Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

Advanced Subsidiary
Unit 2: Development, Plants and the Environment

Tuesday 15 January 2013 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
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.*
- 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 3 9 8 7 9 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 Animal cells are eukaryotic.

(a) Name **three** structures that are present in prokaryotic cells but absent in animal cells.

(3)

1 .....

2 .....

3 .....

(b) Eukaryotic cells contain membrane-bound organelles.

The table below lists some organelles and the types of membrane associated with them.

Place a cross (☒) in the box that correctly relates to the type of membrane associated with each organelle.

(4)

Organelle	Single membrane	Double membrane
nucleus	☒	☒
Golgi apparatus	☒	☒
mitochondrion	☒	☒
lysosome	☒	☒

(Total for Question 1 = 7 marks)

2 A scientist wanted to use stem cells to develop a new treatment for adults with Alzheimer's disease.
These stem cells could come from an embryo or an adult.

(a) Read through the following passage on the use of embryos as a source of stem cells, then write on the dotted lines the most appropriate word or words to complete the passage.

(4)

When an egg cell becomes fertilised, it is called a ..... .

After the first cell division there are two cells and after the fourth division the number of cells is ..... .

Each of these cells has the potential to give rise to any type of cell and is therefore said to be ..... .

After approximately five days, a mass of cells forms called a blastocyst.

Scientists can extract stem cells from the blastocyst, which are said to be ..... , as they can give rise to most cells, but not extra-embryonic cells.

(b) This new treatment for Alzheimer's disease could use stem cells taken from another adult.

Suggest **three** potential risks to the health of a person with Alzheimer's disease of this treatment.

(3)

1 .....

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2 .....

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3 .....

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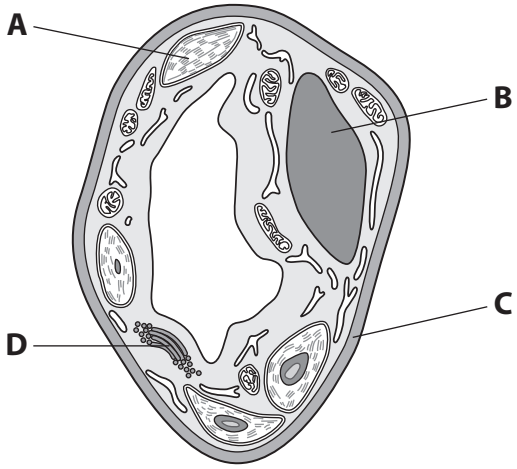
(Total for Question 2 = 7 marks)

3 Plant cells are organised into tissues, organs and systems.

(a) The diagram below shows a plant cell, as seen using an electron microscope.



For each of the following questions, place a cross (☒) in the box that identifies the structure.

(i) The structure that modifies protein into glycoprotein is

(1)

A ☒ **B** ☒ **C** ☒ **D** ☒

(ii) The structure, other than the nucleus, that contains DNA is

(1)

A ☒ **B** ☒ **C** ☒ **D** ☒

(iii) The structure that would **not** be present in the anaphase stage of mitosis is

(1)

A ☒ **B** ☒ **C** ☒ **D** ☒

(b) Plants contain xylem tissue.

(i) Explain what is meant by the term **tissue**.

(2)

(ii) Describe the functions of xylem.

(2)

*(c) Plant cells may contain cellulose.

Describe the structure of a cellulose microfibril.

(4)

(Total for Question 3 = 11 marks)

4 Biodiversity is an important aspect of conservation.

(a) Biodiversity can be measured by investigating species richness.

Explain what is meant by the term **species richness**.

(2)

(b) Biologists studied the effects of public footpaths on biodiversity in chalk grassland.
They recorded the presence (✓) or absence (×) of six species of plants on a public footpath across chalk grassland.
They also studied an area of undisturbed chalk grassland with no public access.

The results are shown in the table below.

Plant species	Public footpath across chalk grassland	Undisturbed chalk grassland
Agrimony	×	✓
Bird's-foot trefoil	×	✓
Cow parsley	×	✓
Dandelion	✓	✓
Fragrant orchid	×	✓
Ribwort plantain	✓	✓

(i) Using information from the table, suggest possible long-term effects on chalk grassland of public access.

(2)

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(ii) The fragrant orchid is a rare species. It shows high genetic diversity.

Explain what is meant by the term **genetic diversity**.

(2)

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(c) Seedbanks are important for the long-term conservation of rare plant species.

(i) Suggest and explain why it is better to store seeds, rather than keeping fully grown plants, for the long-term conservation of rare plant species.

(3)

(ii) In seedbanks, dried seeds are stored at low temperatures and in a dry atmosphere.

Suggest why these conditions are needed for seed storage.

(3)

(Total for Question 4 = 12 marks)

5 Some plants, such as garlic, show antimicrobial properties.

(a) Explain what is meant by the term **antimicrobial properties**.

(1)

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(b) The flow chart below shows some stages in a practical experiment to investigate the antimicrobial properties of garlic.

Stage 1

A culture of one species of bacteria is mixed into melted agar.

↓

Stage 2

The mixture is poured into a sterile Petri dish. The lid is replaced on the dish and the mixture allowed to cool so the agar can set.

↓

Stage 3

The Petri dish lid is removed and a paper disc soaked in garlic extract (disc A) is placed on the surface of the agar. A control disc (disc B) is also placed on the agar. The lid is replaced.

↓

Stage 4

The Petri dish is incubated for 24 hours and the results observed.

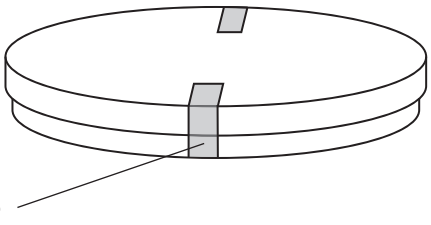
(i) Suggest why the bacteria are mixed with the agar in stage 1.

(1)

(ii) Explain why the Petri dish must be sterile at stage 2.

(2)

(iii) In stage 3, the lid is taped on using two pieces of sticky tape as shown below.



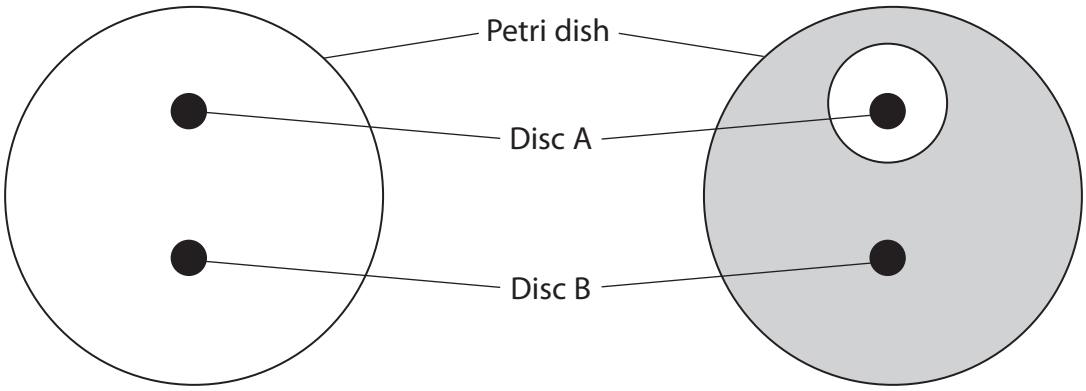
Explain why the two halves of the Petri dish are not completely sealed with sticky tape.

(2)

(iv) Suggest a suitable temperature for the safe incubation of the agar plates in a school laboratory. Give an explanation for your answer.

(2)

(v) The diagrams below show the Petri dish at the beginning and end of stage 4.



Beginning of stage 4 **End of stage 4**

Describe and explain the results shown at the end of stage 4.

(3)

(Total for Question 5 = 11 marks)

6 Plants need mineral ions to ensure healthy growth.

*(a) The optimum concentration of nitrate ions for healthy growth of *Pelargonium* plants is thought to be about 200 parts per million.

Pelargonium

Magnification × 0.1

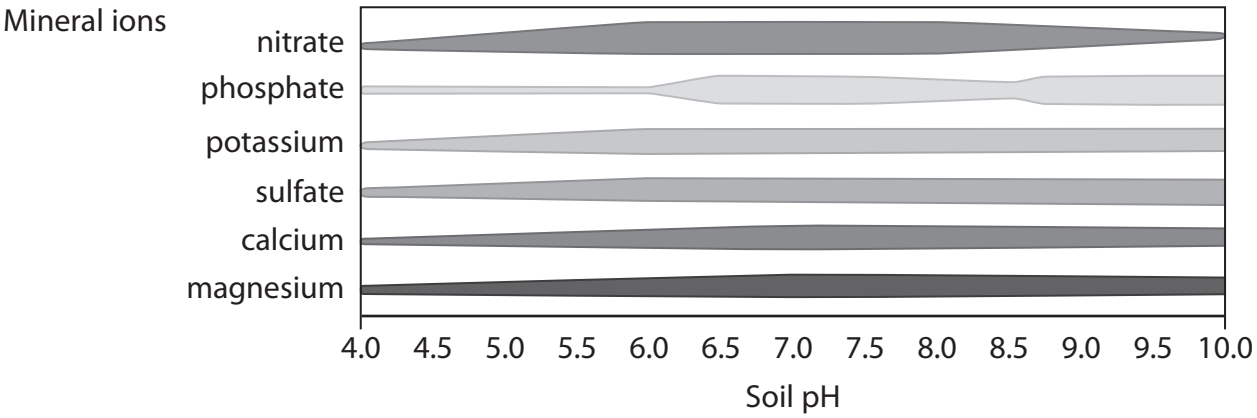
Describe how you would carry out an investigation to find the optimum concentration of nitrate ions needed for the healthy growth of *Pelargonium* plants in a laboratory.

(5)

(b) The availability of mineral ions to a plant is affected by the pH of the soil.

The chart below shows the effect of soil pH on the availability of mineral ions to plants.

The width of each bar indicates the availability of each mineral ion.



(i) Using the information from the chart, suggest the optimum soil pH for healthy growth of a plant. Give **one** reason for your answer.

(2)

(ii) Using information from the chart, explain why a low soil pH could result in reduced photosynthetic activity by plants.

(2)

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(Total for Question 6 = 9 marks)

7 Natural selection can lead to adaptation and evolution.

Ladybird beetles are insects that feed on other insects such as greenfly.

Ladybird beetle

Magnification × 10

(a) The table below shows two possible adaptations for ladybird beetles due to natural selection.

Place a cross (☒) in the box that best describes whether the adaptation is behavioural, anatomical or physiological.

(2)

Possible adaptation of the ladybird beetle	**Behavioural**	**Anatomical**	**Physiological**
Production of chemicals in the blood that taste bad to predators	☒	☒	☒
Clustering together with other ladybird beetles during cold weather	☒	☒	☒

(b) The flow chart below shows some stages of natural selection, using the ladybird beetle as an example.

Stage 1 – There is genetic variation between individuals within a population of an endemic species of ladybird beetle.

↓

Stage 2 – Natural selection enables some of the individual ladybird beetles to survive and breed.

↓

Stage 3 – This can lead to adaptation and evolution.

(i) Explain what is meant by the term **endemic** in stage 1.

(1)

(ii) Suggest how genetic variation occurs within a population of ladybird beetles in stage 1.

(3)

(iii) Explain what could occur in stage 2 to bring about adaptation in the ladybird beetle population.

(4)

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(Total for Question 7 = 10 marks)

8 The phenotype of an organism may be affected by both genotype and the environment.
For example, the risk of developing skin cancer is affected by the activity of the p53 gene and exposure to ultraviolet (UV) light.

(a) The p53 gene plays an important role in the cell cycle in humans.

Explain the role of the cell cycle.

(2)

(b) The p53 gene is called a 'tumour suppressor gene'. Cancers can form when the p53 gene does not function properly. UV light can cause mutations in this gene. The mutant gene results in the production of p53 mutant cells which may become cancerous.

(i) Name **one** environmental factor, other than UV light, that can cause a cell to become cancerous.

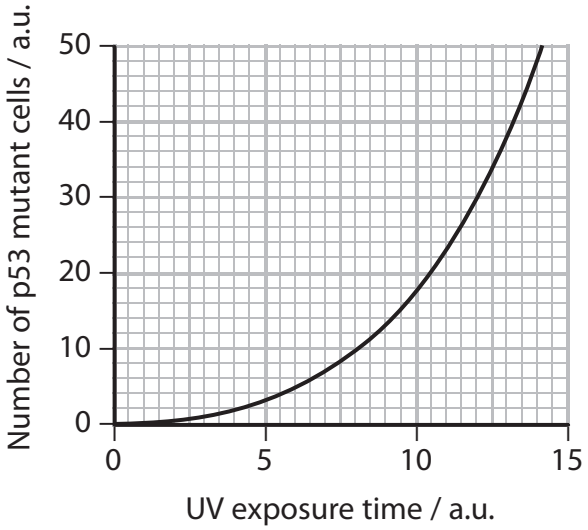
(1)

(ii) Suggest how the cell cycle will be affected in cells that have become cancerous.

(2)

(c) In an investigation, isolated skin cells were exposed to UV light for different lengths of time. The number of p53 mutant cells produced was recorded.

The graph below shows the effect of UV light on the number of p53 mutant cells produced.



(i) Use the graph to find the number of p53 mutant cells produced after an exposure time of 12 a.u.

(1)

..... a.u.

(ii) Using the information in the graph, describe the effect of exposure to UV light on the number of p53 mutant cells produced.

(3)

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(iii) Name the type of cell division responsible for the increase in number of the p53 mutant cells.

(1)

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(d) When cells divide out of control to produce a tumour, the cells may not become specialised.

Describe the process by which cells usually become specialised following cell division.

(3)

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(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS

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