Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						7	0	4	0	/	0	2	Signature	

Paper Reference(s)

7040/02

London Examinations GCE

Biology

Ordinary Level

Paper 2

Wednesday 9 May 2007 – Afternoon

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

The paper is arranged in three sections, A, B and C.
In Section A, answer ALL questions in the spaces provided in this book.
In Section B, answer any TWO questions in the spaces provided in this book.
In Section C, answer any TWO questions in the spaces provided in this book.
In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
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 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 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.

Printer's Log. No.
A25935A
W850/U7040/57570 4/6/4/2/2/1

A 2 5 9 3 5 A 0 1 2 4

Turn over

edexcel
advancing learning, changing lives

Leave blank

SECTION A

Answer ALL questions in this section

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

Athletes and their respiration

Adam is an athlete. When he starts to run quickly, his muscles contract and stores of available energy in his muscle cells are used up. In order to continue using his muscles, Adam must release more energy as fast as he requires it. This energy is released by aerobic respiration. How fast the energy is released depends upon how fast his muscles are supplied with oxygen. A fit athlete can absorb about 4 dm^3 (litres) of oxygen per minute and release about 80 kJ of energy. However, only about 20% of this energy is available for movement.

The energy released by using the 4 dm^3 of oxygen would enable a fit athlete to run at a speed of about 20 km per hour. If this athlete could keep up this speed for over two hours, he would have a good chance of winning a medal in an Olympic marathon race. To win a short sprint event, however, he would need to run nearly twice as fast. He obtains the energy for this extra speed from anaerobic respiration. This more than doubles the energy available to the athlete, but anaerobic respiration cannot continue at this rate for more than a short time.

In a 100 m race, most of the energy required is released by anaerobic respiration. The same is true of jumping and throwing events. In middle distance races, such as the 800 m and 1500 m, athletes obtain about half the energy they require from aerobic respiration and the other half from anaerobic respiration. A good middle distance runner judges his speed so that the combined energy supplied by aerobic and anaerobic respiration is enough to get him to the finish before the build up of lactic acid affects his muscles.

After an event involving anaerobic respiration, the athlete continues to breathe heavily so that he can obtain oxygen to convert lactic acid to harmless products. This extra amount of oxygen is called the 'oxygen debt'. The maximum oxygen debt that an athlete can build up is about 17 dm^3. It may take an athlete up to 45 minutes to repay this debt and his breathing to return to normal.

(a) Which substance found in muscle cells acts as an energy store?

.....

(1)

(b) What is the oxygen required for? (line 5)

.....

(1)

Leave blank

(c) Describe what happens to the 80% of energy that is not available for the athlete to use for movement. (line 6)

.....

.....

.....

.....

(2)

(d) Suggest why anaerobic respiration can continue only for a short period of time. (line 14)

.....

.....

.....

.....

(2)

(e) Suggest why oxygen is not used during jumping and throwing events. (line 16)

.....

.....

.....

.....

(2)

(f) In a long distance race, such as a marathon, suggest what proportion of the total energy needed would come from anaerobic respiration. Give a reason for your answer.

.....

.....

.....

.....

(2)

BLANK PAGE

Leave blank

(g) Explain why the breathing rate is higher than normal just after an athlete finishes a sprint race. (line 26)

.....

.....

.....

.....

(2)

(h) Suggest **two** characteristics of a middle distance athlete's body that would influence their performance.

1 .....

.....

2 .....

.....

(2)

Q1

(Total 14 marks)

Leave blank

2. Hoagland was a scientist who measured the concentration of mineral ions in the cell sap of a freshwater plant. He also measured the concentration of several ions found in the pond water in which the plant lived. His results are shown in the table below.

Location	**Concentration of ions in mg per litre**				
	Sodium	Potassium	Magnesium	Calcium	Chloride
Cell sap	1980	2400	260	380	3750
Pond water	28	2	360	26	35

(a) Which mineral ion has the greatest difference in concentration between the cell sap and the pond water?

.....

(1)

(b) Name **one** ion that could have entered the plant by diffusion. Explain your answer.

.....

.....

.....

.....

.....

.....

(3)

(c) Suggest the function of the magnesium ions in the plant.

.....

(1)

(d) Hoagland found that some ions were absorbed only if oxygen was bubbled through the pond water. Explain this observation.

.....

.....

.....

.....

.....

.....

(3)

Leave blank

(e) Plants need carbon dioxide to carry out photosynthesis. Suggest where the water plant gets its carbon dioxide from.

.....

(1)

(f) Plants require carbon dioxide and mineral ions for successful growth. Name **one** other factor the water plant needs for growth and explain why it is necessary.

.....

.....

.....

.....

(2)

Q2

(Total 11 marks)

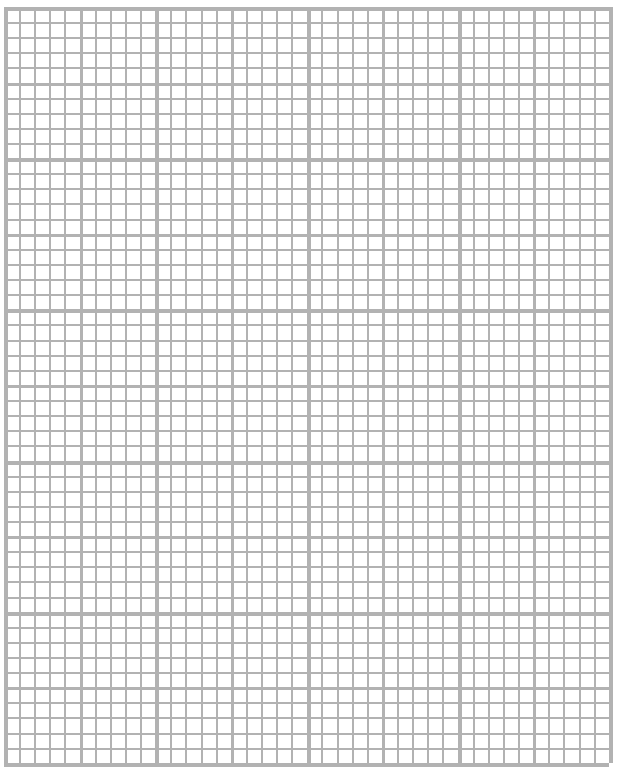
Leave blank

3. Mussels are animals that live on rocky sea shores, attached to rocks. They feed by filtering plankton (microscopic plants and animals) from seawater. The shore is covered by seawater twice a day because the sea rises and falls between the low water and high water marks. Mussels living near the low water mark are covered by seawater for a longer time than the mussels living near the high water mark.

An experiment was carried out to find the rate at which mussels from different places on the shore filter plankton out of seawater. The mussels were put into beakers containing plankton, and the percentage of plankton remaining in the water was measured every hour for four hours. The results are shown in the table below.

Time in hours	**Percentage of plankton remaining in beakers**	
	Mussels near high water mark	Mussels near low water mark
0	100	100
1	82	88
2	60	76
3	39	62
4	20	50

(a) (i) Plot a graph of these results on the grid below. Join the points with straight lines.



(5)

Leave blank

(ii) Over the four-hour period the mussels from near the high water mark removed plankton at the rate of 20% per hour. At what rate did the mussels from near the low water mark remove plankton from the water?

.....

(1)

(iii) Suggest an explanation for the relationship between the place where the mussels live on the shore and their filtering rate.

.....

.....

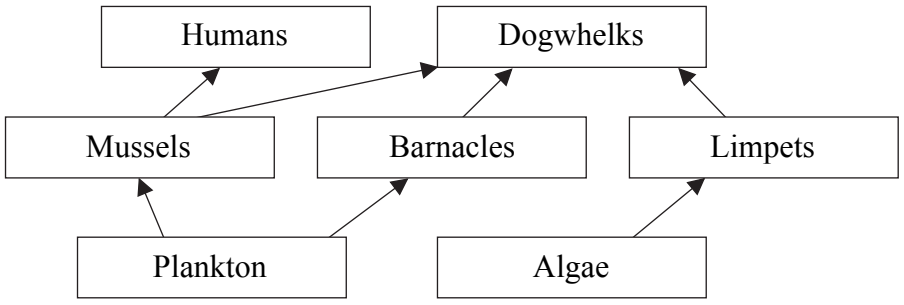
.....

.....

(2)

Leave blank

(b) The food web shown below includes mussels.



(i) How many different food chains are contained in this food web?

.....

(1)

(ii) Name the primary consumers in this food web.

.....

(1)

(iii) In the space below draw and label a pyramid of biomass for this food web.

(3)

(Total 13 marks)

Q3

Leave blank

4. Describe an experiment you could carry out to show the effect of different carbon dioxide concentrations on the growth of a plant.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

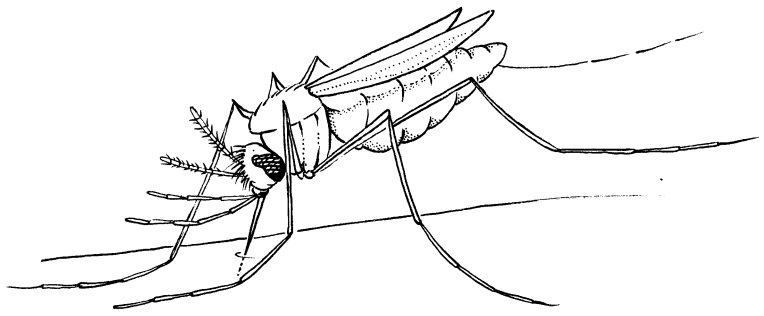
.....

Q4

(Total 6 marks)

Leave blank

5. The diagram below shows a mosquito feeding on blood from a human arm.



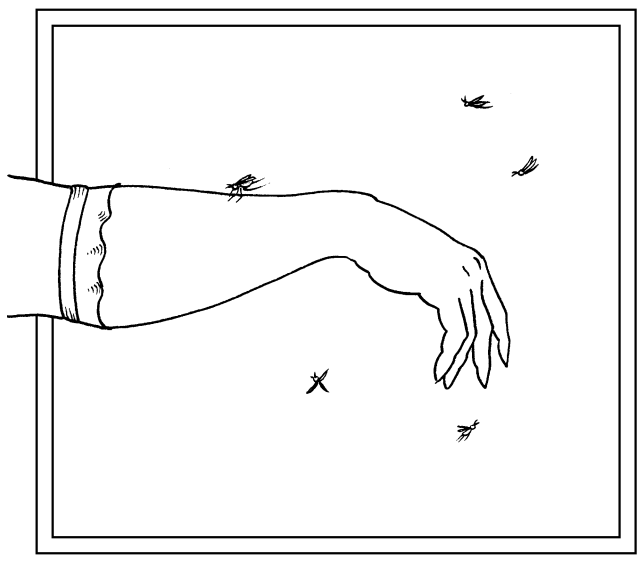
(a) Name **two** substances in human blood that the mosquito could use for energy.

1 .....

2 .....

(2)

(b) Repellants contain chemicals that stop mosquitoes biting humans. Any new repellant needs to be tested to see if it works. Scientists do this by spraying this new repellant onto the arms of a number of people. These people then put their arms into a sealed tank containing mosquitoes, for 10 minutes. The diagram below shows what the apparatus looks like.



Leave blank

In one experiment the number of mosquito bites on each arm was counted and compared with a control group. The table below shows the results.

Arm	**Number of mosquito bites**	
	New repellant	Control
1	1	10
2	0	15
3	1	10
4	2	11
5	1	14
Average	**1**	**?**

(i) Calculate the average number of bites for the control group.

.....

(1)

(ii) Suggest what treatment could have been used with the control group.

.....

.....

(1)

(iii) Name **two** factors that must be kept the same to make sure the experiment is a fair test.

1 .....

2 .....

(2)

(iv) What conclusion about the new repellant can you make from these data? Explain your answer.

.....

.....

.....

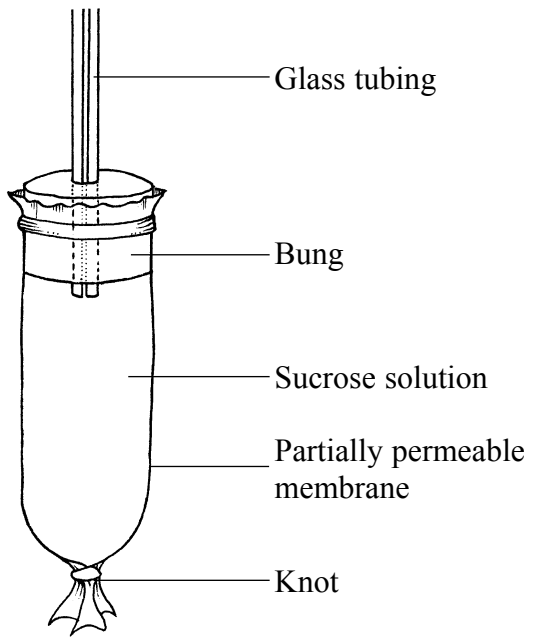
.....

(2) **Q5**

(Total 8 marks)

Leave blank

6. The diagram below shows a bag containing a sucrose solution. The bag is made from a material that acts as a partially permeable membrane.



(a) What is meant by the term **partially permeable membrane**?

.....

.....

.....

.....

(2)

(b) At the start, the bag containing the sucrose solution weighed 30 g. The bag was then put into a beaker of water for one hour. After one hour the bag was taken out of the water and weighed again. It then weighed 33 g.

(i) Calculate the percentage increase in mass of the bag after one hour. Show your working.

Answer .....

(2)

Leave blank

(ii) Explain why the bag increased in mass after one hour.

.....

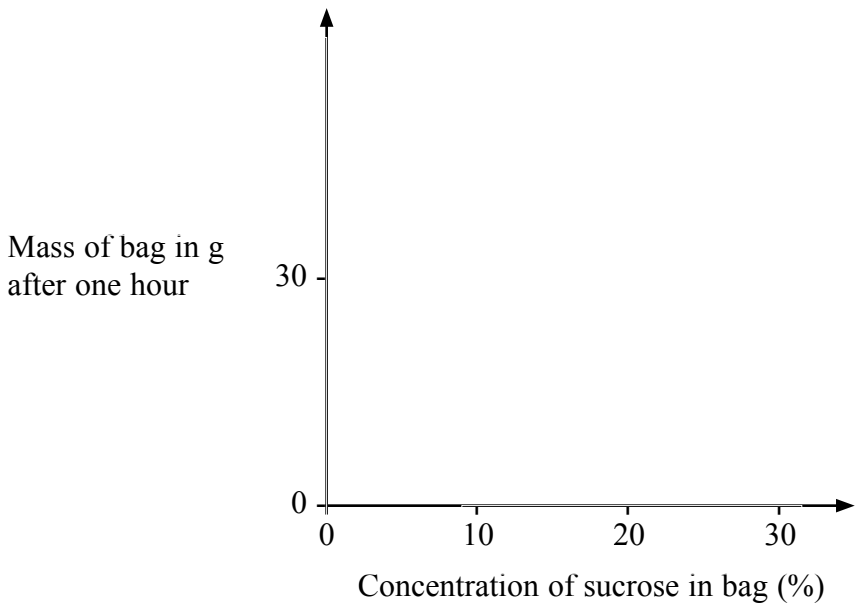
.....

.....

.....

(2)

(iii) In a further experiment, four bags containing 30 g of sucrose solution of 0%, 10%, 20% and 30% concentrations were put into water. After one hour they were weighed again. Sketch a line on the graph below to show the results you would expect.



(2) **Q6**

(Total 8 marks)

TOTAL FOR SECTION A: 60 MARKS

Leave blank

SECTION B

Answer TWO questions in this section. Where appropriate you may draw diagrams to make your answer clearer. Write your answers in the spaces provided.

If you answer Question 7, put a cross in this box ☒.

7. (a) Explain how the response of a plant shoot to light differs from its response to gravity.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4)

(b) How does nervous communication differ from hormonal communication in animals?

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4) **Q7**

(Total 8 marks)

Leave blank

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

8. A large area of forest was cut down and the land was cleared. Explain how this might affect each of the following cycles.

(a) The carbon cycle

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4)

(b) The water cycle

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4) **Q8**

(Total 8 marks)

Leave blank

If you answer Question 9, put a cross in this box ☒.

9. An industrial fermenter is a large container used to culture microorganisms. Suggest and explain what effect each of the following would have.

(a) A failure in temperature control

.....

.....

.....

.....

.....

(3)

(b) A breakdown of the paddle stirrers

.....

.....

.....

.....

.....

.....

(3)

(c) A lack of aseptic conditions

.....

.....

.....

.....

(2) **Q9**

(Total 8 marks)

TOTAL FOR SECTION B: 16 MARKS

Leave blank

SECTION C

Answer TWO questions in this section. Where appropriate you may draw diagrams to make your answer clearer. Write your answers in the spaces provided.

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

10. Describe and explain the mechanisms by which oxygen from the atmosphere is taken into the human body and absorbed into the blood stream.

Leave blank

Q10

(Total 12 marks)

Leave blank

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

11. With reference to named examples, describe the causes of pathogenic diseases, how their spread can be controlled and how the body responds to infection.

Leave blank

Q11

(Total 12 marks)

A 2 5 9 3 5 A 0 2 2 2 4

Leave blank

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

12. Describe and explain the methods that are used to farm large numbers of fish to provide a source of protein.

Leave blank

Q12

(Total 12 marks)

TOTAL FOR SECTION C: 24 MARKS

TOTAL FOR PAPER: 100 MARKS

END