

Paper Reference(s)

7040/01

London Examinations GCE

Biology

Ordinary Level

Paper 1

Monday 23 May 2005 – Morning

Time: 2 hours

Materials required for examination

Answer book (AB12)

Items included with question papers

Nil

Instructions to Candidates

Answer BOTH questions from Section A and any THREE questions from Section B.

In the boxes on the answer book, write the name of the examining body (London Examinations), your centre number, candidate number, the subject title (Biology), the paper reference (7040/01), your surname, other names and signature.

Answer your questions in the Answer book. Make sure your answers to parts of questions are clearly numbered. Use additional answer sheets if necessary.

Information for Candidates

Calculators may be used.

The total mark for this paper is 100.

The mark allocation is indicated at the end of each question.

The marks for parts of questions are shown in round brackets: e.g. (2).

This paper has seven questions. There are no blank pages.

Advice to Candidates

Write your answers neatly and in good English.

In calculations, show **all** the steps in your working.

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SECTION A

Answer BOTH questions

1. Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Herbicides, pesticides and some applications of genetically modified (GM) plants

Ideally, a herbicide should affect only the target weed and also be 'safe' to both animals and to the environment. To overcome the environmental effects, herbicides that are biodegradable have been developed. However, herbicides are often toxic to crops as well as to weeds. A possible solution to this problem is to develop genetically modified (GM or 'genetically engineered') plants. So far, for GM plants that have been developed, the main commercial application is in the area of herbicide resistance and also of pest control.

It is possible to produce GM crop plants that contain pesticides in their leaves. GM maize plants have been developed that contain a gene taken from the bacterium *Bacillus thuringiensis*. Maize plants containing this gene (the Bt gene) produce a protein that is toxic to some insects. This reduces the need to use pesticide to protect the crop, so less pesticide is released into the environment.

Genetic modification has other possible applications. Using the plant known as oil seed rape, scientists hope to develop a GM plant that can 'manufacture' commercial quantities of plastic. To do this, the scientists have taken genes for making 'plastic' molecules from microbes and inserted the genes into the oil seed rape plant. The plant grows and produces seeds that contain large amounts of a plastic. This plastic can then be used to make many kinds of household products. The plastic made from oil seed rape has two important advantages when compared with plastic manufactured industrially from chemicals. Firstly, the oil seed rape plastic is biodegradable – if buried in the ground, it disappears in about 6 months, producing only carbon dioxide and water. Secondly, the oil seed rape plastic reduces pollution that would result from industrial manufacturing processes.

As another example, using a combination of GM techniques and selective breeding methods, it has been possible to produce rice plants that have improved nutritional qualities. Genes that help in the production of vitamin A have been put into one rice variety, and genes that help enrich the iron content have been put into another variety. Then, using selective breeding methods with these two varieties, a variety of rice that combines both qualities has been produced.

There are both advantages and disadvantages in using GM crops. There are concerns about the safety of foods derived from GM crops and there are also concerns that there will be transfer of genes from GM crops to wild species, by cross-pollination. This could lead to a reduction in species diversity. However, some people argue that the advantages of GM crops outweigh the disadvantages.

- (a) What is the benefit to a farmer of using GM plants that are resistant to herbicides?
(lines 5 and 6) (2)
- (b) What is the benefit to a farmer of using GM plants that produce pesticides? (line 7) (3)
- (c) (i) Name **two** substances given in the passage that are described as biodegradable. (2)
- (ii) Explain what happens to biodegradable substances. (2)
- (d) Outline the steps taken to produce GM plants, including the names of the enzymes used. (3)
- (e) What are the advantages to people of eating rice containing vitamin A and iron? (line 24) (2)

(Total 14 marks)

2. A seal is a mammal that lives on land but feeds in the sea.

The table below shows the amount of oxygen in different parts of the body of a seal with a body mass of 30 kg, during a dive below water.

The table also shows the amount of oxygen in the same body parts of a human with a body mass of 70 kg, during a dive below water.

Part of body	Amount of oxygen in cm ³	
	Seal (body mass 30 kg)	Human (body mass 70 kg)
Lungs	55	720
Blood	1125	1000
Muscle cells	270	240
Tissue fluid	100	200
Total	1550	2160

(Adapted from Biozone Learning Media (UK) www.biozone.co.uk)

- (a) Calculate the total amount of oxygen per kg of body mass in the seal and the total amount of oxygen per kg of body mass in the human. (3)
- (b) (i) During a dive, in a human, 33.3% of the total amount of oxygen gas is in the lungs. Calculate the percentage of the total amount of oxygen gas in the lungs of a seal, during a dive. Show your working. (2)
- (ii) Suggest why the difference in the amount of oxygen in the lungs of these mammals makes it easier for a seal to dive. (2)
- (c) During a dive, cell respiration changes from aerobic to anaerobic. Give **two** ways in which aerobic respiration differs from anaerobic. (2)
- (d) Suggest why a seal can stay under water longer than a human. (2)

(Total 11 marks)

TOTAL FOR SECTION A: 25 MARKS

SECTION B

Answer any **THREE** questions

3. (a) (i) Name a method of reproduction that involves only mitosis. (1)
- (ii) Name **two** processes in living organisms, other than reproduction, that involve mitosis. (2)
- (b) Give **two** ways in which the cells produced by mitosis are different from the cells produced by meiosis. (2)
- (c) (i) Name **two** organs in a mammal in which meiosis takes place. (2)
- (ii) Name **two** structures in a flowering plant in which meiosis takes place and for **each** structure name the cell produced. (4)
- (d) Describe how hormones control the menstrual cycle. (9)
- (e) Describe a controlled experiment you could do to show that warmth is needed for seed germination. (5)

(Total 25 marks)

4. (a) (i) Root hair cells are found at the surface of plant roots. Draw a labelled diagram of a root hair cell. (5)
- (ii) Describe how water gets into a root hair cell from the soil. (3)
- (iii) Describe how mineral ions get into a root hair cell from the soil. (3)
- (iv) Name the tissue that transports water from roots to leaves. (1)
- (b) Give **three** reasons why water is important to plants. (3)
- (c) In the water cycle, some of the water is present in the air. Suggest ways in which this water gets into the air. (4)
- (d) When potted plants are watered, the water flows down the air spaces in the soil. Describe an experiment you could carry out to find out if putting too much water on potted plants slows their growth. Describe and explain the results you would expect to obtain. (6)

(Total 25 marks)

5. (a) Write a balanced chemical equation for photosynthesis. (3)
- (b) Why is photosynthesis important in plants? (3)
- (c) Explain how the structures in a leaf help in the process of photosynthesis. (10)
- (d) (i) Light intensity is an abiotic factor that affects the rate of photosynthesis. Name **three** other abiotic factors that can affect the rate of photosynthesis. (3)
- (ii) Describe a controlled experiment you could carry out to find out the effect of light intensity on the rate of oxygen production by a water plant. (6)

(Total 25 marks)

6. (a) Explain the meaning of the following feeding relationships, giving **one** appropriate example in **each** case.
- (i) Mutualism (3)
 - (ii) Parasitism (3)
 - (iii) Saprophytism (3)
- (b) Give an example of **one** disease caused by **each** of the following and describe the method of transmission.
- (i) Bacteria (2)
 - (ii) Viruses (2)
- (c) Describe a simple experiment you could carry out to determine the effect of temperature on the growth of a fungus (such as yeast or a mould fungus). (6)
- (d) (i) Give **three** features that are characteristic of insects. (3)
- (ii) Explain what is meant by metamorphosis and describe its importance in the life cycle of insects. (3)

(Total 25 marks)

7. (a) (i) Give **two** ways that forest land can be used for agriculture, after the forest has been cut down (deforestation). (2)
- (ii) Describe and explain **three** disadvantages of deforestation. (6)
- (b) (i) Describe an experiment you could carry out to show that mineral fertiliser improves the growth of plants. (6)
- (ii) Give **three** reasons why farmers should avoid adding too much mineral fertiliser to their fields. (3)
- (c) Describe the way in which fish farming is carried out to provide a source of animal protein. (8)

(Total 25 marks)

TOTAL FOR SECTION B: 75 MARKS

END

Edexcel Limited gratefully acknowledges the following source in the preparation of this exam paper:

Biozone.co.uk, 2003