Paper Reference(s)

7040/02

London Examinations GCE

Biology

Ordinary Level

Paper 2

Tuesday 20 January 2009 – Afternoon

Time: 2 hours

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
The paper is arranged in THREE sections, A, B and C.
In Section A, answer ALL questions.
In Section B, answer any TWO questions.
In Section C, answer any TWO questions.
Write your answers in the spaces provided in this question paper.
Indicate which question you are answering by marking the box (☒). If you change your mind, put a line through the box (☒) and then indicate your new question with a cross (☒).

Information for Candidates

Calculators may be used.
The total mark for this paper is 100.
The marks for parts of questions are shown in round brackets: e.g. **(2)**.
This paper has 12 questions. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.
In calculations, show **all** the steps in your working.

Turn over

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

Emphysema

1   Each time you breathe in, bacteria enter your lungs. Usually these bacteria do not make you ill because they are ingested and digested by white blood cells found on the surface of the air sacs. The bacteria are digested by a protease enzyme. This enzyme is useful because it protects you from infection and also digests damaged or dying
5   cells. However, it can also digest healthy lung tissue.

Normally this protease enzyme is prevented from digesting your lung tissue by a protein made in your liver. This protein is called alpha-1 antitrypsin (A1T). If present in sufficient amounts, the A1T protein destroys the protease enzyme before it can damage the lung tissue. However, problems can occur if too much protease enzyme
10   is released or if not enough A1T protein is produced. In this situation, the protease enzyme may attack the lung tissue.

Smoking cigarettes encourages the white blood cells to release too much protease enzyme. This is one reason why people who smoke are likely to develop emphysema, a lung disorder in which the air sacs become damaged and some are destroyed.
15   People with emphysema struggle to achieve normal gas exchange and find exercise very difficult.

The ability to make A1T is controlled by a gene that is inherited. The gene has different alleles. The allele (**A**) for making A1T is dominant to the allele (**a**) for not being able to make A1T. Most people are homozygous dominant for the A1T gene
20   and have healthy lungs. People who are heterozygous are known as carriers for the condition and also have healthy lungs. However, people who are homozygous recessive for the A1T gene cannot make enough A1T. These people are likely to develop emphysema.

Since A1T deficiency is an inherited disorder, it occurs when both parents pass on a
25   recessive allele to their child. A father and mother who are both carriers could expect to have a 50% chance of having a child who is a carrier, a 25% chance of having a healthy child and a 25% chance of having a child who is deficient in A1T.

(a) What is meant by each of the following terms as used in the passage?

(i) Ingested (line 2)

....

....
(1)

(ii) Digested (line 2)

....

....
(1)

(iii) Gas exchange (line 15)

....

....

....

....
(2)

(b) Describe the problems that might occur in the lungs if the protease enzyme is allowed to attack lung tissue. (line 11)

....

....

....

....

....

....
(3)

(c) Suggest why people with emphysema find it difficult to exercise. (line 15)

....

....

....

....
(2)

BLANK PAGE

(d) Use a genetic diagram to show the possible genotypes and phenotypes of children produced by two parents heterozygous for the A1T gene.

(4)

(e) Emphysema can result from genetic or environmental factors.

(i) Name **one** other human characteristic that is controlled only by a genetic factor.

....

(1)

(ii) Name **one** other human characteristic that is influenced by genetic and environmental factors.

....

(1)

Q1

(Total 15 marks)

2. The biomass of plants and animals was measured in two ponds, A and B. The biomass was measured in g per 100 litres of pond water. The results are shown in Table 1.

Table 2 shows the change in the level of dissolved oxygen and in the pH of the two ponds from early morning (08.00) to just after midday (12.30).

Table 1

Pond A		Pond B	
Plant biomass in g per 100 litres	Animal biomass in g per 100 litres	Plant biomass in g per 100 litres	Animal biomass in g per 100 litres
5 688	189	3	3 618

Table 2

Time	Pond A		Pond B	
	Oxygen in mg per litre	pH	Oxygen in mg per litre	pH
08.00	13.3	8.3	5.1	8.0
09.30	22.3	8.8	4.6	8.0
11.00	25.1	9.0	4.1	7.9
12.00	26.2	9.0	3.9	7.9
12.30	26.0	9.0	3.8	7.8

(a) Calculate the total animal biomass in 500 litres of pond water from Pond A.

....

(1)

(b) (i) Calculate the percentage change in the level of oxygen from 08.00 to 12.30 in Pond B. Show your working.

Answer .... %

(3)

(ii) Suggest **two** physical factors that are involved in the change in the level of oxygen in Pond A from 08.00 to 12.30. Explain how a change in these factors leads to a change in the oxygen level.

....

....

....

....

....

....

(3)

(c) Suggest why the changes in pH in Pond A from 08.00 to 12.30 are different from the changes in Pond B.

....

....

....

....

....

....

(3)

(Total 10 marks)

Q2

3. The diagram below shows a section through a pitfall trap used to collect small animals. If the animals fall into the trap they cannot escape.
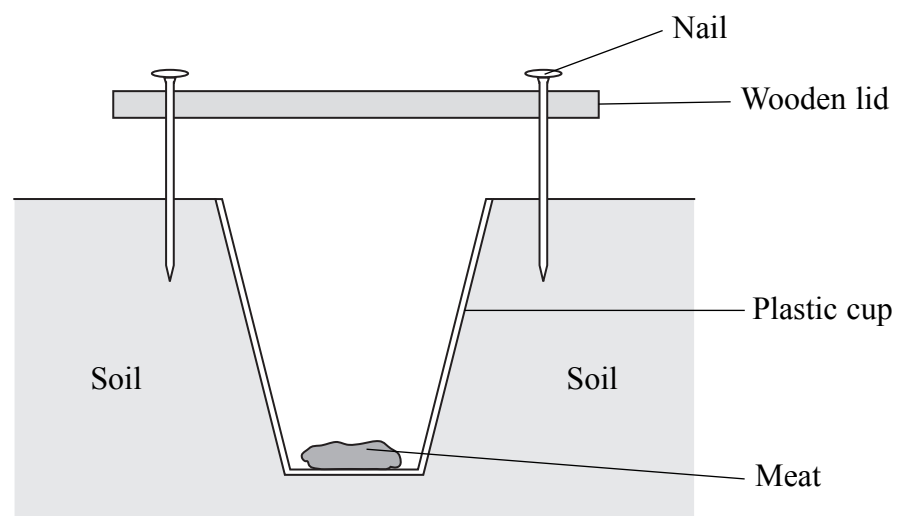
The trap was used to investigate the number of different animals active in a field during the day and during the night. The results are shown in the table below.

Animal	Number caught during the day	Number caught during the night
Beetles	1	20
Earthworms	0	12
Spiders	1	4
Woodlice	10	36

(a) Suggest reasons for the differences in the number of animals caught during the day and the number of animals caught at night.

....

....

....

....

....

....

(3)

(b) (i) Suggest why the lid is needed.

....

....

....

(1)

(ii) Suggest why the meat is placed in the trap.

....

....

....

(1)

(iii) Suggest **two** features about the meat that must be kept the same for the investigation to be fair.

1 ....

....

2 ....

....

(2)

(Total 7 marks)

Q3

4. The diagram below shows the apparatus used by a student to measure the heat produced by germinating seeds.

Vacuum flask

Germinating
seeds

Dead seeds

Cotton wool

Thermometer
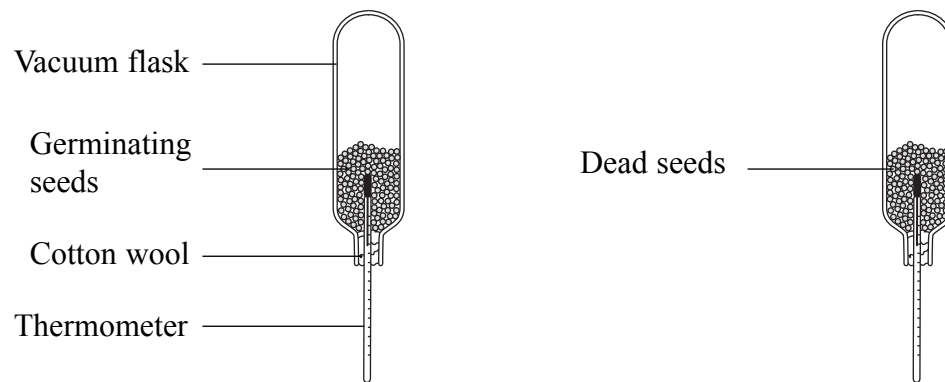
(a) The table below shows the steps used to set up the apparatus and the reason for each step. Complete the table by writing reasons in each empty box. One has been done for you.

Step	Reason for step
1. Soak one set of seeds in water for 24 hours	
2. Boil second set of seeds	
3. Wash both sets of seeds in disinfectant	
4. Place each set of seeds in a different vacuum flask and leave for several days	Compare heat production

(3)

(b) Why is a vacuum flask used to contain the seeds?

....

....

(1)

(c) Suggest why cotton wool is used to plug the vacuum flasks rather than a rubber bung.

....

....

....

....

(2)

(d) Describe and explain the results you would expect after several days.

....

....

....

....

(2)   **Q4**

(Total 8 marks)

5. An investigation was carried out into carbon dioxide production during the decomposition of a small dead mammal.

The volume of carbon dioxide was measured for one hour on alternate days over a period of 13 days. The table below shows the rate of carbon dioxide production on these days.

Day	Rate of carbon dioxide production in cm³ per hour
1	0.1
3	0.4
5	1.0
7	2.5
9	0.7
11	0.3
13	0.1

(a) Plot a line graph on the grid below to show carbon dioxide production during the investigation. Use a ruler to join the points with straight lines.

(5)
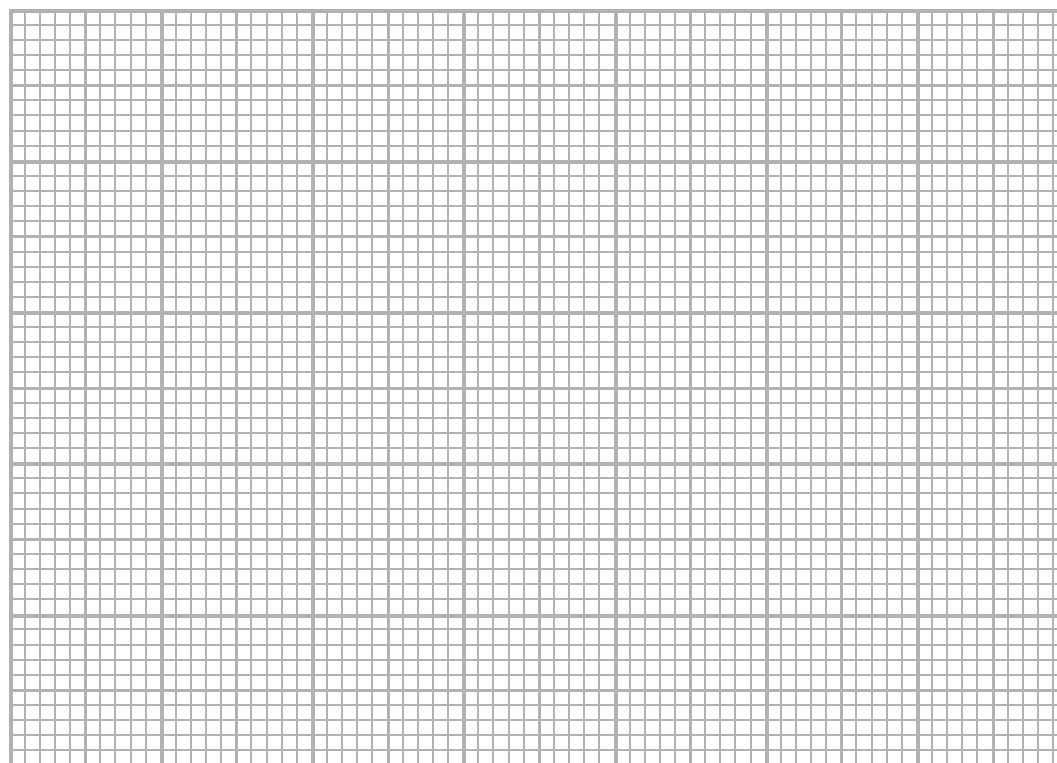
(b) (i) Describe the changes in the rate of carbon dioxide production during the 13 days.

....

....

....

....

(2)

(ii) Suggest an explanation for the changes in the rate of carbon dioxide production during the 13 days.

....

....

....

....

....

....

(3)

(c) Name **two** factors that could affect the rate of decomposition of the animal. For **each** factor explain how it would affect the rate.

1 ....

....

....

....

2 ....

....

....

....

(4)

Q5

(Total 14 marks)

6. Describe an investigation to find out how smoking cigarettes affects heart rate.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

Q6

(Total 6 marks)

TOTAL FOR SECTION A: 60 MARKS

BLANK PAGE

TURN OVER FOR SECTION B

SECTION B

Answer TWO questions in this section. If you change your mind, put a line through the box ($\boxtimes$) and then indicate your new question with a cross ($\boxtimes$).

Where appropriate you may draw diagrams to make your answer clearer.

If you answer Question 7, put a cross in this box $\boxtimes$.

7. (a) Describe the differences between aerobic and anaerobic respiration in mammals.

....

....

....

....

....

....

....

....

....

....

(4)

(b) Suggest why smaller mammals often have a higher respiration rate than larger mammals.

....

....

....

....

....

....

....

....

....

....

(4)

(Total 8 marks)

Q7

If you answer Question 8, put a cross in this box ☒ .

8. (a) Describe the similarities between the changes that take place in water polluted by sewage and in water polluted by fertilisers.

....

....

....

....

....

....

....

....

....

(4)

    (b) Explain why there is a limit to the number of links found in food chains.

....

....

....

....

....

....

....

....

....

....

(4)

Q8

(Total 8 marks)

9. (a) Explain how the growth of microorganisms in a fermenter would be affected if the paddles failed to work.

....

....

....

....

....

....

....

....

....

....

(4)

   (b) What are cloned transgenic animals and how might they be of use in the future?

....

....

....

....

....

....

....

....

(4)

(Total 8 marks)

TOTAL FOR SECTION B: 16 MARKS

SECTION C

Answer TWO questions in this section. If you change your mind, put a line through the box (⧄) and then indicate your new question with a cross (⌧).

Where appropriate you may draw diagrams to make your answer clearer.

If you answer Question 10, put a cross in this box ⌧ .

10. Describe the methods that can be used by farmers to increase the production of food crops.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

Q10

(Total 12 marks)

If you answer Question 11, put a cross in this box ☒ .

11. How does the structure of different blood vessels help them to carry out their roles?

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

Q11

(Total 12 marks)

If you answer Question 12, put a cross in this box ⊠ .

12. Describe how the human kidney is able to regulate the concentration of the blood.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

Q12

(Total 12 marks)

TOTAL FOR SECTION C: 24 MARKS

TOTAL FOR PAPER: 100 MARKS

END

BLANK PAGE

BLANK PAGE

BLANK PAGE