Paper Reference(s)

7040/01

London Examinations GCE

Biology

Ordinary Level

Paper 1

Monday 27 May 2002 – 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.
Write your answers in the answer book. Make sure your answers to parts of questions are clearly numbered. Use supplementary answer sheets if necessary.

Information for Candidates

The total mark for this paper is 100.
The mark allocation is indicated at the end of each question.
Marks for parts of questions are shown in round brackets: e.g. **(2)**.
This paper has seven questions. Page 8 is blank.

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 which follow.

Maggot cure for 'unbeatable bug'

Maggots may be the answer to antibiotic resistant infections. Doctors say that maggots are able to clear up methcillin resistant *Staphylococcus aureus* (known as MRSA) – the bacteria that have defeated most other drugs and have become a problem in many hospitals. Doctors even suggest that early use of maggots on infected wounds would in many cases reduce the need for treatment with antibiotics.

It is not fully understood how the maggots work. But there are three main theories – they may produce anti-bacterial agents, or suck up the bacteria, or perhaps change the acidity of an infection.

Maggots were widely used for medicinal purposes as early as 1900 but with the introduction of antibiotics in the 1940s their use died out. Now, with the rise of antibiotic-resistant infections, there is renewed interest. The maggots are used to treat ulcers, pressure sores and infections caused by diabetes. The maggots used are sterile greenbottle fly larvae. These are used because they digest only dead tissue and do not burrow down into live flesh. Other larvae, for example the screw worm, do eat living tissue.

The greenbottle maggots are used when they are only three days old and two millimetres long. They are applied to the wound, sealed in with a bandage and left to feed. They release enzymes that break up the dead tissue and liquify it. The maggots then suck up the liquid, clearing up the infection as they go.

(*BBC online network news 18/3/99*)

(a) Methcillin is an antibiotic. Explain why bacteria that have become resistant to antibiotics have led to problems in many hospitals. (Line 3)

(2)

(b) Suggest why 'a change in the acidity' might reduce the infection. (Line 6)

(1)

(c) The greenbottle fly is a dipteran fly and the maggot is the larval stage. Name the other stages in the life cycle, in the correct order.

(2)

(d) Greenbottle larvae are used in preference to other larvae, such as the screw worm. Suggest why greenbottle larvae are used. (Line 10)

(2)

(e) (i) The maggots produce enzymes (Line 14) that break up and liquify the dead tissue. Name **one** enzyme that the maggots would release and name the product(s) of this reaction.

(2)

(ii) In what way is this nutrition similar to the nutrition of a mould fungus?

(1)

(f) The increase in the number of *Staphylococcus aureus* that are resistant to antibiotics is the result of mutations. Explain what is meant by **mutation**.

(2)

(Total 12 marks)

2. A student carried out an investigation into the effect of different concentrations of sodium chloride solution on potato tissue.

Six cubes, each measuring 2 cm × 2 cm × 2 cm, were cut from a large potato. The cubes were placed on filter paper, gently blotted dry and weighed. Two cubes were then placed in petri dishes in each of three solutions as follows: 10% sodium chloride solution, 2% sodium chloride solution and distilled water. The potato cubes were left in the solutions for 2 hours, then removed, blotted as before and weighed again. The results are shown in the table below.

Solution	Initial mass of cubes in g	Final mass of cubes in g	Change in mass in g	Change in mass (%)
10% sodium chloride	10.7	9.8	– 0.9	–8.41
2% sodium chloride	10.9	10.8		
Pure water	11.3	13.0	+ 1.7	+15.04

(a) Why were the cubes gently blotted dry before weighing?

(1)

(b) Calculate the change in mass and percentage change in mass for the potato cubes in 2% sodium chloride solution.

(3)

(c) Explain the difference between the changes in mass for potato cubes in pure water and in the 10% sodium chloride solution.

(5)

(d) Why is it more appropriate to compare percentage change in mass rather than the change in mass?

(1)

(e) Suggest another method of investigating the effect of the different solutions on potato cubes that does not require weighing the cubes.

(3)

(Total 13 marks)

TOTAL FOR SECTION A: 25 MARKS

SECTION B

Answer any THREE questions

3. (a) Name **four** components found in human blood. For each named component give **one** function that it carries out.

(8)

(b) (i) Plants have **two** transport systems. Name these two systems, and for each system, name **one** substance it transports.

(4)

(ii) Explain why unicellular organisms such as an amoeba do not need a transport system.

(2)

(c) Explain how the alveoli in a mammal are adapted for the function of gas exchange.

(5)

(d) Gas exchange in a leaf can be affected by the environmental conditions surrounding the leaves. Explain how each of the following changes would affect the gases passing into and out of the leaf.

(i) An increase in light intensity

(3)

(ii) An increase in temperature

(3)

(Total 25 marks)

4. (a) Describe how the human kidney excretes the waste products of protein metabolism.

(8)

(b) A major function of the human kidney is osmoregulation. This allows the body to expel excess water and maintain the water balance in the body. The desert rat is a mammal which is able to conserve water by producing very concentrated urine.

(i) Suggest **one** advantage to the desert rat of producing very concentrated urine.

(1)

(ii) The desert rat never drinks water. Suggest where its body water comes from.

(1)

(iii) The desert rat is nocturnal. It is active at night and rests during the day. Suggest how this behaviour might benefit this organism.

(3)

(c) The human skin is an organ of excretion. Name **two** waste products that it excretes and in each case state its origin.

(4)

(d) Describe how the nitrogenous wastes from animals are recycled and converted into a form that flowering plants can absorb.

(8)

(Total 25 marks)

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5. (a) Describe a simple controlled experiment that shows how the stem of a plant responds to light from one direction. Include the results you would expect.

(7)

(b) Human response to stimuli may involve hormonal or nervous communication.

(i) Give **four** ways that the hormonal system differs from the nervous system.

(4)

(ii) Describe the role of hormones in the control of blood sugar levels in humans.

(8)

(iii) Your hand touches a hot object. Describe the sequence of events that occur to enable it to be withdrawn immediately.

(6)

(Total 25 marks)

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6. (a) Give **three** ways in which sexual reproduction differs from asexual reproduction.

(3)

(b) Name **four** structures in the human male reproductive system and describe **one** function of each.

(8)

(c) By means of a genetic diagram, show how sex is inherited in humans.

(4)

(d) Pea plants can be tall or dwarf. The condition is controlled by a single pair of alleles. Some breeding experiments were carried out with pea plants.

In Cross 1, pure-breeding tall plants were crossed with pure-breeding dwarf plants. All the offspring grew into tall plants.

In Cross 2, the tall offspring from Cross 1 were allowed to self-pollinate and some of the offspring grew into tall plants and some into dwarf plants.

(i) Using a genetic diagram, show how Cross 1 produced all tall offspring.

(4)

(ii) Using a genetic diagram, show what offspring would be produced if a tall plant from the offspring of Cross 1 was crossed with a dwarf plant.

(4)

(iii) If the plants produced from Cross 2 are allowed to self-pollinate, what proportion would continue to produce only tall plants? Explain your answer.

(2)

(Total 25 marks)

7. (a) For a local ecosystem, describe the methods you could use to find out the organisms that are present and estimate their relative numbers.

(6)

(b) Describe what is meant by each of the following feeding relationships, and in each case, give **one** example.

(i) Parasitism

(3)

(ii) Saprophytism

(3)

(iii) Mutualism

(3)

(c) Describe how each of the following changes would affect the carbon cycle.

(i) Deforestation

(3)

(ii) Industrialisation

(3)

(d) (i) Give **one** example of a pollutant of water and state its effect.

(2)

(ii) Give **one** example of a pollutant of air and state its effect.

(2)

(Total 25 marks)

TOTAL FOR SECTION B: 75 MARKS