Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	4	3	7	/	4	H	Signature	

Paper Reference(s)

4437/4H

Examiner's use only

Team Leader's use only

London Examinations IGCSE

Science (Double Award)

Biology

Paper 4H

Higher Tier

Thursday 15 May 2008 – Afternoon

Time: 1 hour 30 minutes

Question Number	Leave Blank
1	
2	
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12	
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 reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

Information for Candidates

The total mark for this paper is 90. The marks for the parts of questions are shown in round brackets: e.g. **(2)**.
There are 24 pages in this question paper. All blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

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Answer ALL the questions. Write your answers in the spaces provided.

1. In an area of rainforest, there were plans to cut down lots of trees (deforestation) to build a new road. Some people did not want this to happen, but some people did.

(a) Suggest **one** reason why some people wanted the road to be built.

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(1)

(b) Describe **two** biological effects that may occur as a result of deforestation.

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2 .....

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(4)

(Total 5 marks)

Q1

Leave blank

2. The drawing shows a flowering plant.

(a) (i) Name the part of the flower that produces pollen.

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(1)

(ii) Use a line and the letter **P** to label this part on the drawing.

(1)

(iii) Explain what is meant by the term **pollination**.

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(2)

(b) The stem and leaves of the plant grow upwards. Name **one** stimulus that makes them grow upwards.

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(1)

Leave blank

(c) The leaves produce glucose by photosynthesis.

(i) Write the word equation for photosynthesis.

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(2)

(ii) Describe how the structure of the leaf is adapted to help obtain the gas required for photosynthesis.

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(2) **Q2**

(Total 9 marks)

Leave blank

3. John ate some rice. The rice contained starch.

Describe how the starch is broken down in the digestive system.

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Q3

(Total 6 marks)

Leave blank

4. People with diabetes may not produce enough insulin and so are unable to control their blood glucose level. To overcome this, they inject themselves with insulin in the leg.

The passage below describes how the injected insulin travels from the leg to the liver. Use suitable words to complete the sentences in the passage.

The insulin travels to the heart in a blood vessel called the .....,

the largest vein in the body. Blood enters a chamber called

the right ....., and passes to the right ventricle before being

pumped in the pulmonary artery to the ..... Backflow of

blood is prevented by atrio-ventricular and semilunar ..... The

blood containing insulin returns to the heart in the pulmonary vein. It then leaves the

heart in the ....., the largest artery in the body. Finally, the

insulin is taken into the liver by the..... artery. When insulin

reaches the liver cells it causes the conversion of ..... into an

insoluble carbohydrate called .....

Q4

(Total 8 marks)

Leave blank

5. The techniques of selective breeding and micropropagation (tissue culture) can be used together to produce large numbers of plants with desired characteristics.

(a) The table shows the steps taken to produce plants using selective breeding.

Complete the table by using numbers to show the correct order of the steps.

Step	Order of step
repeat crosses for several generations	
cross parent plants to produce more offspring	
identify parent plants with desired characteristics	
select offspring with desired characteristics	

(3)

(b) Give **two** reasons why micropropagation (tissue culture) is a useful technique to use after a selective breeding programme.

1 .....

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2 .....

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(2)

Q5

(Total 5 marks)

Leave blank

6. The table below shows the crop yield of three different crops when grown in soil and in liquid fertiliser.

Crop grown in	Crop yield		
	Tomatoes in kg per plant	**Potatoes in tonnes per hectare**	**Rice in kg per hectare**
soil	5.4	12.1	551
liquid fertiliser	9.0	26.3	1652

(a) Calculate the percentage increase in the growth of tomatoes in liquid fertiliser compared to those grown in soil. Show your working.

Answer .....

(2)

(b) Suggest why the growth of all the crops was better in liquid fertiliser than it was in the soil.

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(2)

Q6

(Total 4 marks)

Leave blank

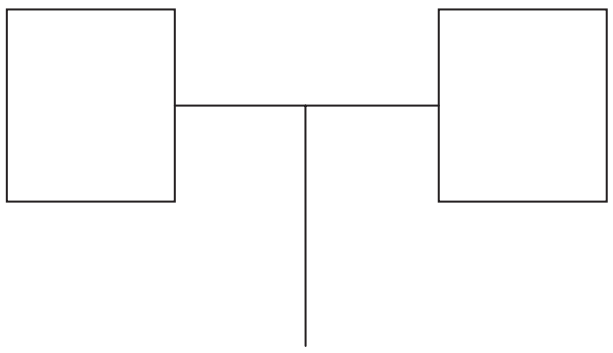
7. The photograph shows a mouse of normal size together with some dwarf mice.

A gene controls whether a mouse is normal in size or dwarf. This gene has two alleles. The allele **D** is dominant to the allele **d**. Mice with a dominant allele develop a normal pituitary gland. This produces a growth hormone and these mice grow to normal size. Mice that lack the dominant allele develop a pituitary gland that fails to secrete growth hormone. These mice do not grow to normal size and are dwarf.

Dwarf mice are sterile and can only be produced by mating normal mice.

(a) (i) A cross between two normal mice produced some dwarf mice. Complete the diagram below to give the genotypes of the parents and the possible offspring from this cross.

genotype of male parent **genotype of female parent**



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possible genotypes of offspring

(2)

Leave blank

(ii) What is the phenotype ratio of the possible offspring?

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(1)

(iii) What is the probability of two homozygous parents producing a dwarf mouse? Give a reason for your answer.

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(2)

(b) Suggest why dwarf mice use up more oxygen per g body mass than normal mice.

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(2)

Q7

(Total 7 marks)

Leave blank

8. Certain species of yeast are used to make beer. The yeast cells digest starch to make a sugar. This sugar is then used in anaerobic respiration to make the beer.

(a) Write the word equation for anaerobic respiration by these yeast cells.

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(2)

(b) When making beer, the yeast cells do not normally digest all the starch. This means that the beer produced is high in carbohydrate. However, when making bread a different species of yeast is used. This species is able to produce an enzyme that helps to digest more of the starch. The production of this enzyme is controlled by a gene.

The yeast cells normally used to make beer can be genetically modified to contain this gene.

(i) Describe the steps that would be taken to produce these genetically modified yeast cells.

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(4)

(ii) Suggest how these genetically modified yeast cells could produce beer that is low in carbohydrate.

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(2)

Q8

(Total 8 marks)

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9. Nitrification can occur in the soil and is an important process for plants. Describe briefly what is involved in nitrification and state why the process is important for plants.

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Q9

(Total 3 marks)

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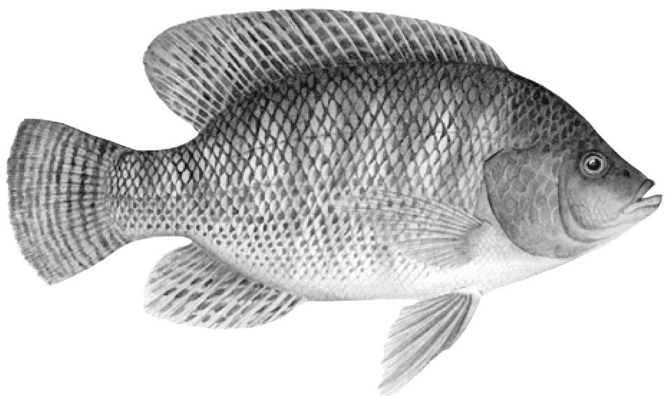
10. Fish farms produce large numbers of fish as food for humans. The fish are kept in ponds and fed a diet that includes lipids and vitamins.

The picture shows one type of fish that is farmed.



(a) Suggest why fish need lipids.

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(1)

(b) For every 100 units of energy ingested by each fish, 23 units are assimilated into biomass. Give **two** reasons to explain what might have happened to the other 77 units of energy.

1 .....

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2 .....

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(2)

(2)

Leave blank

(c) Excreted waste from the fish must be removed from the ponds. If it is allowed to escape into rivers it might cause pollution.

Describe and explain the events that might occur as a result of this pollution.

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(5) **Q10**

(Total 8 marks)

Leave blank

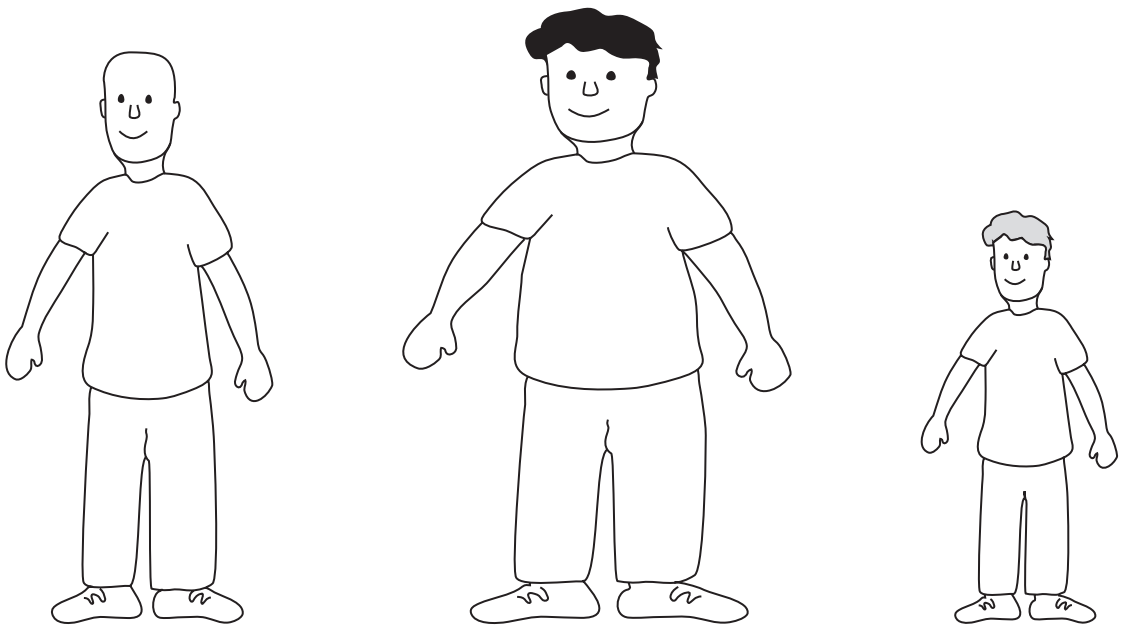
11. Obesity (being extremely overweight) is an increasing problem in the Western world. You can calculate whether or not you are obese by using a formula called the BMI (body mass index). The formula is shown below.

$$\textbf{BMI} = \frac{\textbf{body mass in kg}}{\textbf{(height in m)}^2}$$

The table shows how BMI values are used to describe the weight of people.

BMI value	Description of weight
less than 18.5	underweight
18.5 to 24.9	normal weight
25.0 to 29.9	overweight
30.0 or above	obese

The diagram gives information about the mass and height of three people, A, B and C.



A

70 kg
1.7 m

B

96 kg
1.8 m

C

57 kg
1.2 m

Leave blank

(a) Use the BMI formula to complete the table below. Show your working.

Person	BMI value	Description of weight
A	24.2	normal weight
B		
C		

(2)

(b) Exercise increases muscle tissue and reduces body fat. Muscle is more dense than fat. Suggest how this might affect the BMI of an athlete compared to a non athlete of the same size.

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(1)

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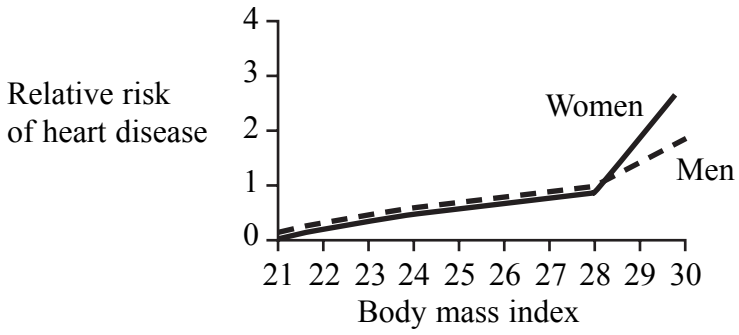
(c) The graph shows the relationship between BMI and the risk of heart disease in men and in women.



(i) Give **two** conclusions that can be drawn from the information in the graph.

1 .....

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2 .....

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(2)

(ii) When a person has heart disease, the blood vessels supplying the heart muscle become narrow and may get totally blocked. Suggest how this might happen and describe how it would change the respiration of heart muscle cells, leading to their death.

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(5)

Q11

(Total 10 marks)

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12. Ultrafiltration and selective reabsorption are processes that take place in the kidneys.

(a) Give **three** ways in which ultrafiltration differs from selective reabsorption.

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2 .....

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3 .....

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(3)

(b) Kidneys can produce urine that varies in volume and concentration depending on certain events.

(i) Complete the table by writing the correct word in each box to show the description of urine after each event. Some boxes have been completed for you.

Event	**Volume of urine** (large or small)	**Concentration of urine** (dilute or concentrated)
after doing lots of exercise		concentrated
after eating lots of protein	small	
after drinking lots of water		
after eating salty crisps		

(4)

Leave blank

(ii) Damage to the pituitary gland can prevent the secretion of the hormone ADH. Explain how this affects osmoregulation by the kidney.

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(4)

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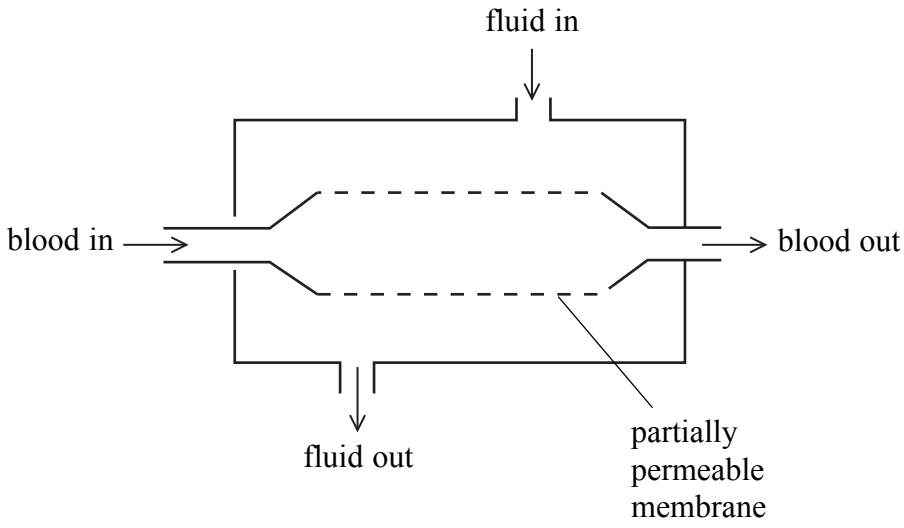
(c) If kidneys stop working, a kidney machine can be used to remove waste substances from the blood. The diagram shows a section of the machine.



A tube is connected from a vein in the arm to the kidney machine. Blood flows through the kidney machine before returning to the same vein in the arm. A fluid also passes through the machine removing the waste substances from the blood.

(i) Suggest **two** reasons why the tube is connected to a vein rather than an artery.

1 .....

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2 .....

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(2)

(ii) The kidney machine can remove excess salts (mineral ions) from the blood. Explain how these pass from the blood into the fluid.

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(2)

Leave blank

(iii) Name **two** waste substances, other than salts, that the kidney machine can remove from the blood.

1 .....

2 .....

(2)

Q12

(Total 17 marks)

TOTAL FOR PAPER: 90 MARKS

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