

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

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London Examinations IGCSE
Science (Double Award)

Team Leader's use only

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Biology

Paper 4H

Higher Tier

Wednesday 17 November 2010 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination

Nil

Items included with question papers

Nil

Question Number	Leave Blank
1	
2	
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12	
Total	

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 the page. Check that you have the correct question paper. Answer **ALL** the questions in the spaces provided in this question paper. Do not use pencil. Use blue or black ink. Show all the steps in any calculations and state the units. Calculators may be used.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 12 questions in this question paper. The total mark for this paper is 90. There are 24 pages in this question paper. Any 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. The table lists the names of different structures found within a human.

Complete the table by numbering each structure in order of its size.
Use number 1 for the smallest structure through to number 4 for the largest.

Name of structure	Order of size
brain	
nucleus	
nervous system	
nerve cell	

Q1

(Total 3 marks)

2. Explain how sewage pollution can affect the plants and animals in a river.

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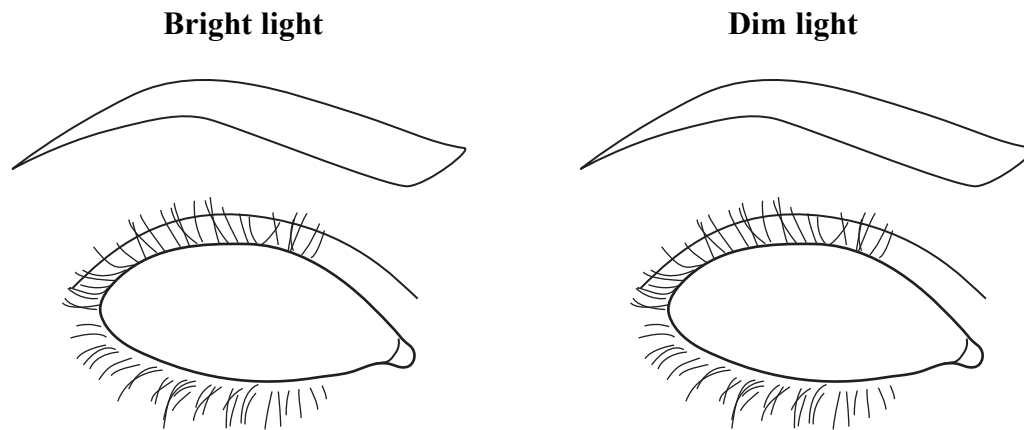
Q2

(Total 5 marks)



3. The iris of the eye helps the pupil to change as a person moves from an area of bright light to an area of dim light.

(a) (i) Draw and label the iris and the pupil in each eye below to show how they would appear in bright and dim light.



(3)

(ii) Explain how the iris produces this change in appearance in the pupil.

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(2)

(iii) Explain why it is important to change the appearance of the pupil when moving from bright light into dim light.

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(2)



(b) Changes in the eye also take place to help focus on near objects.
Describe these changes.

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(3)

(Total 10 marks)

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Q3

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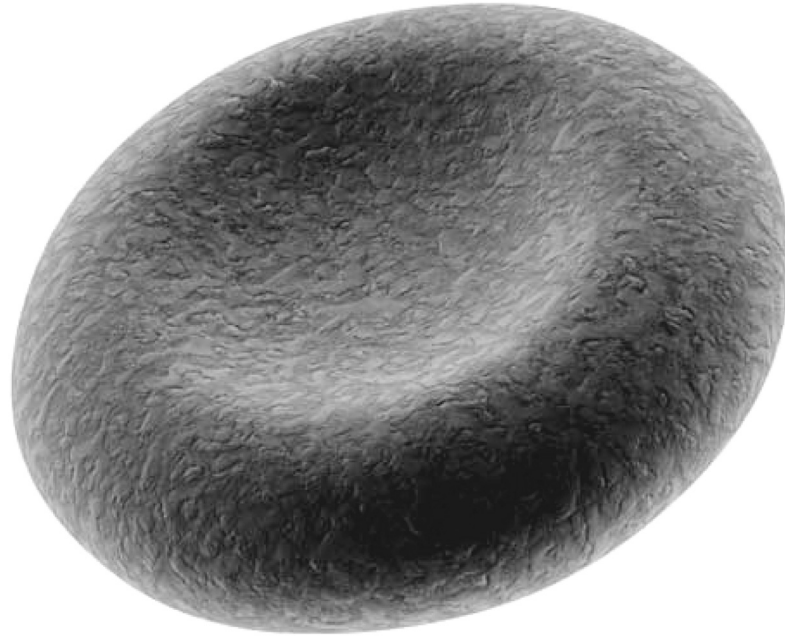


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4. The diagram shows a normal red blood cell.



(a) Describe **two** ways in which the structure of a normal red blood cell helps it to absorb and transport oxygen.

1

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2

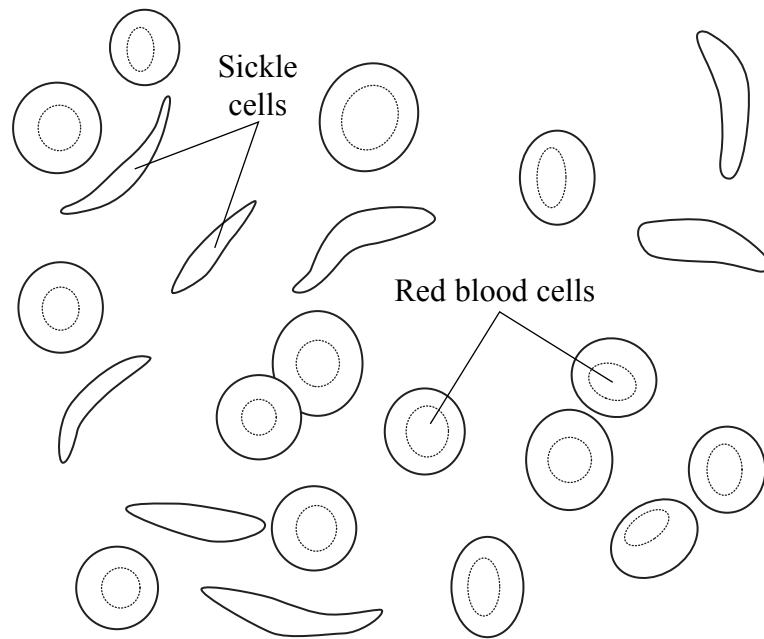
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(2)



(b) Sickle cell anaemia is an inherited condition that affects the shape of red blood cells. It is caused by a recessive allele, **n**, which causes the cells to buckle and look sickle-shaped. The dominant allele, **N**, allows red blood cells to develop normally.

The diagram shows normal red blood cells and sickle-shaped red blood cells.



(i) What is an allele?

..... (1)



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blank

(ii) Two parents know they are both heterozygous for sickle cell anaemia.

Complete the genetic diagram below to show the genotypes of the parents, their gametes and their possible offspring.
Use the letter **N** for the dominant allele and the letter **n** for the recessive allele.

Parent genotypes

Gamete genotypes

Possible offspring genotypes

(3)

(iii) What are the phenotypes of the possible offspring?

.....

(1)

Q4

(Total 7 marks)



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5. The heart rate of an athlete was measured every ten minutes for one hour during a training session.

The results are shown in the table.

Time in minutes	0	10	20	30	40	50	60
Heart rate in beats per minute	66	77	88	100	112	114	113

- (a) Describe how heart rate changes during the training session.

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.....
.....
.....

(2)

- (b) Explain the change in the results from 0 minutes to 40 minutes.

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(4)

(Total 6 marks)

Q5

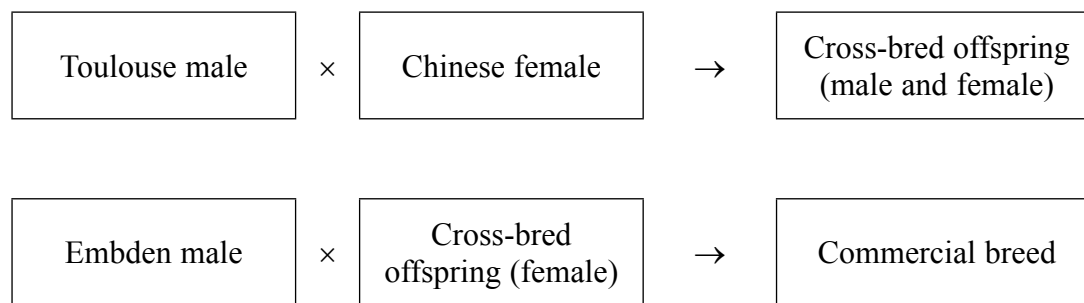


6. The photograph shows a bird called a goose.



Two breeds of goose called Toulouse and Embden grow quickly. However, both breeds lay very few eggs. Another breed of goose called Chinese lays lots of eggs but grows slowly.

Farmers have used a breeding process to produce a commercial breed of goose from these three different breeds. The diagram below shows the breeding process.



(a) Name the **two** desired characteristics farmers wanted to obtain with the commercial breed of goose.

1

2

(2)





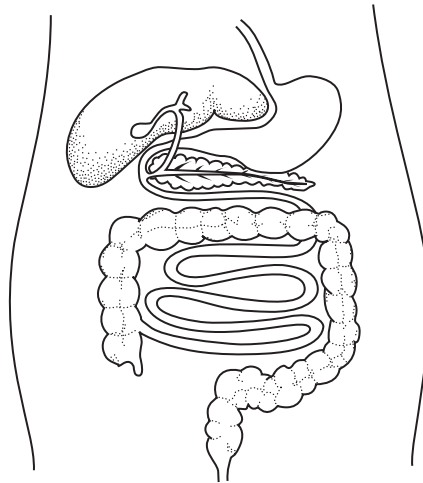
<p>(b) Use the information opposite to suggest one difference in the characteristics of the cross-bred female and the Chinese female.</p> <p>.....</p> <p>.....</p> <p style="text-align: right;">(1)</p> <p>(c) The breeding process involves farmers choosing which birds breed with each other.</p> <p>What name describes a breeding process in which humans choose which animals breed together?</p> <p>.....</p> <p style="text-align: right;">(1)</p> <p style="text-align: right;">(Total 4 marks)</p>	<p>Leave blank</p> <p>Q6</p> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>



N 3 7 8 1 3 A 0 1 3 2 4



7. The diagram shows part of the human digestive system and some other organs.



- (a) (i) Using the letter **P** and a guideline, mark on the diagram the pancreas. **(1)**
- (ii) The pancreas secretes enzymes that digest large molecules into smaller molecules.

Complete the table to show the missing large molecule and enzymes.

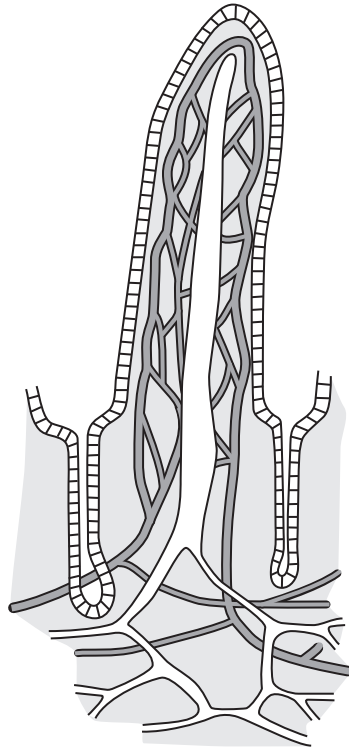
Large molecule	Smaller molecule	Enzyme
	fatty acids and glycerol	
starch	maltose	

(3)



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(b) The diagram shows a villus.



Explain how the structure of a villus helps it perform its function.

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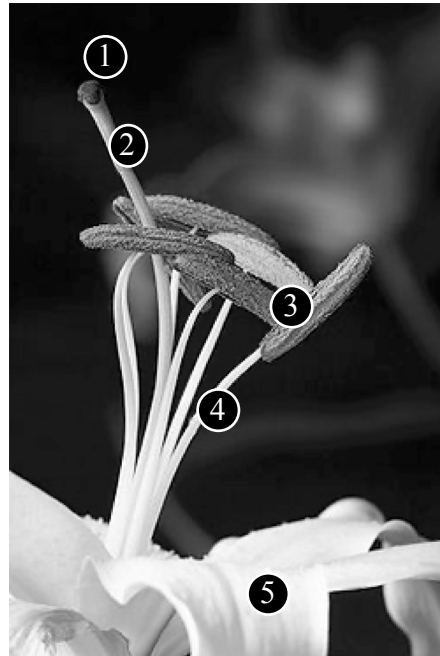
(5)

Q7

(Total 9 marks)



8. The photograph shows the reproductive structures of a flower called a lily.



(a) (i) Which number labels an anther?

..... (1)

(ii) What is the function of the anther?

..... (1)

(iii) Using the information in the photograph, suggest why this flower does not pollinate itself.

.....
..... (1)



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blank

(b) Lilies can be cloned and then mass produced using micropropagation.

(i) What does the term **cloned** mean?

.....
.....

(2)

(ii) Complete the following passage about micropropagation. Write the most suitable word on the dotted lines.

Micropropagation is sometimes known as tissue

Small pieces of plants called are grown on nutrient

jelly. All procedures must be carried out under

conditions to make sure that there are no fungi or

present. The small pieces of plants grow because the cells

..... and then develop into new plants.

(5)

Q8

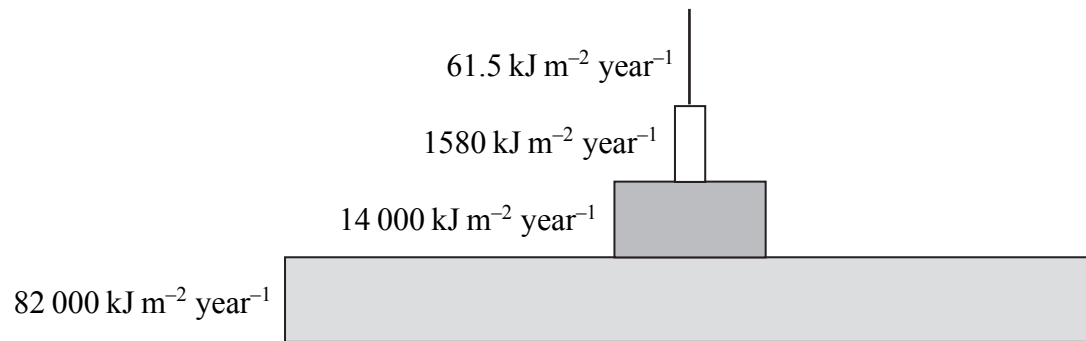
(Total 10 marks)



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9. (a) Pyramids of energy show the rate of energy flow at successive trophic levels in a given area over a fixed period of time.

The diagram below shows a pyramid of energy.



- (i) Calculate the percentage of energy transferred from the producer trophic level to the tertiary consumer trophic level.

Answer.....%
(2)

- (ii) Explain why so little energy is transferred from one trophic level to the next.

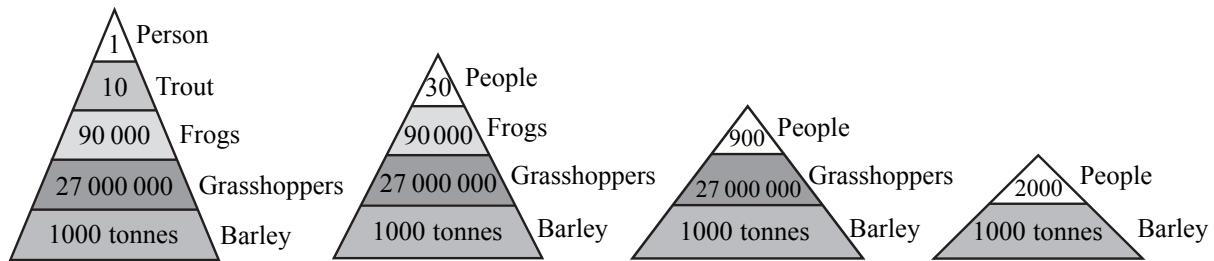
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(3)



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(b) The diagram below shows the different numbers of humans that can be supported in food chains of different lengths.



(i) How many more humans can be supported on a diet of barley compared to a diet of trout?

.....
(1)

(ii) What is the relationship between the length of a food chain and the number of people who can be supported by it? Explain your answer.

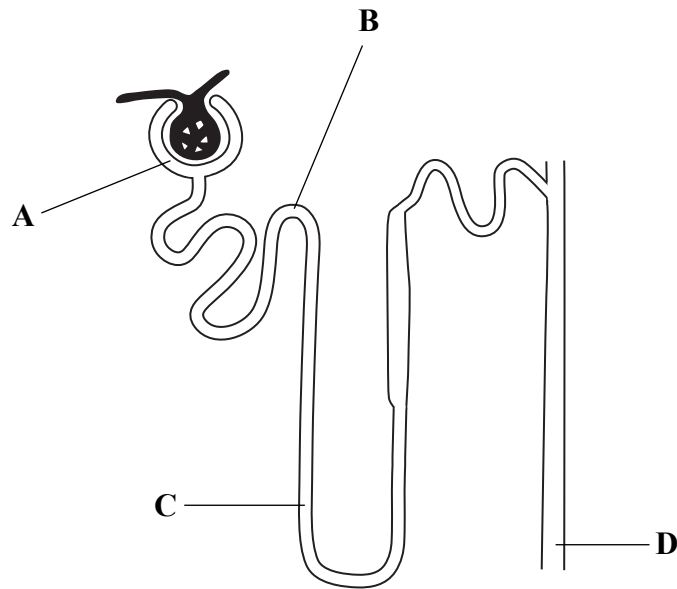
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(2)

(Total 8 marks)

Q9



10. The diagram shows a nephron from a human kidney.



(a) Identify the parts of the nephron labelled **A**, **B**, **C** and **D**.

A

B

C

D

(4)

(b) In which part, **A**, **B**, **C** or **D**, does each of the following occur?

(i) Ultrafiltration

(ii) Reabsorption of glucose

(iii) Increased permeability to water in response to ADH

(3)



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(c) The table shows the amount of some substances (in arbitrary units) filtered, excreted and reabsorbed by the kidneys in a day.

Substance	Filtered	Excreted	Reabsorbed
water	180	1.50	178.5
glucose	800	0	800
urea	56	28	28

(i) Calculate the percentage of filtered urea that is reabsorbed.

Answer %
(2)

(ii) Suggest why it is important to excrete urea.

.....
.....
(1)

(iii) Suggest why it is important that all the glucose is reabsorbed.

.....
.....
(1)

(iv) Use the information in the table to name the process by which glucose is reabsorbed.
Give a reason for your answer.

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(2)

(Total 13 marks)

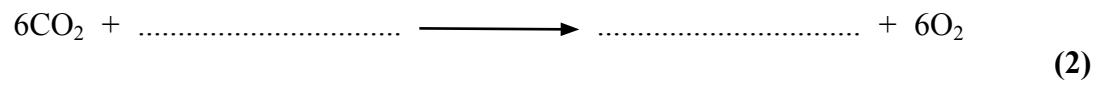
Q10



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11. Green plants carry out the processes of photosynthesis and respiration.

(a) Complete the balanced chemical symbol equation for photosynthesis.



(b) Identify **two** environmental factors that can affect the rate of movement of carbon dioxide into the palisade cells of a plant.

1

2 (2)

(c) Describe and explain how the net exchange of carbon dioxide in a green plant is different during the day compared to the night.

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(4)

Q11

(Total 8 marks)



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12. Human body temperature is 37°C. When a person is in a hot environment where the air temperature is much higher than 37°C, changes take place to make sure that their body temperature remains at 37°C.

(a) Explain **two** changes that take place in the body to keep its temperature at 37°C in a hot environment.

1

.....

.....

2

.....

.....

(4)

(b) Maintaining a constant body temperature is an example of homeostasis.

Give **two** other examples of homeostasis in the human body.

1

2

(2)

(c) Homeostasis involves negative feedback.

With reference to body temperature, describe what is meant by the term **negative feedback**.

.....

.....

(1)

Q12

(Total 7 marks)

TOTAL FOR PAPER: 90 MARKS

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