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Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Biology

Advanced Subsidiary

Unit 2: Development, Plants and the Environment

Tuesday 6 June 2017 – Afternoon

Time: 1 hour 30 minutes

Paper Reference

WBI02/01

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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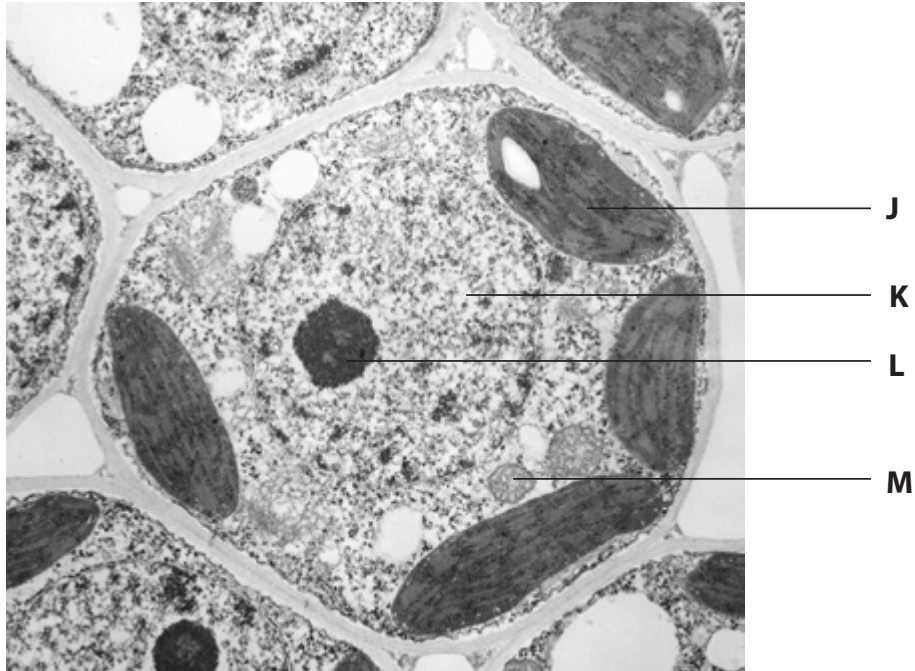



Pearson

Answer ALL questions.

Some questions must be answered with a cross ☐. 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 a plant cell as seen using an electron microscope.



Magnification $\times 20\,000$

- (a) Place a cross ☐ in the box next to the number of structures labelled in the photograph that would also be present in an animal cell.

(1)

- ☐ A 1
☐ B 2
☐ C 3
☐ D 4



(b) The table below shows some features of plants cells and prokaryotic cells.

For each feature, place **one** cross ☒ in the appropriate box, in each row, to show whether it is found in plant cells only, prokaryotic cells only or in both plant cells and prokaryotic cells.

(3)

Feature	Plant cells	Prokaryotic cells	Plant cells and prokaryotic cells
cellulose cell wall	☐	☐	☐
nucleus	☐	☐	☐
ribosomes	☐	☐	☐

(c) Some plant cells contain plasmodesmata.

Describe the structure of plasmodesmata.

(2)

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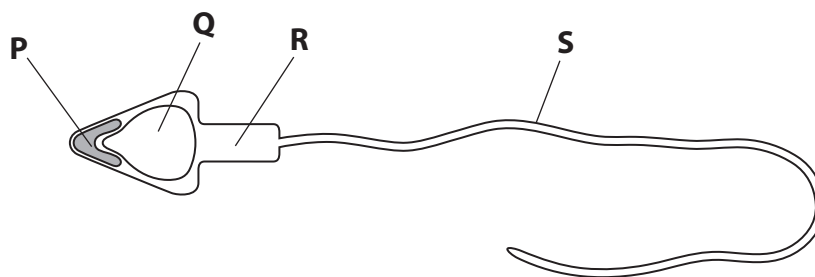
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(Total for Question 1 = 6 marks)



2 The diagram below shows a sperm cell.



(a) Name the structure labelled **P**.

(1)

(b) Place a cross ☐ in the box next to the structure that contains mitochondria.

(1)

☐ **A P**

☐ **B Q**

☐ **C R**

☐ **D S**

(c) Place a cross ☐ in the box next to the structure or structures that contain DNA.

(1)

☐ **A P only**

☐ **B P and R**

☐ **C Q only**

☐ **D Q and R**

(d) Describe the role of structure **S**.

(2)

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*(e) Explain the role of meiosis in the production of genetically variable sperm cells.

(5)

Handwriting practice area with 20 horizontal dotted lines.

(Total for Question 2 = 10 marks)



3 Plant-based plastics are being developed to replace oil-based plastics.

Sugar and corn crop plants have been used to make some of these plant-based plastics.

(a) Give **two** advantages of using plant-based plastics compared with oil-based plastics.

(2)

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2

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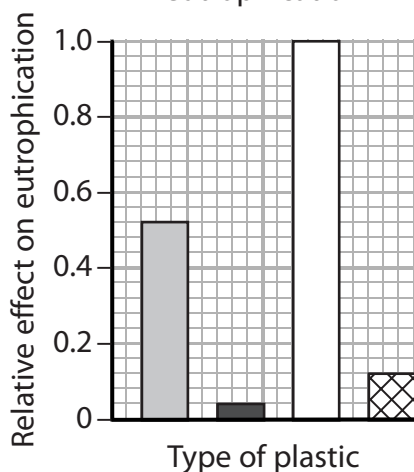
(b) Research has shown that the production of plant-based plastics may not be as environmentally friendly as the production of oil-based plastics.

The graphs below show the relative effects on eutrophication and on damage to the ozone layer of producing two oil-based plastics, **A** and **B**, and of producing two plant-based plastics.

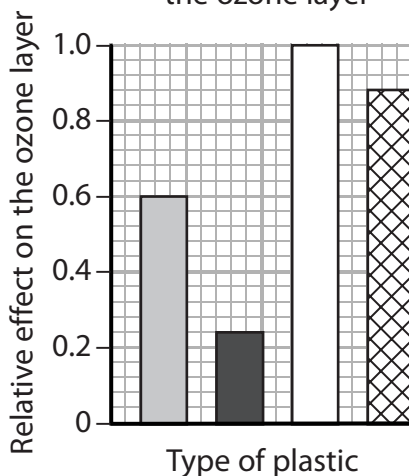
Eutrophication is damage caused to lakes and rivers by using too much fertiliser.

The ozone layer helps to reduce ultraviolet light from the Sun reaching the Earth's surface.

Graph 1: effect on eutrophication



Graph 2: effect on the ozone layer



Key

- oil-based plastic **A**
- oil-based plastic **B**
- sugar-based plastic
- corn-based plastic



Using the information in the graphs and your own knowledge, discuss whether the production of plant-based plastics is less environmentally friendly than the production of oil-based plastics.

(4)

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P 4 8 4 1 6 A 0 7 2 4

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- (c) Fertilisers are spread on the land to supply plants with the inorganic ions that they require for growth.

Explain how plants use named inorganic ions.

(3)

- (d) Ultraviolet light has been shown to increase the risk of skin cancer.

Suggest how skin cancer is the result of an interaction between genotype and the environment.

(3)

(Total for Question 3 = 12 marks)



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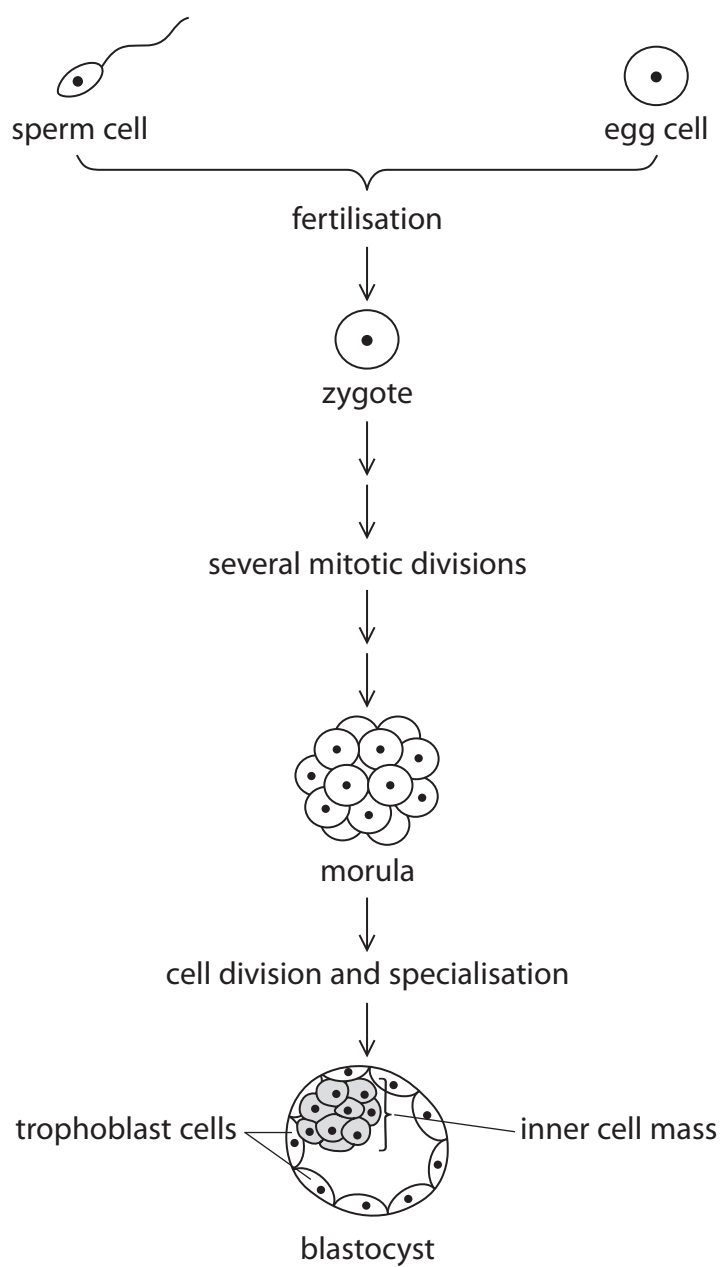
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4 The diagram below shows some of the stages in the formation of an embryo.



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- (a) The morula consists of totipotent stem cells.

Explain the meaning of the term **totipotent stem cells**.

(2)

- (b) Explain the role of mitosis and the cell cycle in the formation of the morula from the zygote.

(3)

- (c) The blastocyst consists of two types of cell, trophoblast cells and the inner cell mass.

Cells in the inner cell mass are pluripotent.

Explain how the cells formed from the inner cell mass become specialised.

(3)

(Total for Question 4 = 8 marks)



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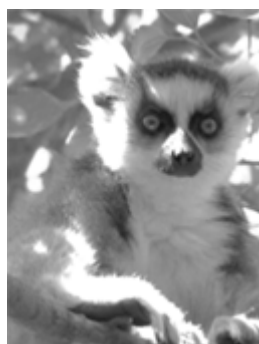
5 Madagascar is a large island off the southeast coast of Africa.

Approximately 90% of the organisms found in Madagascar are endemic.

Lemurs are endemic to Madagascar. They are thought to have evolved from a group of early monkeys 40 million years ago. These monkeys were carried across the sea from Africa on a raft of vegetation.

There are many different species of lemur.

The photographs below show four species of lemur.



Not to the same scale

(a) Explain how endemic lemurs evolved in Madagascar.

(3)

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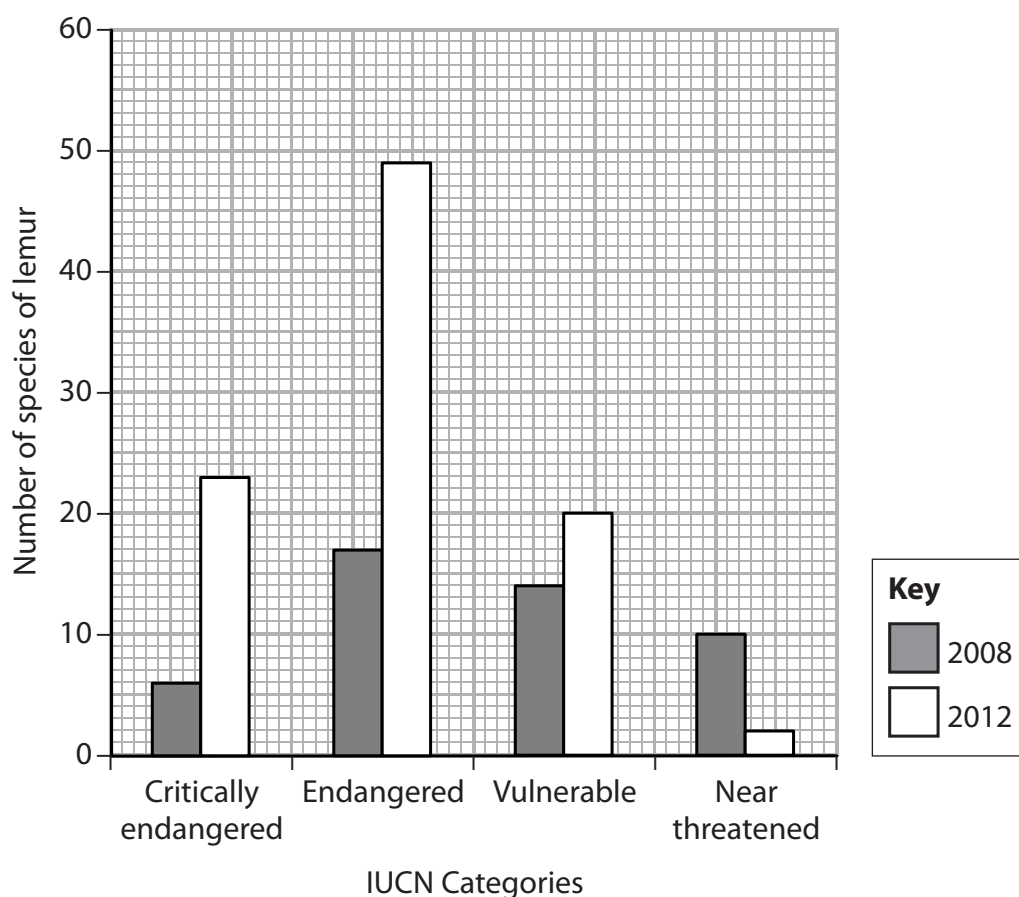
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(b) A number of species of lemur are threatened with extinction.

The International Union of Conservation of Nature (IUCN) classifies different species into categories, according to how threatened they are. This information is published regularly.

The graph below shows information, published by the IUCN in 2008 and 2012, concerning lemurs.



(i) There were 103 known species of lemur in 2012.

Calculate the percentage of species of lemur that are included in these IUCN categories in 2012.

(3)

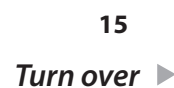
Answer %



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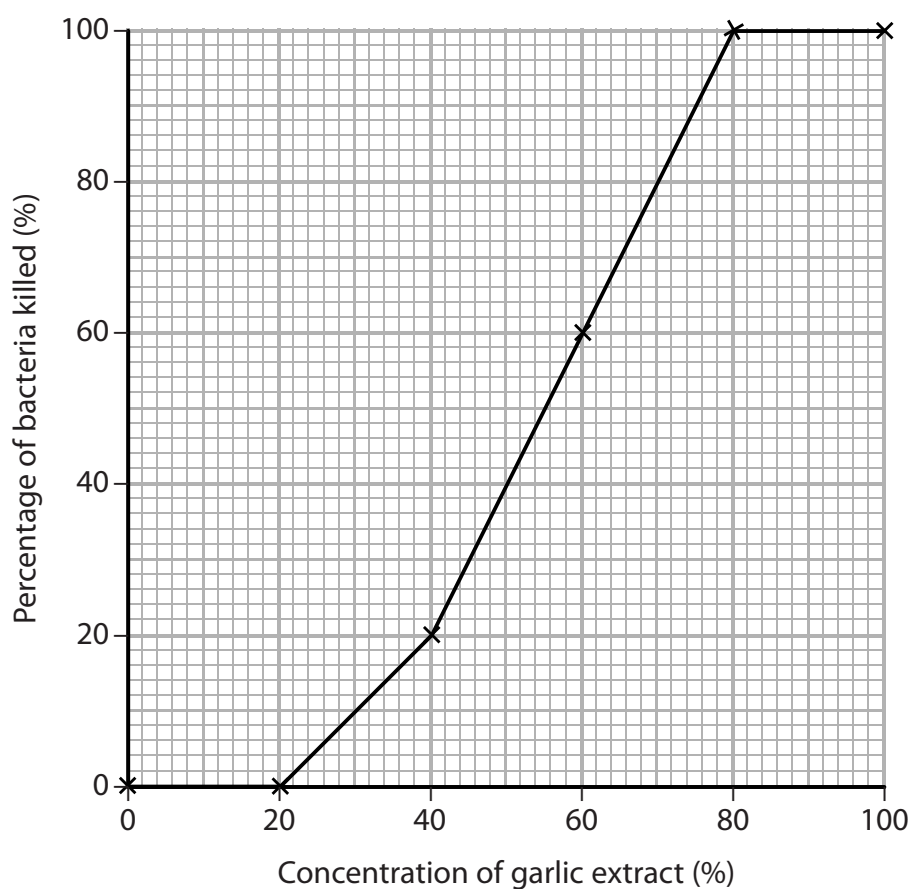
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6 Some people believe that garlic extract helps to reduce infection.

(a) The graph below shows the effect of the concentration of garlic extract on one species of bacteria.



(i) Use the information in the graph to describe the effect that the concentration of garlic extract has on this species of bacteria.

(2)



* (ii) Describe an investigation to determine the effect of the concentration of garlic extract on other species of bacteria.

(6)

(b) Suggest **two** differences between the way William Withering would have tested garlic extract and contemporary drug trials.

(2)

1

2

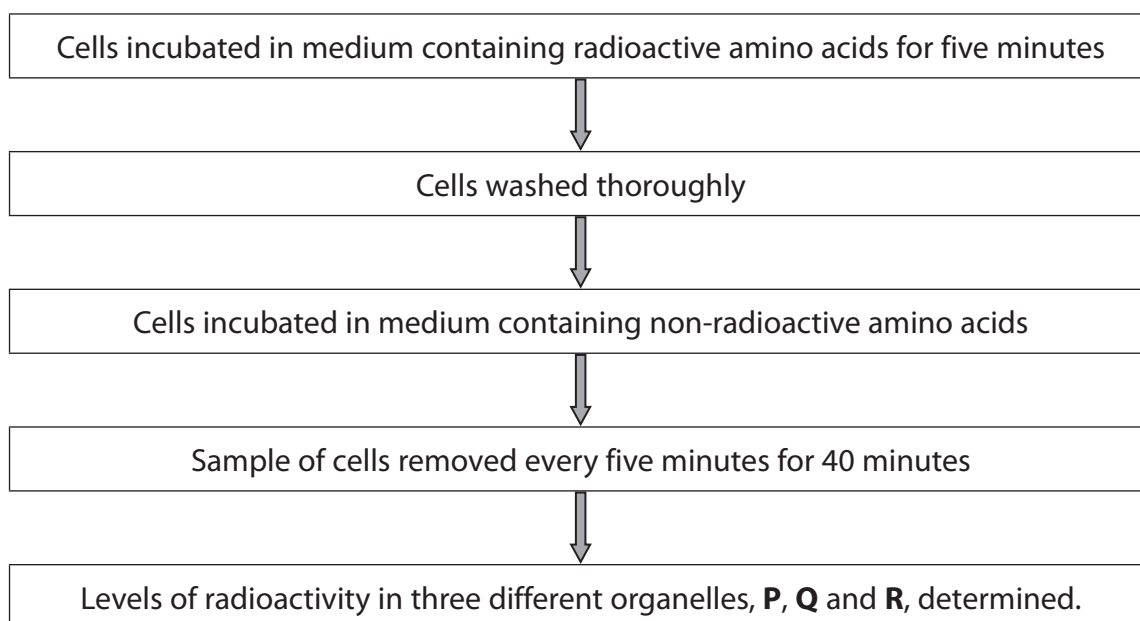
(Total for Question 6 = 10 marks)



P 4 8 4 1 6 A 0 1 7 2 4

- 7 An experiment was carried out to study the synthesis and movement of proteins through cells.

The diagram below shows the method used.



The table below shows the results of this experiment.

Time / minutes	Level of radioactivity / arbitrary units		
	Organelle P	Organelle Q	Organelle R
5	60	0	0
10	80	40	0
15	20	70	0
20	15	80	10
25	10	30	30
30	5	20	60
35	5	10	40
40	5	5	20



- (a) Place a cross ☒ in the box next to the row in the table that correctly identifies the three organelles **P**, **Q** and **R**.

(1)

	Organelle P	Organelle Q	Organelle R
☐ A	Golgi apparatus	ribosome	rough endoplasmic reticulum
☐ B	ribosome	rough endoplasmic reticulum	Golgi apparatus
☐ C	ribosome	Golgi apparatus	rough endoplasmic reticulum
☐ D	rough endoplasmic reticulum	ribosome	Golgi apparatus

- (b) Suggest why the levels of radioactivity increased in organelle **P**.

(2)

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- (c) (i) Describe the changes in the level of radioactivity in organelle **Q**.

(2)

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(ii) Explain the changes in the level of radioactivity in organelle **Q**.

(2)

(d) (i) Suggest why the maximum level of radioactivity in organelle **R** was lower than the maximum level of radioactivity in organelle **P**.

(2)

(ii) Suggest what will happen to the level of radioactivity in organelle **R** after 40 minutes. Give a reason for your answer.

(2)

(Total for Question 7 = 11 marks)



- 8 *Swertia chirata* is a plant that grows in India. It is classified as endangered. The seeds of *S. chirata* have a low germination rate.

This plant is in high demand as it contains compounds that can be used to make medicines.

- (a) Seeds are produced as a result of pollination followed by double fertilisation.

Place a cross ☐ in the box next to the structures formed as a result of double fertilisation.

(1)

- ☐ A diploid zygote and diploid endosperm nucleus
- ☐ B diploid zygote and triploid endosperm nucleus
- ☐ C triploid zygote and diploid endosperm nucleus
- ☐ D triploid zygote and triploid endosperm nucleus

- (b) Scientists used tissue culture techniques to produce large numbers of *S. chirata* plants.

- (i) Explain why it is important that these techniques are carried out under aseptic conditions.

(3)

- (ii) Explain why the scientists took samples of tissue from very specific parts of the *S. chirata* plant.

(2)



- (iii) The scientists checked the chromosomal stability of the plants they produced.
They did this by counting the number of chromosomes in the cells in metaphase.

Draw and label the parts of a chromosome as it appears in metaphase.

(3)

- (c) Suggest how seedbanks could be used to help conserve this endangered plant.

(2)

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS



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