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 7 May 2008 – 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	
Total	

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.
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.
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 11 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.

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SECTION A

Answer ALL the 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.

Artificial selection

In the process of artificial selection, humans act as the agent of selection. The process is controlled by people and is not the result of selection by natural events. For this reason, it is called artificial selection to distinguish it from those processes of selection that people do not control. We refer to these as natural selection.

Many people who breed animals and plants wish to produce individuals with particular characteristics. A farmer may want to produce cattle that give a high yield of meat, sheep with high quality wool or disease-resistant wheat. The farmer chooses those animals likely to produce offspring approaching their desired type, and allows them to mate. Similarly, for plants, the breeder sets up cross-pollination between parents with the desired characteristics. Offspring are then selected and the process is repeated until the desired type is reached.

Cattle in India provide a useful example of the value of selective breeding. For centuries the typical Indian cow was a semi-wild creature. Its breeding was unplanned and its milk yield small. Government farms tried several ways to improve these cattle. First they gave them better food, but this did not significantly improve their milk yield. The cows were easily frightened and when they were being milked, their teats (nipples) closed up and little milk would pass from them. The traditional form of milking had been to have a calf sucking on one teat while the others were milked by hand. This calmed the cow but was uneconomical. Eventually, after some years of selective breeding a strain of less excitable cattle was produced, willing to be milked entirely by hand. By carefully regulating the diet of these cattle it was possible to increase the milk-producing tissue in their udders. In the end it was necessary to milk the cows three times a day to remove the abundant milk supply. After about twenty years of selection, milk production had increased by 300% in these herds of cattle.

An experiment carried out in the USA to produce two different strains of maize also shows the effectiveness of artificial selection. In one strain of maize, the aim was to obtain a high oil content. In the other, the aim was to obtain a low oil content. The work continued for fifty generations, and in each generation 250 plants were grown. Only maize plants nearest to the ideal standard were used to breed the next generation. The results showed that the selection process produced two strains, one with a percentage of oil of 2% and the other with a percentage of oil of 16%. The total number of plants grown was less than 15 000, which suggests that mutation could not have had a significant effect. It was the utilisation of the genes already present in the plants by the process of artificial selection that had produced the changes in these strains of maize.

Leave blank

(a) In what way does artificial selection differ from natural selection? (lines 3 to 4)

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(2)

(b) Suggest why giving the cattle better food did not improve their milk yield. (line 15)

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(1)

(c) The original cows were ‘easily frightened’ (line 16). This behaviour is influenced by a hormone that is produced in response to fear.

(i) Name the hormone.

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(1)

(ii) Suggest why it would be an advantage for wild cattle to be frightened by other animals.

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(2)

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(d) The farmers would find it easy to choose the female cattle to be the parents for the next generation in their selection programme. Suggest how they would choose the male parents and give a reason for your answer.

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(2)

(e) Suggest why farmers might want to produce maize strains with different oil content.

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(3)

(f) Suggest why mutation was unlikely to have been a factor in the production of maize plants with different oil yields. (line 32)

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(2)

Q1

(Total 13 marks)

Leave blank

2. The data below show information about tuberculosis (TB) and HIV infection in some African countries.

Country	Total number of TB cases	Number of TB cases per 100 000 of population	Percentage of HIV cases in the adult population
Congo	204 000	366	5.3
Ethiopia	267 000	353	3.5
Kenya	207 000	619	6.1
Mozambique	89 000	460	16.1
Nigeria	374 000	290	3.9
South Africa	339 000	718	18.8
Uganda	112 000	402	6.7
Zimbabwe	87 000	674	17.0

(a) Which country has the highest number of TB cases per 100 000 population?

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(1)

(b) (i) Calculate the percentage of the population of Zimbabwe that has TB. Show your working.

Answer = ... %

(2)

(ii) From the information provided, which infection occurs more frequently in Zimbabwe?

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(1)

(c) Name the type of organism that causes HIV.

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(1)

Leave blank

(d) HIV is becoming a major threat to the health of the populations in many countries. Suggest what steps a country could take to reduce the incidence of HIV and prevent its spread.

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(3)

(e) Describe the relationship between the incidence of HIV in the population and the number of cases of TB in these countries. Suggest an explanation for your answer.

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(2)

(f) The global incidence of HIV and the number of TB cases is much lower than in these African countries. Suggest **two** reasons for this.

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2 .....

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(2)

Q2

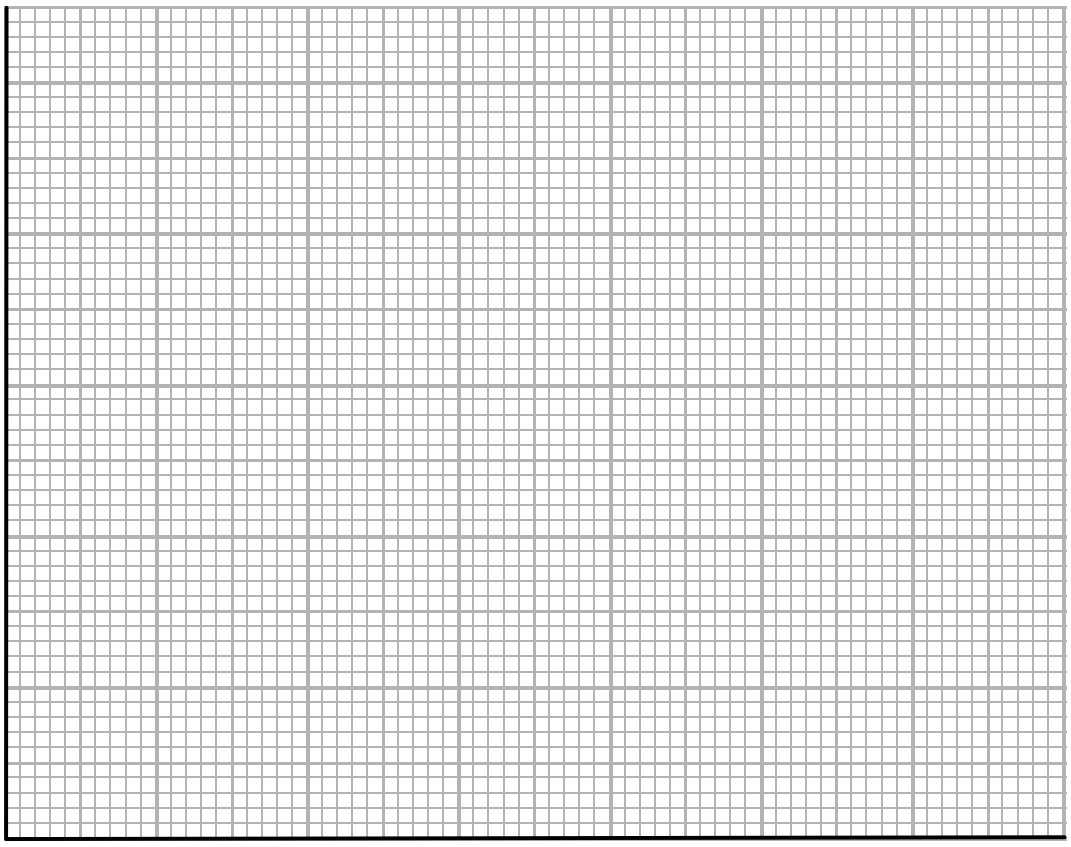
(Total 12 marks)

Leave blank

3. An investigation was carried out to find out how the rate of photosynthesis changed with light intensity at two different temperatures and at two different levels of carbon dioxide. The results are shown in the table below.

Light intensity in arbitrary units	**Rate of photosynthesis in mm^3 CO_2 per cm^2 per hour**			
	Low CO_2		**High CO_2**	
	20 °C	30 °C	20 °C	30 °C
0	0	0	0	0
1	53	54	55	55
2	56	58	110	145
3	56	59	150	170
4	56	59	160	225
5	56	59	180	250
6	56	59	200	270
7	56	59	200	275

(a) On the grid below plot the data for the **high CO_2** at each temperature by drawing two lines on the same axes. Join your points for each temperature using straight lines.



(6)

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(b) (i) Describe the effect of increasing the light intensity on the rate of photosynthesis at high levels of carbon dioxide at 20 °C.

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(2)

(ii) Describe the effect of the different temperatures on the relationship between light intensity and rate of photosynthesis at high levels of carbon dioxide.

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(2)

(iii) Describe the effect of the different temperatures on the relationship between light intensity and rate of photosynthesis at low levels of carbon dioxide.

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(1)

(iv) Suggest why a change in temperature at high levels of carbon dioxide has a different effect on the rate of photosynthesis compared with a change in temperature at low levels of carbon dioxide.

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(2)

(c) Suggest a method a farmer could use to increase the level of carbon dioxide in a glasshouse.

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(1)

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(d) In this investigation the scientists measured the rate of photosynthesis per unit area of the plant leaves. Describe a method you could use to estimate the leaf area of a plant.

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(2)

(Total 16 marks)

Q3

4. Describe an investigation you could carry out to determine the effect of Vitamin D on the growth rate of young mice.

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(Total 6 marks)

Q4

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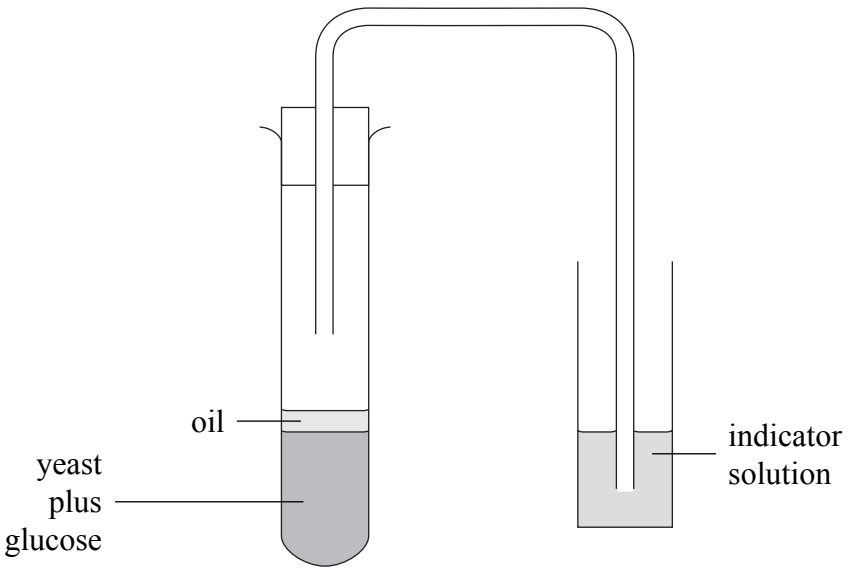
5. Polly investigated the effect of different concentrations of glucose on alcohol production (fermentation) by yeast. The changes in the indicator solution are used as a measure of the rate of alcohol production.

She put 10 cm^3 of a suspension of yeast cells into a boiling tube and added 20 cm^3 of 2% glucose solution. She then put the boiling tube into a water bath at 30 °C.

She added a layer of oil to the boiling tube and inserted a bung attached to a delivery tube as shown. The delivery tube took the gas produced into a second tube, which contained an indicator solution.



After she had carried out the experiment using 2% glucose, she repeated the experiment using 4%, 6%, 8% and finally 10% glucose.

(a) (i) Name the process by which living cells release energy from glucose.

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(1)

(ii) Name the gas produced by the yeast as it ferments the glucose.

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(1)

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(iii) Suggest a suitable indicator that Polly could have used to detect the gas. Describe the change she would have seen.

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(iv) Suggest why the layer of oil is put on the surface of the glucose and yeast solution.

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(b) Polly kept the temperature constant during her investigation. Name **one** other variable that Polly should have kept constant and suggest how she could have controlled this variable.

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(c) Polly wanted to measure the rate of the fermentation reaction. Describe how she could do this to obtain quantitative results.

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(3)

(d) The results she obtained showed that the rate of reaction increased as the concentration of glucose increased up to a maximum at 8% glucose. The rate then levelled off. Suggest an explanation for these results.

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(2)

Q5

(Total 13 marks)

TOTAL FOR SECTION A: 60 MARKS

Leave blank

SECTION B

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 6, put a cross in this box ☒.

6. (a) How do the effects of malnutrition and obesity differ?

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(4)

(b) Explain why bacterial diseases are treated differently to viral diseases.

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(4) **Q6**

(Total 8 marks)

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

7. (a) Explain the differences between digestion and absorption.

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(4)

(b) Explain the importance of the changes in pH in digestion in the human alimentary canal.

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(4)

Q7

(Total 8 marks)

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

8. (a) Explain how both decomposition and denitrification affect the availability of nitrogen to crop plants.

(i) Decomposition

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(2)

(ii) Denitrification

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(2)

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(b) Suggest how building a new road through a forest would affect the local ecosystem.

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(4) **Q8**

(Total 8 marks)

TOTAL FOR SECTION B: 16 MARKS

Leave blank

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 9, put a cross in this box ☒.

9. Describe and explain how the different components of blood are involved in transport and in defence of the body from infection.

Leave blank

Q9

(Total 12 marks)

Leave blank

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

10. Describe how bacteria can be genetically modified and then grown in a fermenter to produce human insulin.

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Q10

(Total 12 marks)

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

11. Describe how water and sucrose are transported in flowering plants.

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Q11

(Total 12 marks)

TOTAL FOR SECTION C: 24 MARKS

TOTAL FOR PAPER: 100 MARKS

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