



88146005

**BIOLOGY**  
**STANDARD LEVEL**  
**PAPER 2**

Candidate session number

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Monday 10 November 2014 (afternoon)

Examination code

1 hour 15 minutes

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**INSTRUCTIONS TO CANDIDATES**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is [50 marks].

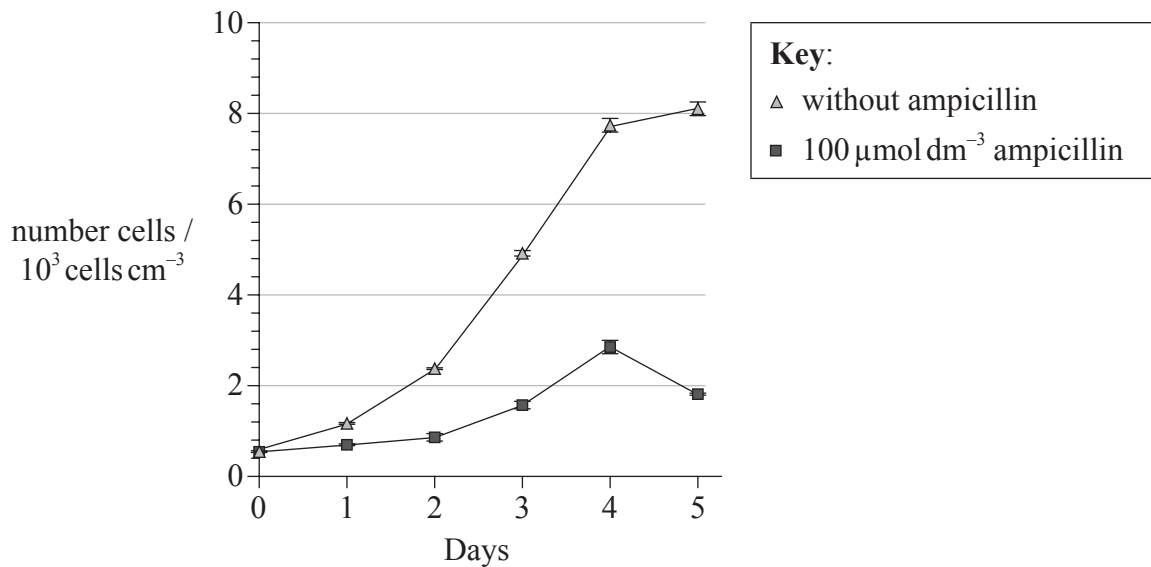


16EP01

**SECTION A**

Answer **all** questions. Write your answers in the boxes provided.

1. The antibiotic ampicillin is an inhibitor of the enzyme transpeptidase. The growth in the number of cells of the eukaryotic green alga *Closterium* was monitored under a microscope every day after ampicillin treatment. Each *Closterium* cell contains two chloroplasts. The graph shows the growth curve of cells grown without and with ampicillin.



[Source: adapted from H. Matsumoto et al. 'Treatment with Antibiotics that Interfere with Peptidoglycan Biosynthesis Inhibits Chloroplast Division in the Desmid *Closterium*' (2012) PLoS ONE, 7 (7): e40734. doi:10.1371/journal.pone.0040734]

- (a) Calculate the difference in the number of cells after five days of treatment without ampicillin and with ampicillin. [1]

..... 10<sup>3</sup> cells cm<sup>-3</sup>

(This question continues on the following page)



*(Question 1 continued)*

(b) Outline the effect of  $100 \mu\text{mol dm}^{-3}$  ampicillin on the growth of cells.

[2]

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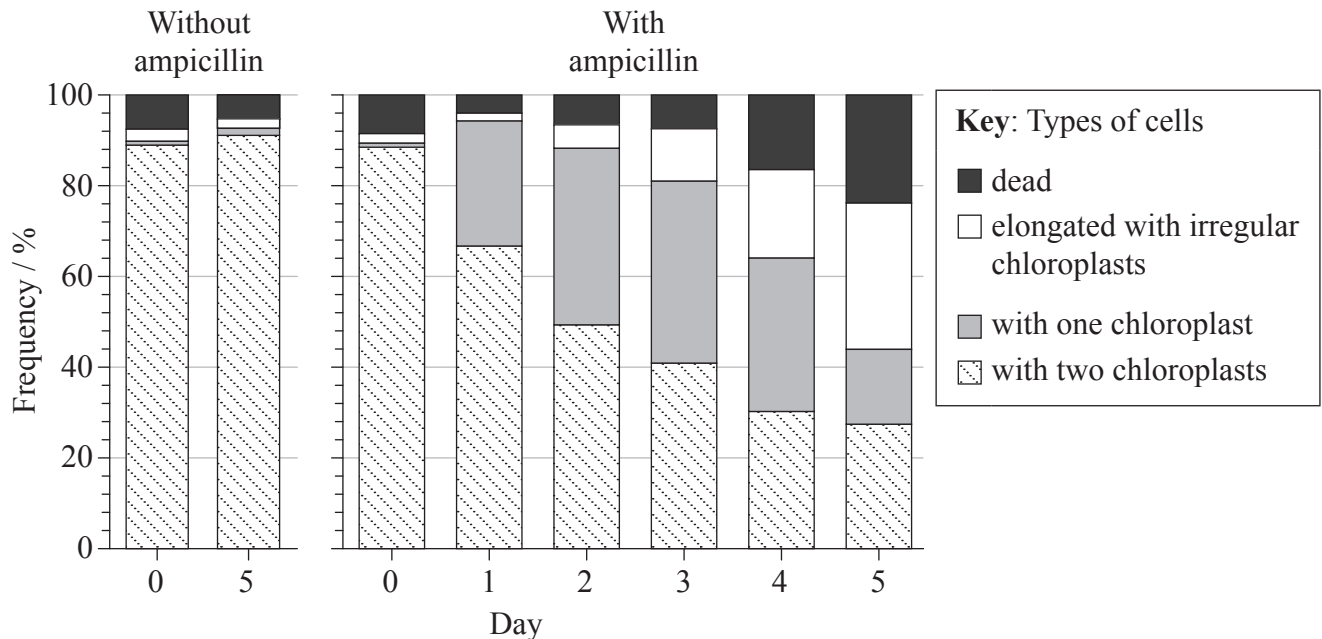


16EP03

**Turn over**

(Question 1 continued)

The effect of ampicillin on chloroplast division was studied in *Closterium*. When *Closterium* cells enter the cell division process, chloroplasts start to divide, forming two new cells with two chloroplasts each. In the medium with  $100 \mu\text{mol dm}^{-3}$  ampicillin, various types of cells can be observed. The bar chart shows the frequency of different cells produced without and with ampicillin.



[Source: adapted from H. Matsumoto et al. 'Treatment with Antibiotics that Interfere with Peptidoglycan Biosynthesis Inhibits Chloroplast Division in the Desmid *Closterium*' (2012) PLoS ONE, 7 (7): e40734. doi:10.1371/journal.pone.0040734]

(c) State the frequency of cells grown with ampicillin on day 3 that contain one chloroplast. [1]

..... %

(This question continues on the following page)



(Question 1 continued)

- (d) Compare the frequency of different types of cells grown without and with ampicillin on day 5. [3]

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- (e) Analyse the effect of ampicillin on *Closterium* cells. [3]

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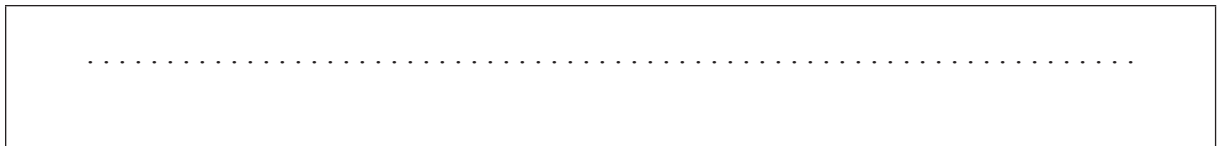
2. The diagram shows a section through the surface of an animal cell.



(a) On the diagram label the membrane components I and II. [2]

(b) (i) On the diagram label III. [1]

(ii) State **one** function of III. [1]



3. (a) Explain how the following influence the enhanced greenhouse effect.

(i) Reforestation of desert

[1]

.....

(ii) Change in energy source from fossil fuels to solar energy

[1]

.....

(iii) Increase in the production of methane

[1]

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*(This question continues on the following page)*



*(Question 3 continued)*

(b) Distinguish between

(i) autotrophs and heterotrophs.

[1]

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.....  
.....

(ii) detritivores and saprotrophs.

[1]

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(iii) bryophyta and filicinophyta.

[1]

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*(Question 3 continued)*

(c) Explain the energy flow in a food chain.

[3]

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(d) Outline the precautionary principle, giving an example.

[2]

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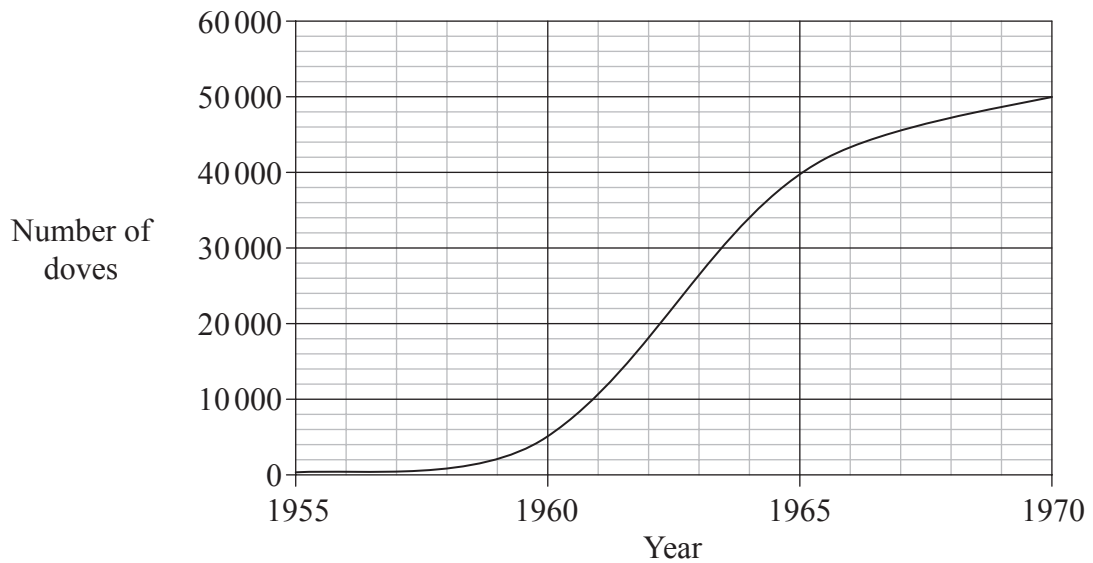
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4. (a) The graph shows a population growth curve for collared doves in the UK.



[Source: ©International Baccalaureate Organization 2015]

- (i) State the name of the stage in the population growth curve occurring between 1961 and 1963. [1]

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- (ii) Explain what is causing the population to rise between 1961 and 1963. [2]

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- (b) State **one** example of evolution in response to an environmental change. [2]

Organism: .....

Selection pressure: .....



**SECTION B**

Answer **one** question. Up to two additional marks are available for the construction of your answer. Write your answers in the boxes provided.

5. (a) Mitosis can only occur when the DNA of a cell has been replicated. Draw the stages in mitosis. [4]
- (b) Describe DNA profiling. [6]
- (c) Explain how a base pair substitution in DNA can cause the disease sickle-cell anemia. [8]
6. (a) Plants and animals both use disaccharides and polysaccharides in a variety of ways. State **one** function of
- a **named** disaccharide and a **named** polysaccharide in plants.
  - a **named** disaccharide and a **named** polysaccharide in animals. [4]
- (b) Explain how glucose is used in both anaerobic and aerobic cell respiration. [8]
- (c) Describe the control of blood glucose concentration in humans. [6]
7. (a) Outline the mechanisms of defence against pathogens in humans. [6]
- (b) *Escherichia coli* is a known pathogen. Draw a labelled diagram of the ultrastructure of *E. coli*. [4]
- (c) Discuss the transmission and social implications of AIDS. [8]



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