



BIOLOGY
STANDARD LEVEL
PAPER 2

Thursday 4 May 2006 (afternoon)

1 hour 15 minutes

Candidate session number

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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 of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.



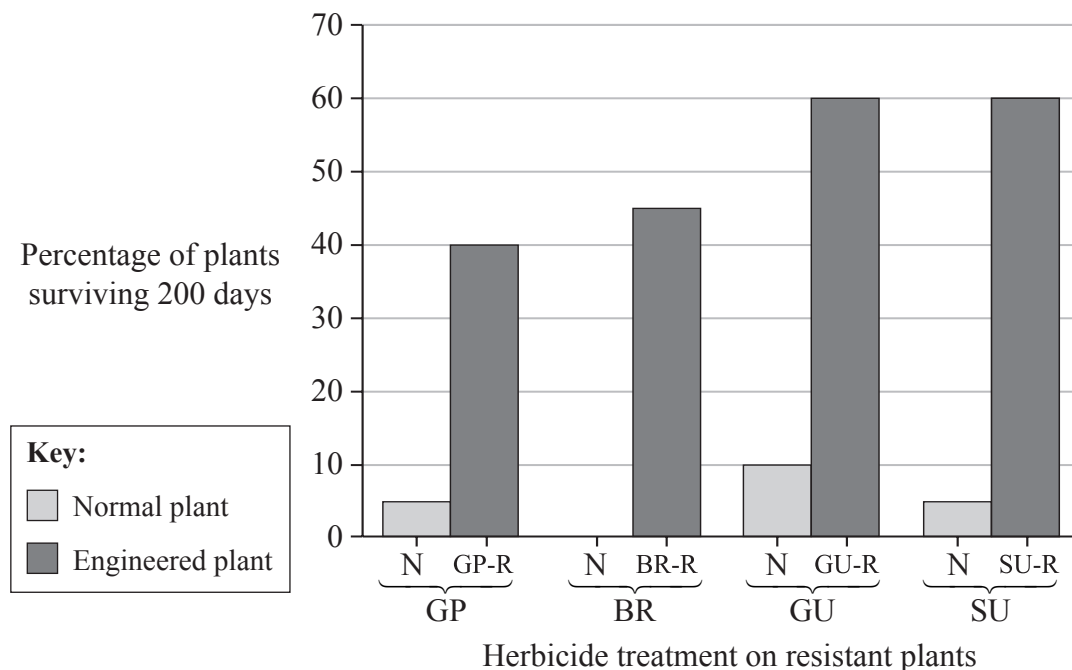
SECTION A

Answer all the questions in the spaces provided.

- Weeds growing with crop plants can reduce yields because they compete for nutrients, water and sunlight. Synthetic chemical herbicides are often used to control these weeds. Herbicides are classified by the kinds of plants they kill and their mechanism of action. Broad-spectrum herbicides kill many different kinds of plants, but often kill the crop plant as well. Genetic engineering can create resistance to specific broad-spectrum herbicides which may solve the problem in crop plants.

Different genes from bacterial sources known to protect against the effects of individual herbicides were engineered into corn plants (*Zea mays*). The resistance of normal and genetically engineered corn plants was measured and compared by calculating the percentage of plants that survived for 200 days with regular herbicide treatments.

Graph 1 Exposure of Normal and Resistant Plants to Different Herbicides



	<i>Herbicide</i>	<i>Resistant Genes</i>
GP	Glyphosate	GP-R
BR	Bromozymil	BR-R
GU	Glufosinate	GU-R
SU	Sulfonylurea	SU-R

(This question continues on the following page)



(Question 1 continued)

(a) (i) Calculate the difference between the survival of engineered plants and normal plants treated with Glyphosate (GP). [1]

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(ii) Identify the engineered plant which shows the greatest difference in resistance to herbicide treatment. [1]

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(iii) Suggest a reason for the difference in survival of the normal plants treated with Glyphosate (GP) and Bromozymil (BR). [1]

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(b) (i) Define the term *genetically modified crop*. [1]

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(ii) State an example of a genetically modified plant other than corn. [1]

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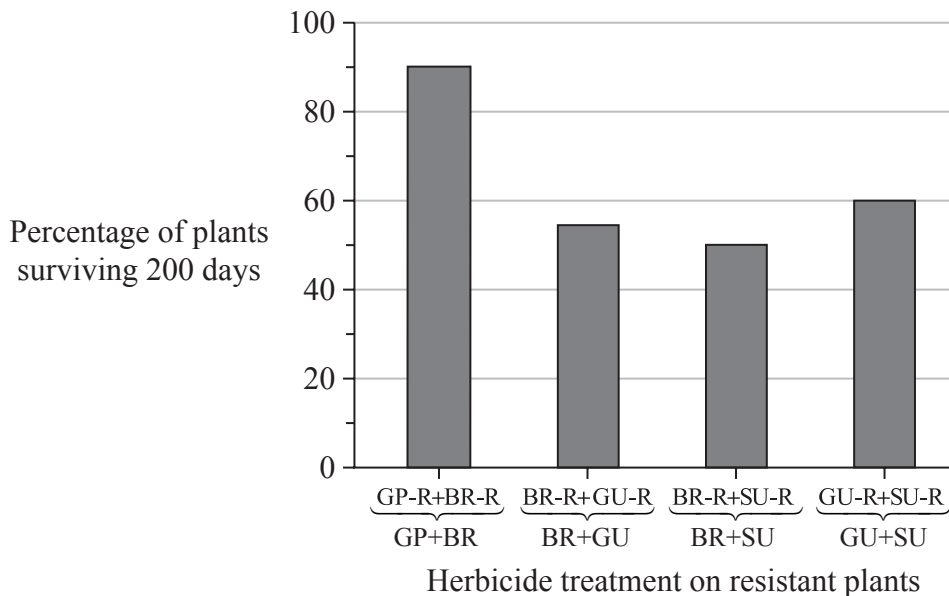
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(Question 1 continued)

The graph below represents data from experiments in which plants were genetically engineered with more than one resistance gene.

Graph 2 Exposure of resistant plants to combinations of herbicides



(c) (i) Using both graphs, compare the data for BR-R with the data for SU-R, and for BR-R+SU-R in the same plant. [2]

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(ii) Suggest a possible reason for these results. [1]

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- (d) Evaluate the effects on survival when combining two herbicide resistance genes in the same plant. [3]

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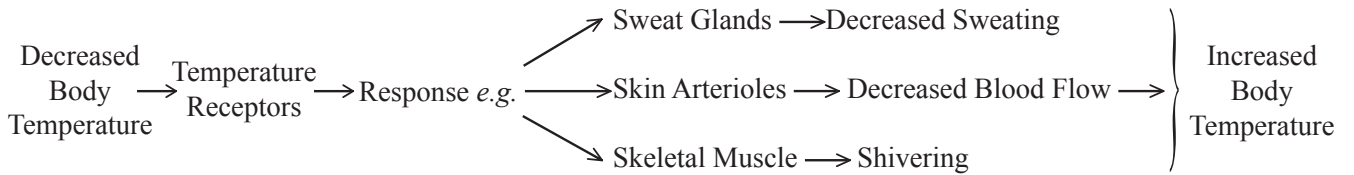
- 2. (a) Explain briefly the principle of negative feedback in homeostasis. [3]

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- (b) Draw an arrow on the diagram below to show where negative feedback occurs. [1]



- (c) State the system used to control the response of the skin arterioles. [1]

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- 3. (a) Identify **two** sources of variation in a species. [2]

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- (b) Explain briefly how natural selection could lead to evolution. [3]

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4. (a) State why each step in a biochemical pathway often requires a separate enzyme. [2]

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- (b) Explain the effects of **either** changing temperature **or** pH on enzyme activity. [3]

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5. (a) Determine the strand of mRNA that is transcribed from the DNA strand below. [1]

A - T - C - C - A - G - G - T - C - A - A - G

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- (b) List **three** of the other molecules, apart from mRNA, required for transcription. [3]

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SECTION B

*Answer **one** question. Up to two additional marks are available for the construction of your answer. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

6. (a) Draw a labelled diagram showing the main features of the ultra structure of an animal [4]
- (b) Explain the process of passive transport across the cell membrane. [8]
- (c) Outline the ethical issues of cloning humans. [6]
7. (a) Draw a labelled diagram showing stages of the carbon cycle. [5]
- (b) Explain how the rate of photosynthesis can be measured. [7]
- (c) Describe why carbohydrates and lipids are used as energy stores. [6]
8. (a) Draw a labelled diagram of the female human reproductive system. [5]
- (b) Describe the development of the early human embryo. [5]
- (c) Explain the role of hormones in the regulation of the menstrual cycle. [8]
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