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Write your name here

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**Edexcel GCE**

# Biology

## Advanced Subsidiary

## Unit 2: Development, Plants and the Environment

| Monday 1 June 2009 – Afternoon<br>**Time: 1 hour 15 minutes** | Paper Reference<br>**6BI02/01** |
|---|---|

| **You do not need any other materials.** | 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.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- 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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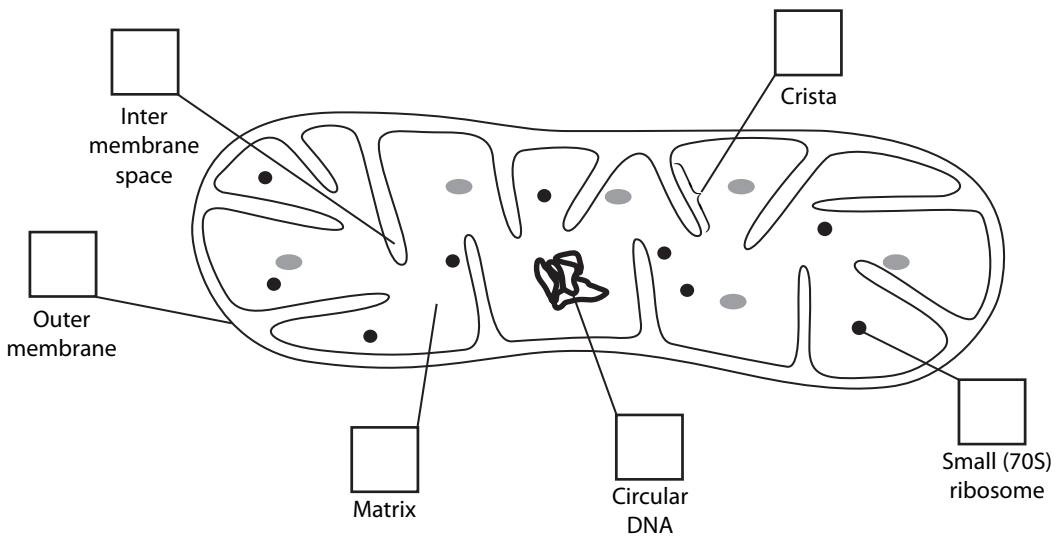
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**Answer ALL questions**

**1** Prokaryotes, mitochondria and chloroplasts have many features in common.

(a) (i) The diagram below shows a mitochondrion. Two of the features labelled are typical of prokaryotes. Place a tick (✓) in each of the **two** boxes that correctly identify these features.

**(2)**




(ii) The table below shows some features of mitochondria. If the feature is also present in chloroplasts, place a tick (✓) in the box to the right of that feature and if it is absent, place a cross (✖) in the box.

**(3)**

| Features present in mitochondria | Feature present (✓) or absent (✖) in chloroplasts |
|---|---|
| Surrounded by a double membrane | |
| Crista present | |
| Circular DNA | |
| Matrix | |
| Glycogen granule | |
| Stalked particles | |

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(b) Bacteria can be identified and classified by looking for certain features. Using the information in the passage below, label the five bacteria with the correct letter.

Bacterium P has a single flagellum to enable it to move whilst bacterium Q has several flagella.

Only bacterium R has visible plasmids and bacterium S has an infolding of its cell surface membrane.

Bacterium T has a slime capsule.

**(4)**



Bacterium .....

Bacterium .....

Bacterium .....

Bacterium .....

Bacterium .....

**(Total for Question 1 = 9 marks)**

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**2** The liver is an organ with many functions.

(a) (i) Give **one** difference between an organ and a tissue.

**(1)**

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(ii) Suggest **one** way in which tissues and organs are similar.

**(1)**

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(b) In a study of cell ultrastructure, a student was able to separate various cell organelles from a sample of liver cells. However, she was unsure of her ability to correctly identify the **three** organelles that she found. She produced a table containing a description of each organelle. Complete the table by writing in the correct name of each organelle.

**(3)**

| Description of organelle | Name of organelle |
|---|---|
| Several curved membrane-bound sacs of decreasing size | |
| A pair of cylinders arranged at right-angles to each other | |
| Small spheres with a single membrane that are filled with hydrolytic enzymes | |

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(c) In the space below, draw a fully labelled diagram of a nucleus, as seen using an electron microscope.

**(4)**

**(Total for Question 2 = 9 marks)**

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**3** Organisms survive in their environment because of their behavioural, physiological and anatomical adaptations.

(a) The table below gives some examples of adaptations. Complete the table by stating whether the example given is behavioural, physiological or anatomical.

**(4)**

| Name of adaptation | Example |
|---|---|
| | Some metabolic reactions become less efficient in cold weather so the organism generates more heat to keep warm |
| | Sheep learn to ignore sounds that have no importance to them |
| | The ears of African elephants are larger than those of Asian elephants, due to differences in the environment |
| | Formation of a sun tan when human skin is exposed to sunlight |

(b) The human egg cell is adapted for its function. Describe and explain **two** adaptations of the human egg cell.

**(4)**

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2 .....

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(c) Pine needles, the leaves of pine trees, are believed to have antimicrobial properties.

Suggest how you could investigate the antimicrobial properties of pine needles.

**(5)**

**(Total for Question 3 = 13 marks)**

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N 3 4 4 6 4 A 0 8 2 4

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**4** Meiosis and mitosis are involved in cell division.

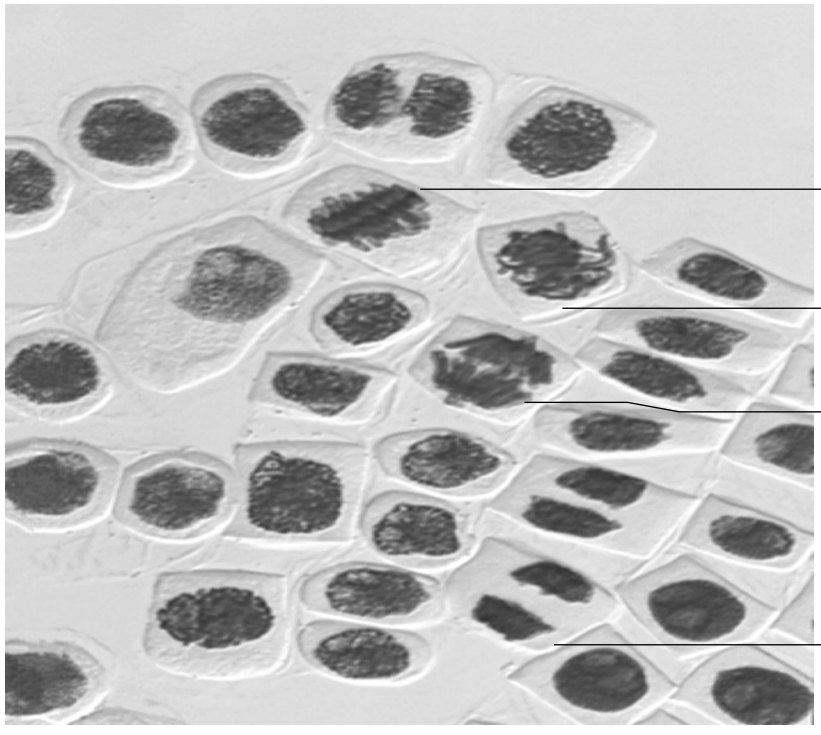
(a) The table below gives some statements about cell division. Place a tick (✓) in the box if **meiosis** is involved.

**(2)**

| Statements about cell division | Meiosis is involved |
|---|---|
| Required for both sexual and asexual reproduction | |
| Produces gametes | |
| Crossing over can occur | |
| Occurs in mammals but not flowering plants | |

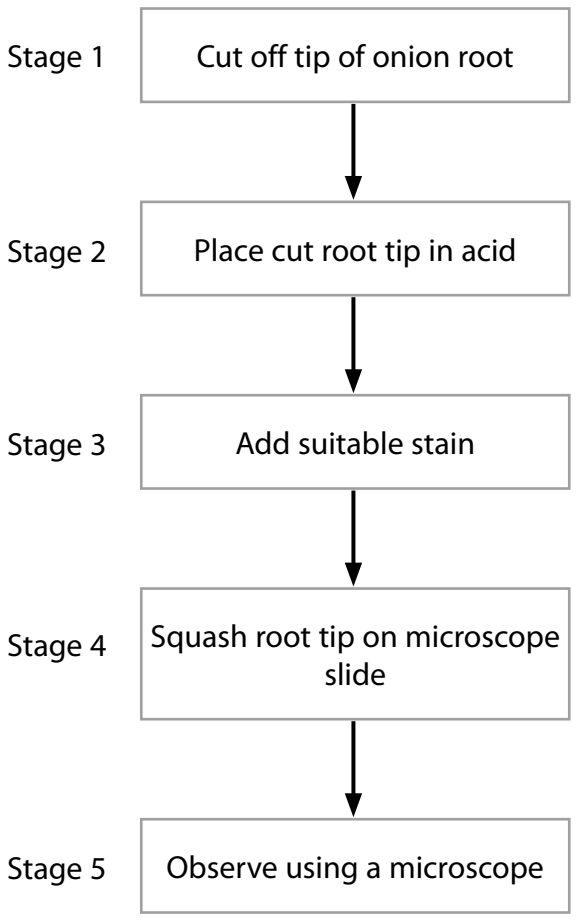
(b) The photograph below shows some cells undergoing **mitosis**. Each of the cells A, B, C and D is in a different stage of mitosis. Write the name of the stage next to the appropriate letter.

**(4)**



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(c) The diagram below shows some stages in the production of a root tip squash to observe mitosis.




(i) Suggest why the **tip** of the onion root is used.

**(1)**

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(ii) Suggest why acid is used in stage 2.

**(1)**

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(iii) Name a suitable stain for the root tip squash.

**(1)**

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(iv) There are various risks associated with the production of a root tip squash.
Suggest **two** risks and the precautions you would take to minimise each risk.

**(2)**

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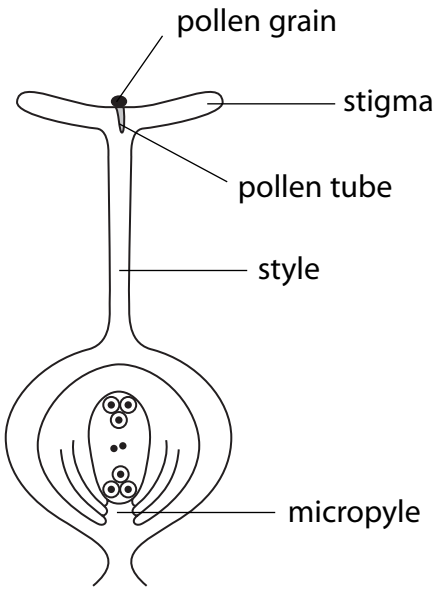
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**(Total for Question 4 = 11 marks)**

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**5** Water is important for many different processes in plants including successful pollen tube growth.

(a) The diagram below shows a pollen grain growing on the stigma of a flower.




(i) The pollen tube grows from the pollen grain to the micropyle. Suggest **one** stimulus, other than water, that causes the pollen tube to grow towards the micropyle.

**(1)**

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(ii) The tip of the growing pollen tube releases digestive enzymes into the style. Suggest the role of these digestive enzymes in the growth of the pollen tube.

**(3)**

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(b) Give **three** roles of water in a plant other than for pollen tube growth.

**(3)**

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**(Total for Question 5 = 7 marks)**

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**6** The yarrow plant, *Achillea* sp., shown in the photograph below, has been extensively studied to try to assess the influence of genes and the environment on its adaptation.

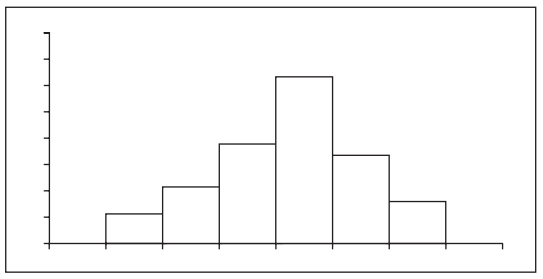


Yarrow plant

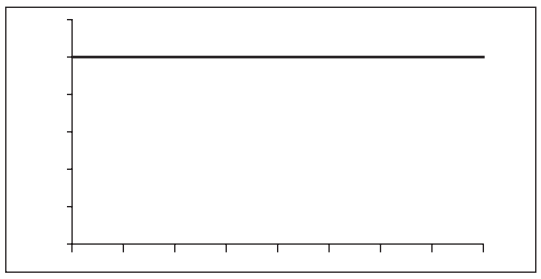
(a) A large number of seeds from wild yarrow plants were grown in controlled environmental conditions. The resulting population contained plants of different heights.

(i) Suggest which of the graphs, A, B, C or D shown below, would represent the height distribution in this plant population and give an explanation for this height distribution.

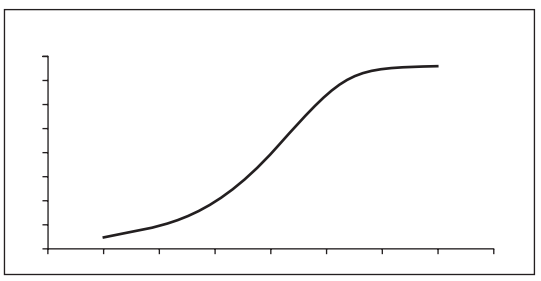
A



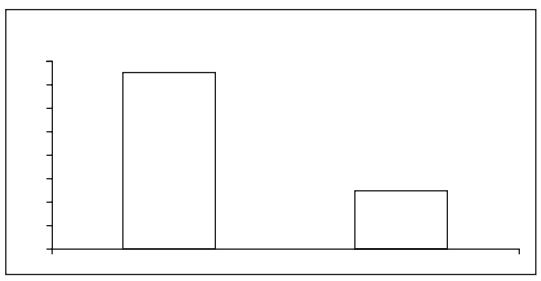
B



C



D





N 3 4 4 6 4 A 0 1 4 2 4

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Graph .....

**(3)**

Explanation .....

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(ii) Suggest **two** environmental conditions that were controlled in this investigation.

**(2)**

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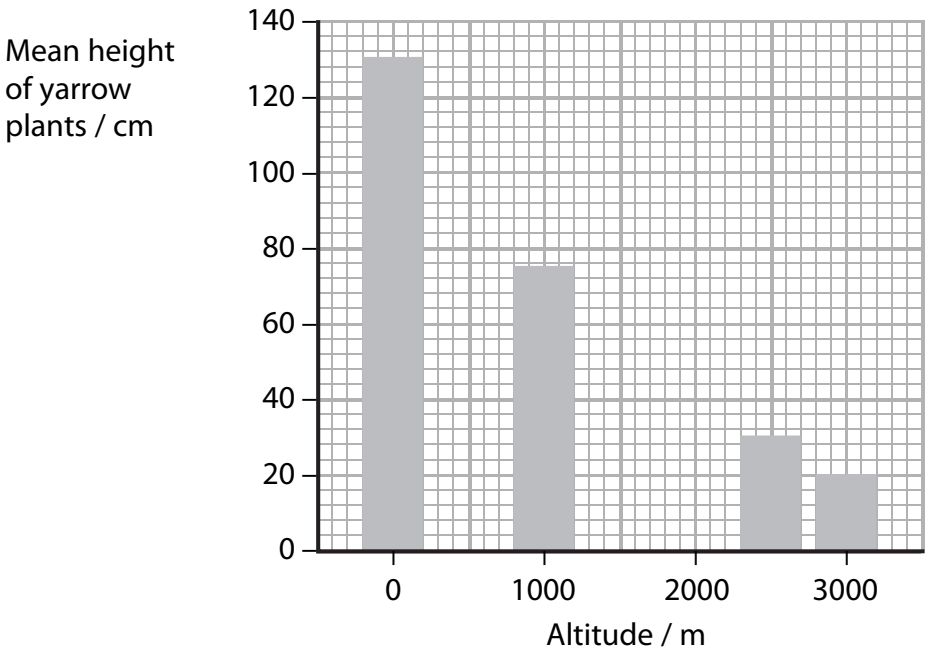
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(b) The mean height of yarrow plants, growing at various altitudes (height above sea level), was recorded. The results are shown in the table and graph below.

| **Altitude / m** | 0 | 1000 | 2000 | 2500 | 3000 |
|---|---|---|---|---|---|
| **Mean height of yarrow plant / cm** | 130 | 75 | 50 | 30 | 20 |




(i) Using the information in the table, complete the graph above.

**(1)**

(ii) Describe the effect of increasing altitude on the mean height of yarrow plants.

**(2)**

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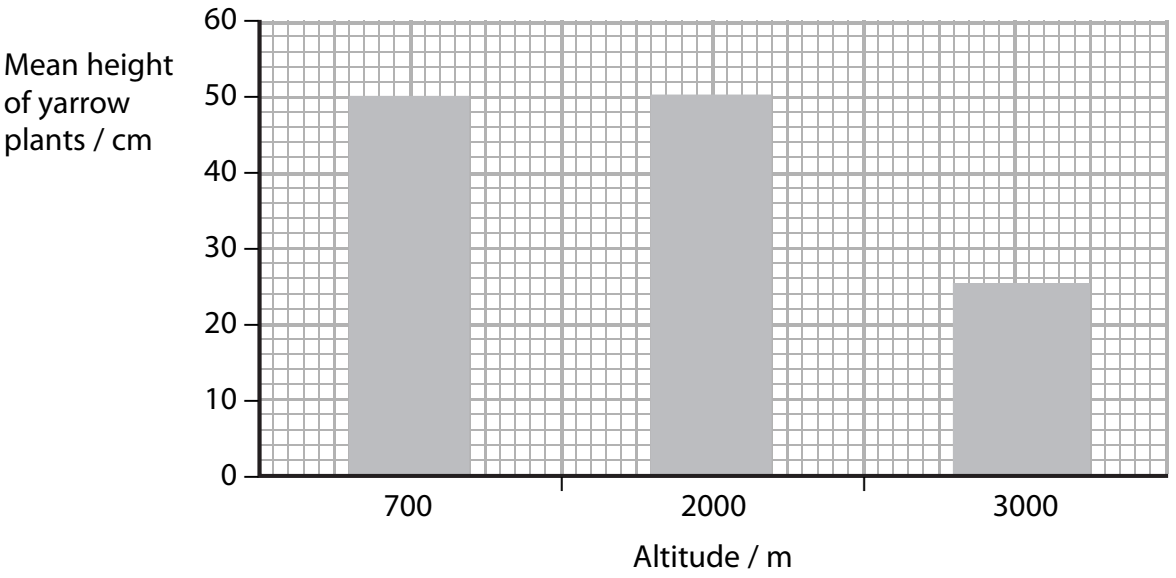
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(c) In a further investigation, plants with a height of 50 cm, growing at 2000 m above sea level, were cloned to produce a large number of plants. These plants were then grown at three different altitudes and their mean height at each altitude was recorded.

The results are shown in the graph below.




The evidence from the graph suggests that a combination of genetic and environmental factors influence the height of yarrow plants at different altitudes above sea level.

(i) Give **one** piece of evidence from the graph which suggests that genetic factors influence the height of yarrow plants at different altitudes.

**(1)**

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(ii) Give **one** piece of evidence from the graph which suggests that environmental factors influence the height of yarrow plants at different altitudes.

**(1)**

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(iii) Suggest a reason for using cloned plants rather than using seeds in this investigation.

**(1)**

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(iv) Suggest a reason for growing cloned plants at 2000 m in this investigation.

**(1)**

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**(Total for Question 6 = 12 marks)**

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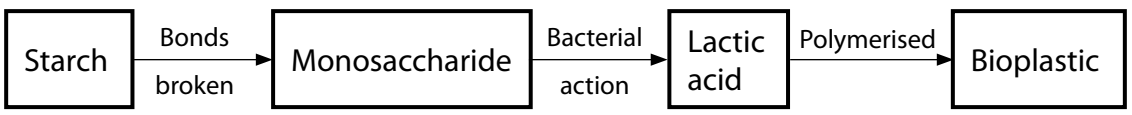
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**7** Bacteria are found in a wide range of habitats. Some bacteria can cause harm whilst others are useful to humans.

(a) During the testing of a new anti-bacterial drug, a double blind trial may be used. Explain what is meant by a **double blind trial** and suggest why it is important.

**(3)**

(b) Bacteria can be used in the production of bioplastic from starch. Bioplastic is a more sustainable form of packaging than oil-based plastics. Part of the conversion process is shown below.




(i) Name the bond that is broken to convert starch into its monosaccharide building blocks.

**(1)**

(ii) Name the monosaccharide formed when the bonds in starch are broken.

**(1)**

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(iii) Suggest why bioplastic is described as a more sustainable form of packaging than oil-based plastics.

**(2)**

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(iv) Bioplastic is biodegradable. Suggest **one** environmental advantage of using biodegradable packaging.

**(1)**

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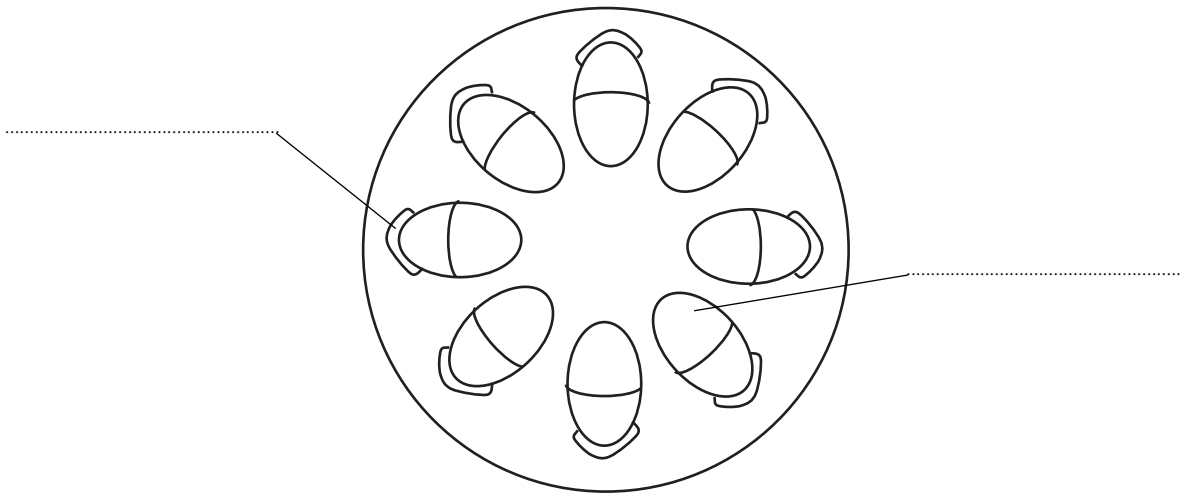
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(c) As well as starch, plants supply other useful products such as plant fibres.

The diagram below shows a transverse section of a stem. Complete the diagram by writing the correct name for each of the parts of the stem alongside the lines on the diagram.

**(2)**



**(Total for Question 7 = 10 marks)**

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**8** During an infection, some white blood cells make glycoproteins which become part of their cell surface membranes. To make glycoproteins, the white blood cells must first synthesise proteins on the surface of their rough endoplasmic reticulum.

(a) Explain how these newly-made proteins end up as glycoproteins on the cell surface membrane.

**(5)**

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(b) There are certain rare blood disorders in which there is a shortage of white blood cells. One potential treatment would be to inject totipotent stem cells into individuals with these disorders.

(i) Explain what is meant by the term **totipotent stem cell**.

**(2)**

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(ii) Suggest why injecting totipotent stem cells may benefit a person with a shortage of white blood cells.

**(1)**

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(iii) Suggest **one** risk to the person receiving the stem cells.

**(1)**

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**(Total for Question 8 = 9 marks)**

**TOTAL FOR PAPER = 80 MARKS**

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