of the cell cycle.



(a) Replication of DNA occurs during the S phase.

In some cells, one complete cell cycle takes 14 hours. In these cells, the S phase takes 8 hours.

Calculate the percentage of time that these cells spend in the S phase.

(1)

Answer .....

(b) In G_2 of the cell cycle, centrioles move to the poles of the cell.

Describe the structure of centrioles.

(2)

(c) (i) The photographs below show the appearance of a cell during different stages of mitosis.

P

Q

R

S

Use the letters to give the sequence of these stages of mitosis.

(1)

(ii) Explain why these stages of mitosis would **not** be seen in a prokaryotic cell.

(2)

(d) Describe the events that take place during late telophase and cytokinesis in a **plant** cell.

(3)

(e) Explain why the mitochondria have to replicate during the early stages of G_1 of the cell cycle.

(2)

(Total for Question 3 = 11 marks)

4 Wheat is a crop plant.

The phenotype of wheat is determined by its genotype and the environment.

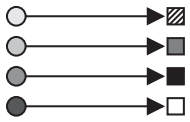
(a) The colour of wheat grains is an example of polygenic inheritance. It is also an example of a character that shows continuous variation.

(i) Put a cross ☒ in the box next to the diagram that illustrates polygenic inheritance for the colour of wheat grains.

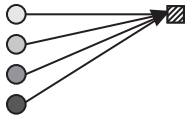
Each circle represents one gene and each square represents one character.

(1)

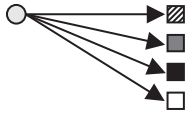
☒ **A**



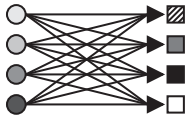
☒ **B**



☒ **C**

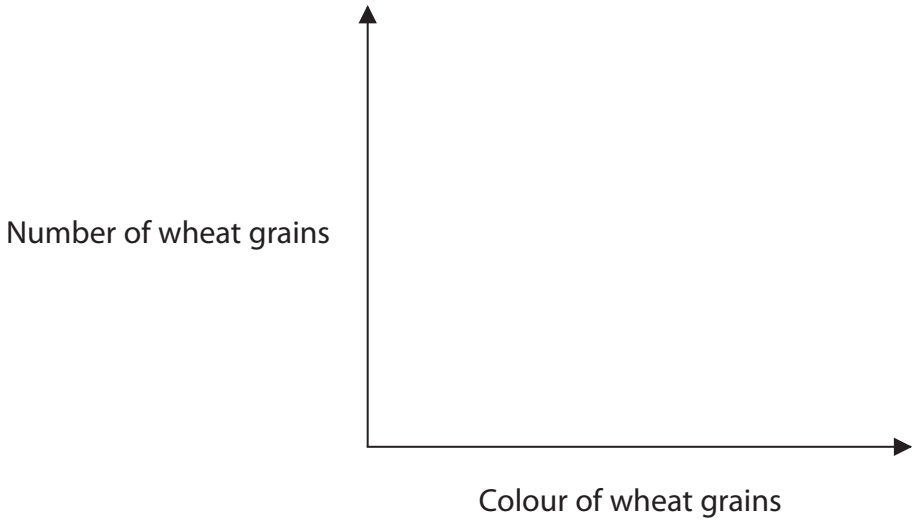


☒ **D**



(ii) Complete the graph below to show continuous variation for this character.

(1)



(b) The phenotype of wheat plants is affected by the availability of magnesium ions.

(i) Explain how a lack of magnesium ions could affect the phenotype of wheat plants.

(3)

*(ii) Describe an investigation that could confirm the effect of a lack of magnesium ions on the phenotype of wheat plants.

(6)

(Total for Question 4 = 11 marks)

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5 Sloths are mammals that live high up in trees and eat leaves.

The photograph below shows a pygmy three-toed sloth.

www.ourendangeredworld.com

Magnification ×0.2

These sloths live on a small island off the coast of Panama. Other species of sloth, including the brown-throated sloth, are found on the mainland.

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

(2)

(b) Pygmy three-toed sloths range from 48 cm to 53 cm in length.

Brown-throated sloths are 15% longer than pygmy sloths.

Calculate the range in length of brown-throated sloths.

Show your working.

(2)

..... cm

(c) Organisms live on the fur of the pygmy three-toed sloth. The fur provides a habitat for these organisms.

Two of these organisms are green algae and moths.

Algae are plant-like organisms that carry out photosynthesis.

Moths are insects that lay eggs.

(i) Suggest **one** advantage to each of these organisms of living together in this way.

(3)

Advantage to the sloth .....

.....

.....

Advantage to the algae .....

.....

.....

Advantage to the moth .....

.....

.....

(ii) Suggest how the species richness of the organisms living on the sloth could be determined.

(2)

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(Total for Question 5 = 9 marks)

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6 Sri Lanka is an island with about 125 species of mammals.

(a) In 1993, the number of different species of mammals in Sri Lanka was estimated to be 90.

Suggest **one** reason for this increase.

(1)

(b) The photograph below shows a civet.

www.wilpattu.com

Magnification ×0.1

Paradoxurus is a genus of civets found in Sri Lanka.

All the civets found in Sri Lanka were thought to be one species, *Paradoxurus aureus*.

Phylogenetic analysis and other studies have shown that these civets belong to three different species.

(i) Explain how the results of molecular phylogeny could show that there are three different species of civets.

(2)

(ii) Describe a breeding experiment that could be carried out to provide further evidence for three separate species.

(2)

(c) The Sri Lankan leopard is listed as an endangered species.

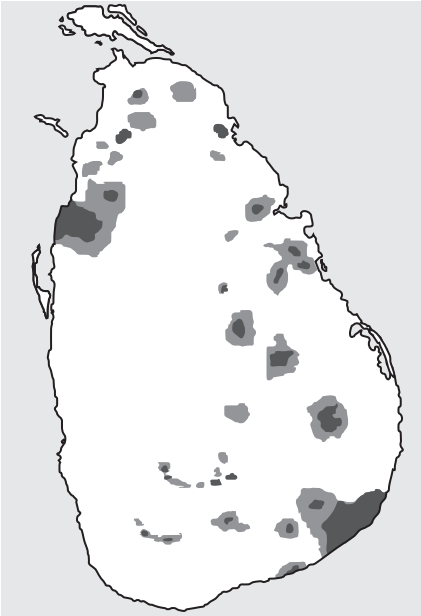
The photographs below each show a Sri Lankan leopard.

wikipedia.org

amazonaws.com

Magnification ×0.05

The map below shows regions in Sri Lanka where the presence of leopards has been confirmed and regions where leopards are thought to be present.



Key

- regions where the presence of leopards has been confirmed
- regions where leopards are thought to be present

(i) The area of this island is 65 610 km^2.

In 2015, the wild population of leopards was estimated to be between 700 and 950 individuals.

Calculate the minimum population density of leopards in Sri Lanka.

(1)

..... leopards km^{-2}

(ii) Using the information in the photographs, suggest why some regions in Sri Lanka are only thought to have leopards present.

(2)

*(iii) Using the information in the map and your own knowledge, explain how conservation projects could help to increase the leopard population in Sri Lanka.

(5)

(Total for Question 6 = 13 marks)

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7 Mammalian gametes are specialised for their functions.

(a) (i) In the space below, draw a diagram to show the structure of a sperm.
Label **three** structural adaptations of the sperm for its function.

(4)

(ii) Explain how a sperm is adapted for its function.

(3)

(b) Polychlorinated biphenyls (PCBs) are chemicals that can reduce the number of sperm produced.

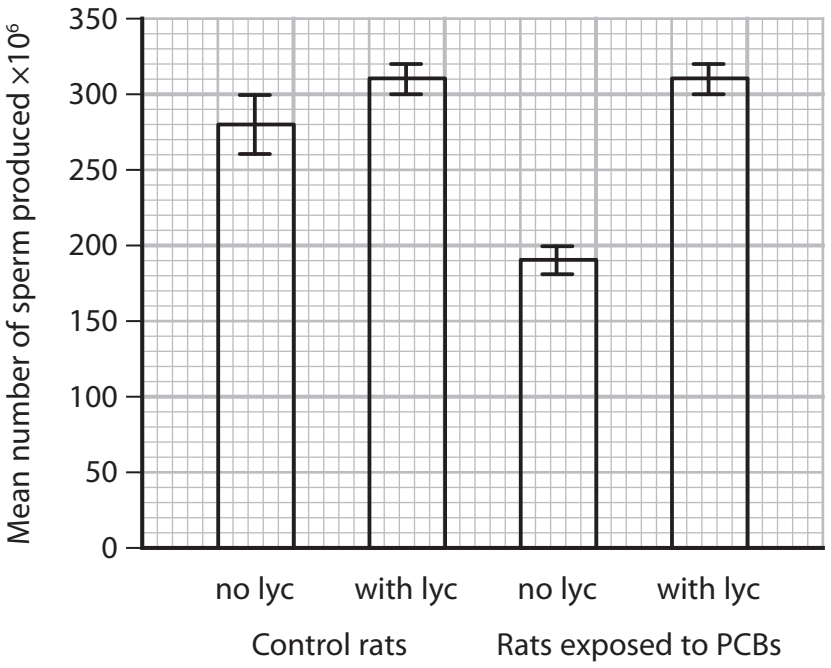
It has been claimed that eating fruits such as tomatoes, papaya and watermelon can increase the number of sperm produced. These fruits contain lycopene (lyc), a chemical that is thought to increase the number of sperm produced.

An investigation was carried out to study the effect of lycopene on the number of sperm produced in rats.

One group was exposed to PCBs and then half of these rats were given lycopene.

Another group, the control rats, were not exposed to PCBs. Half of these rats were given lycopene.

The graph below shows the results of this investigation.



(i) Using the information in the graph, describe the effect of lycopene on the number of sperm produced.

(2)

(ii) Describe how this investigation could be modified to provide evidence that eating certain fruits could reduce the effect of exposure to PCBs.

(3)

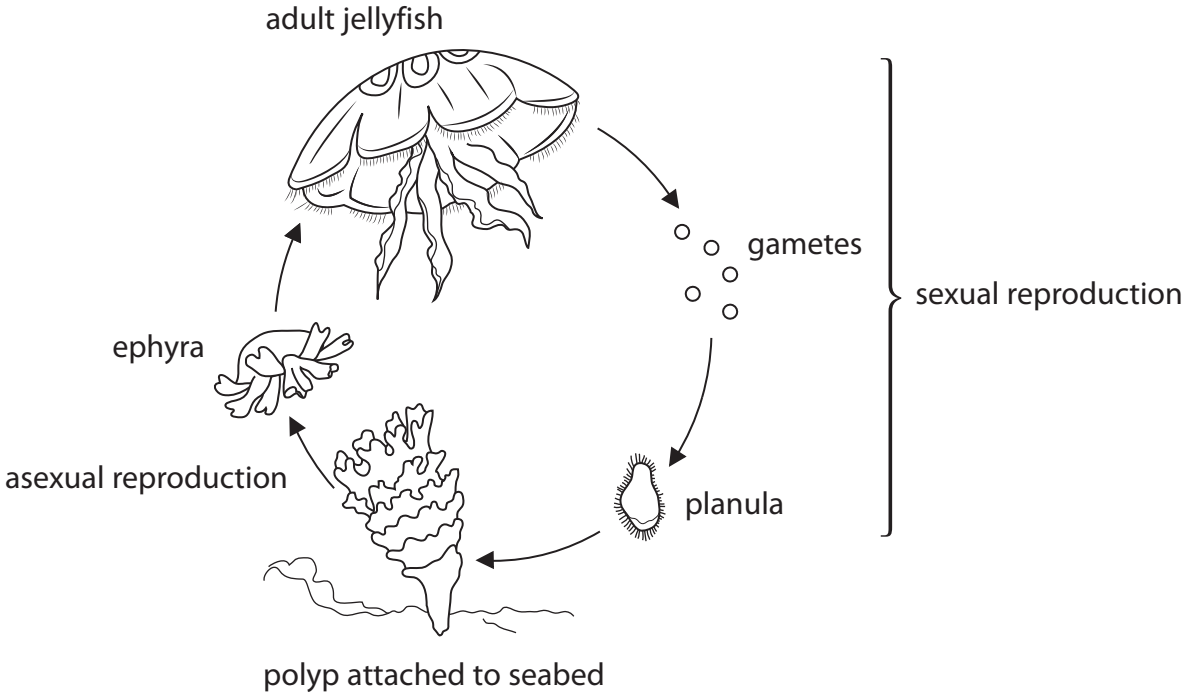
(Total for Question 7 = 12 marks)

8 Some animals are capable of both sexual and asexual reproduction.

The adult jellyfish reproduces sexually by releasing gametes into the sea.
Fertilisation results in the formation of a planula.

The planula becomes a polyp. The polyp can reproduce asexually by forming ephyra.
The ephyra develop into the adult jellyfish.

The diagram below shows these stages in the life cycle of a jellyfish.



(a) The adult of one species of jellyfish has 22 pairs of chromosomes in its cells.

The table below shows some of the stages in the life cycle of this jellyfish.

For each stage, put **one** cross ☒ in the appropriate box, in each row, to show the number of chromosomes in the cells.

(3)

Stage	Number of chromosomes in the cells			
	11	**22**	**44**	**88**
gamete	☒	☒	☒	☒
planula	☒	☒	☒	☒
ephyra	☒	☒	☒	☒

(b) A planula may be either male or female.

State the sex of the polyp and ephyra that would result from a female planula.

(1)

polyp .....

ephyra .....

(c) Suggest the advantages to jellyfish of a life cycle with both sexual and asexual reproduction.

(3)

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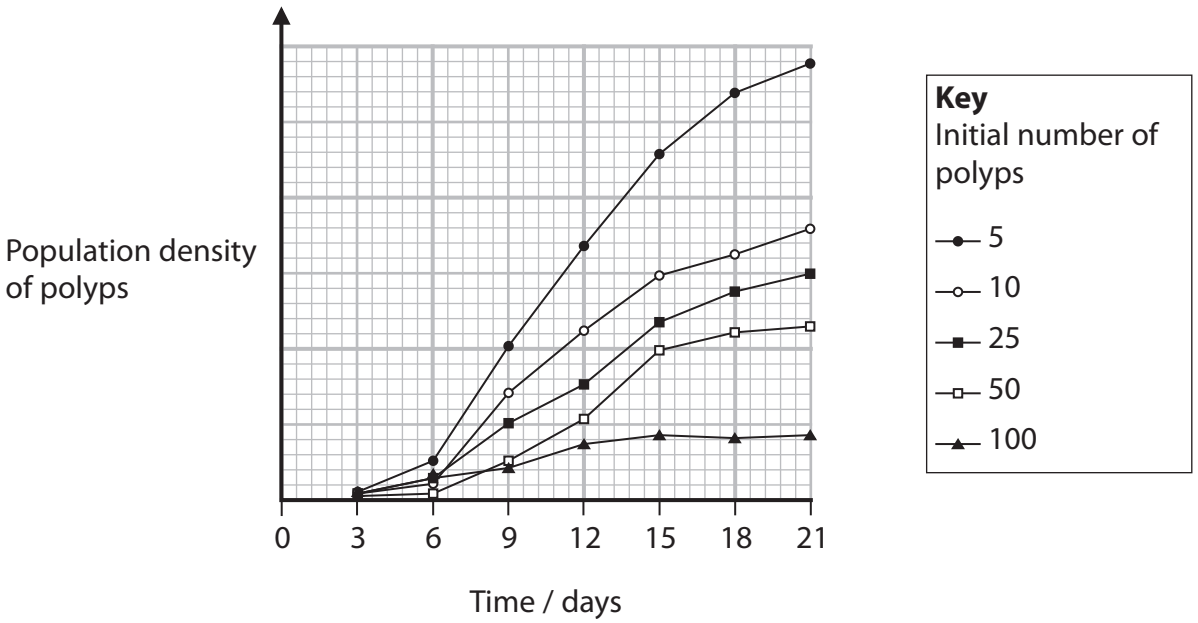
(d) The graph below shows how the initial number of polyps present in one area affects the population density of polyps in the same area.



(i) Using the information in the graph, describe the relationship between the initial number of polyps in an area and the population density.

(2)

(ii) Suggest why the initial number of polyps in an area affects the population density.

(2)

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(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

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