

71
Candidate Num

General Certificate of Secondary Education 2009

**Science: Biology** 

Paper 2 Higher Tier

[G0904]



#### **THURSDAY 28 MAY, MORNING**

TIME

2 hours.

# INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper. Answer all eight questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 160.

Quality of written communication will be assessed in question 3(c)(ii). Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Details of calculations should be shown.

Units must be stated in numerical answers where appropriate.

For Examiner's use only		
Question Number	Marks	
1		
2		
3		
4		
5		
6		
7		
8		

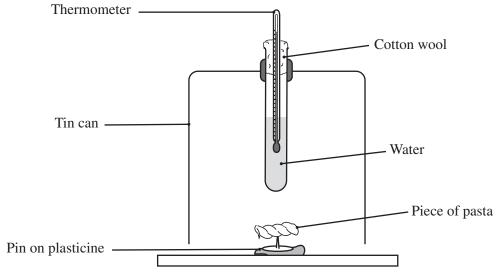
TD 4 1	
Total	
Morke	
Marks	

1	(a)	The graph shows the daily energy requirements for humans at different ages.
		Image of graph not available due to copyright

(i)	At what age do females have their highest energy requirement?	Examiner Onl Marks Rema	_
	years		al K
(ii)	What is the highest energy requirement for males?		
	1, 1	. [1]	
	kJ		
(iii)	Explain why the female energy requirements are lower than tho for males.	ose	
		[1]	
(iv)	Give <b>one other</b> factor which affects the energy requirements of adults.		
		[1]	
(v)	Explain what would happen to a 25-year-old female if her daily energy intake was 8000 kJ.	7	
		[2]	
		[2]	
(vi)	Name the process in cells which releases the energy in food.		
		[1]	
(vii)	Give <b>one</b> other substance produced by this process		
		[1]	

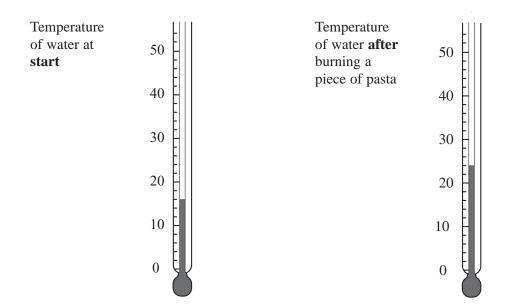
**(b)** The apparatus shown was used to calculate the energy in a piece of pasta.





© Biology Lives by Morton Jenkins, published by Hodder & Stoughton Ltd, 1999, ISBN 0340790512, Reproduced by permission of Hodder & Stoughton Ltd

The thermometers show what happened when the pasta was burned.



(i) Use this information in the diagrams to help calculate the temperature rise.Show your working.

Answer \_\_\_\_\_°C [2]

(ii) Suggest **one** reason why not all the energy in the pasta was used to heat the water.

				Г1

\_\_\_ [1]

(c) The table summarises the nutritional information for pasta and the daily requirements for a 17-year-old male.

Examin	er Only
Marks	Remark

	Pasta/100 g	Recommended daily amount
Energy/kJ	1515	15 000
Protein/g	12.3	50
Carbohydrate/g	74.0	300
Fat/g	1.0	65
Fibre/g	3.0	25
Salt/g	Less than 0.1	6
Calcium/mg	18.0	1000
Iron/mg	1.0	18

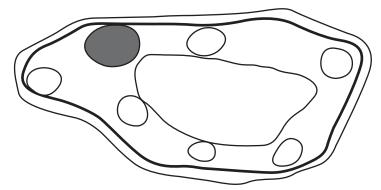
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	heart disease	
	heart disease.	F4:
	constipation.	
		[1]
(ii)	Explain how	
	fat is used in the body.	
		[1]
	iron is used in the body.	
		[2]
	calcium is used in the body.	

[1]

	[1]

2 (a) The drawing shows a leaf cell magnified 2500 times.



© Exploring Science by M Levesley, S Baggley, Julian Clark, Steve Gray and Mark Pimbert, published by Longman, 2002, ISBN 058240362-6 Reproduced by permission of Pearson Education Ltd, publishers

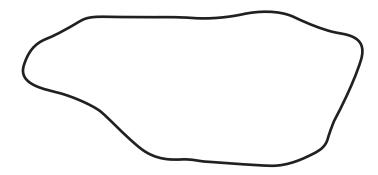
(i)	On the drawing	label a	chloroplast.	
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[1]

**Examiner Only** 

(ii) On the outline below, draw and label the cell wall and vacuole.

[4]



(iii) Explain how this leaf cell is adapted for photosynthesis.

ra

(iv) Give two similarities and two differences between this leaf cell

Similarities:

and an animal cell.

1. \_\_\_\_\_\_ [1]

2. \_\_\_\_\_[1]

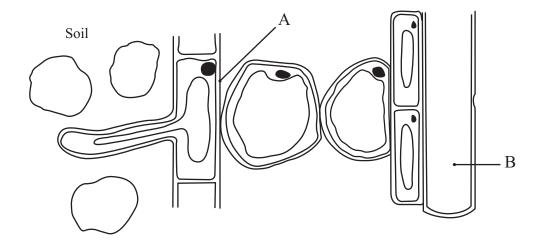
Differences:

1. \_\_\_\_\_\_[1]

2. \_\_\_\_\_\_[1]

(b) The diagram shows part of a root.





(i) Name cell A and explain how it is adapted to carry out a specific function.

Cell A

Adaptation \_\_\_\_\_

\_\_\_\_\_[3]

Tissue B carries water up to the leaves.

(ii) Name tissue B.

\_\_\_\_\_[1]

(iii) Explain how water moves from the soil to tissue B.

\_\_\_\_

\_\_\_\_\_

3 (a) The diagram shows an owl.

Examiner Only		
Marks	Remark	

	3
Cai de la	

Owls belong to the bird group of chordates.

(i) What is a chordate?


\_\_\_\_\_[1]

Birds skin is covered in feathers.

(ii) Suggest two functions of feathers.

[2]

(iii) Name **one** feature shown in the diagram which adapts the owl to hunting and explain how this adaptation helps the owl catch its prey.

Feature \_\_\_\_\_ [1]

Adaptation \_\_\_\_\_

\_\_\_\_\_\_[1]

(iv) Give two other features of birds.

1. \_\_\_\_\_\_[1]

2. \_\_\_\_\_\_[1]

**(b)** Owls hunt rats which feed on chicken eggs, grain, leaves and root vegetables.

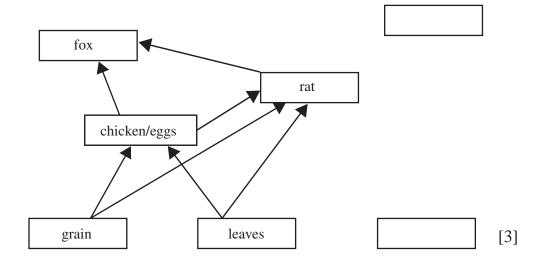
Examiner Only

Marks Remark

Chickens also eat grain and leaves.

Rats and chickens are preyed on by foxes.

(i) Use this information to **complete the food web**.



(ii) Name a producer from this food web.

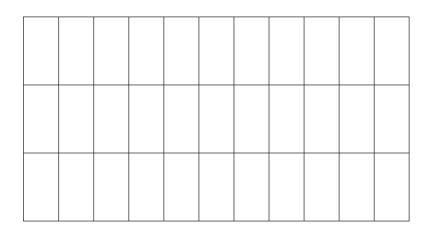


(iii) At what trophic level do chickens feed?

[1]
_ L

An examination of owl pellets over a period of time showed that one owl weighing 300 g ate 400 g of rats. These rats consumed about 600 g of food in the same period of time.

(iv) Draw and label a pyramid of biomass for this owl.



[3]

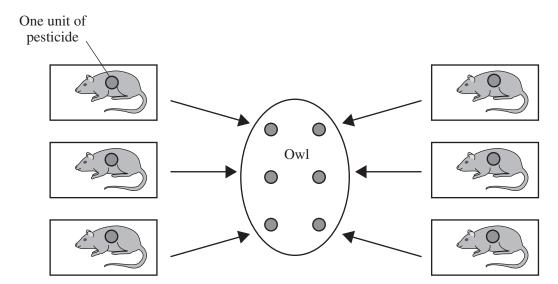
(c)	Farmers use pesticides to control the number of rats.
	Over-use of pesticides has led to rats building up resistance.

Examiner Only				
Marks	Remark			

(	$(\mathbf{i})$	) What	is	a	pesticide's
٠,	( <del>-</del> .	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	10	u	pobliciac

		[2

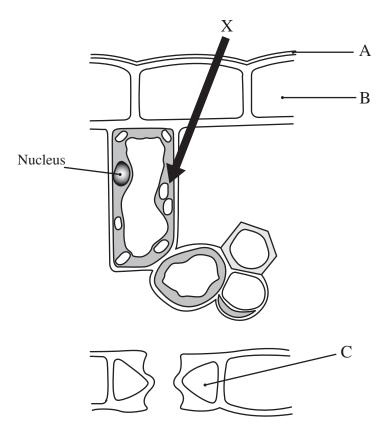
The diagram shows how the over-use of pesticides in rats can result in the death of an owl.



(ii)	Use the diagra	am to help explair	n how the over-use	e of pesticides in
	rats can result	in the death of ar	n owl, but not that	of rats.

 [3]

4 (a) The diagram shows part of a leaf.



@ Biology by G & M Jones, published by Cambridge University Press, 1987. ISBN 0521338697

<b>(i)</b>	What	does	arrow	X	re	present?
------------	------	------	-------	---	----	----------

F43
111
111

(ii) Name parts A, B and C.

(iii) Name the layer of cells where most photosynthesis occurs.

F 4	1	7
		- 1
L:	_	J.

(iv) Describe how carbon dioxide enters the leaf.

 [2	2	١
	_	•

er Only
Remark

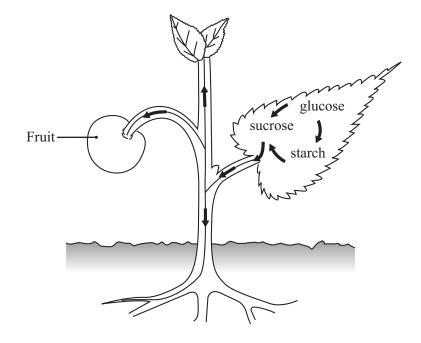
## **(b)** Complete the table.

Examin	er Only
Marks	Remark

Adaptation of leaf	Function
1. Large surface area	
2.	To allow sunlight to reach all cells
3.	

[4]

(c) The diagram shows what happens to the products of photosynthesis.



 $^{\odot}$  Biology by G & M Jones, published by Cambridge University Press, 1987. ISBN 0521338697

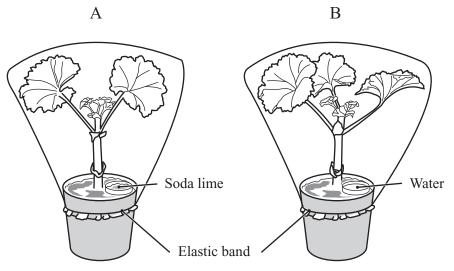
Use the diagram to explain **three** ways the products of photosynthesis can be used by a plant.

\_[3]

(d) The diagram shows a photosynthesis experiment.

Both plants were destarched and then left in the light for 48 hours.

Examin	er Only
Marks	Remark



 $@ \ Reproduced \ with the permission \ of \ Nelson \ Thornes \ Ltd \ from \ Biology \ for \ Life, 2nd \ edition \ ISBN \ 0-17-448096-2 \ first \ published \ in \ 1986 \ delta \ for \ Proposition \ Proposition$ 

(i)	Explain	why	soda	lime	is	present.
-----	---------	-----	------	------	----	----------

_	
	11
1.	1 I

(ii)	Why	is	plant B	required?
\ <del></del> /	, , , ,	10	PIGHT D	. 10901100

F 1 1
11

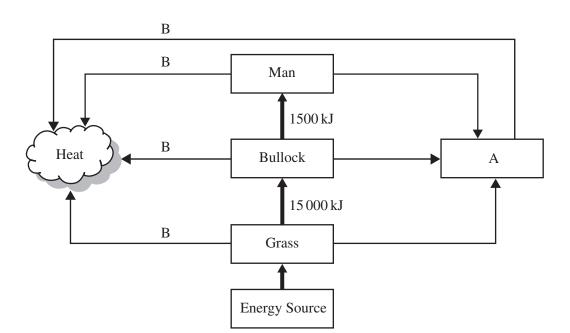
The table shows the results of the experiment.

Plant	Colour of leaf after starch test	Starch present/absent
A	Orange/brown	Absent
В	Blue/black	Present

(iii) Explain	these results.		

[2
----

5 (a) The diagram represents the energy flow through a short food chain.



	(i)	Give the	source of	energy for	the	food	chain
--	-----	----------	-----------	------------	-----	------	-------

\_\_\_\_\_[1]

(ii) Name organism A and process B.

Organism A \_\_\_\_\_\_ [1]

Process B \_\_\_\_\_\_ [1]

(iii) Calculate the percentage of the energy in the grass that is transferred to the growth of the bullock. Show your working.

Answer \_\_\_\_\_ [2]

**Examiner Only** 

Farmers can increase the percentage of the energy used by their bullocks for growth, by keeping them in cattle sheds during the winter.

Examiner Only					
Marks	Remark				

(iv)	Suggest <b>two</b> reasons why	bullocks	kept in	cattle shee	ds in the	
	winter could grow faster.					

[2]

**(b)** The table shows the estimated mass of spawning herring between 1998 and 2003.

Year	Mass of spawning herring/thousands of tonnes
1998	700
1999	850
2000	800
2001	1200
2002	1600
2003	2250

Adapted from: http://www.cefas.co.uk/media/31684/herringnorthsea.pdf © Crown Copyright

(i) Draw a histogram of the mass of spawning herring.



Change	[1]	
Explanation		
	[2]	
	awning herring has been caused by the European Union, to prevent overfishing.	
) Explain overfishing.		
) Laplain overnoming.		
	[1]	
Strategy	Explanation	
Strategy	Explanation	
	Explanation	
Quota	Explanation	
	Explanation	
	Explanation	
	Explanation	
Quota	Allows smaller, immature fish to escape.	

(c)	The	human population is estimated to rise to 6000000000 in 2010.		Examin Marks	er Only Remark
	(i)	Suggest <b>two</b> factors which have helped increase the human population.		illar no	. Tomark
			[2]		
	(ii)	Suggest <b>two</b> factors which can cause a decrease in the human population.			
		1	[1]		
		2	[1]		
			[1]		

**6** (i) Complete the table to show the processes involved in the nitrogen cycle.

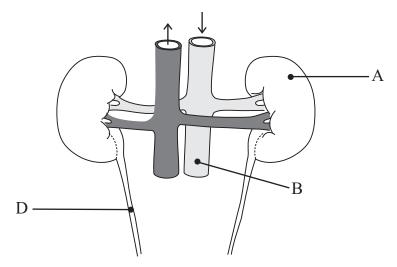
_	Chemical re	emical reaction		
Process	From	То		
	ammonia (ammonium compounds)	nitrates		
Denitrification	nitrates			
Nitrogen fixation				
	protein	ammonia Examiner O		
		Marks Ren		
		[1]		
Farmers plough fields to a	nerate the soil.	[1]		
	nerate the soil.	[1]		
(iii) Suggest two ways plo	oughing may improve crop yield.			
(iii) Suggest two ways plo	oughing may improve crop yield.			
(iii) Suggest two ways plo	oughing may improve crop yield.			
(iii) Suggest two ways plo	result in eutrophication.			

[1]

<b>(v)</b>	Explain how the risks of eutrophication can be reduced by		Examine Marks	er Only Remark
	applying the fertilizer only during periods of plant growth.		ina no	. Contain
		F 4 3		
	avoiding application of fertilizer during periods of heavy rain.			
(vi)	Suggest <b>one other</b> advantage of using natural fertilizer rather than artificial fertilizer to the			
	soil			
	farmer.			
		[1]		
(vii)	Suggest <b>two</b> advantages of artificial fertilizer.			
		[2]		

		[2]

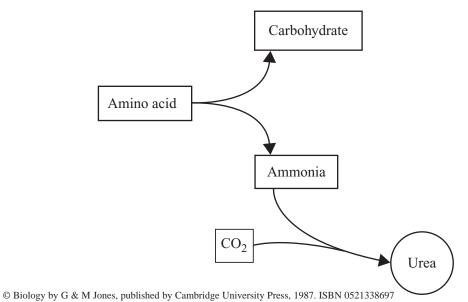
The diagram shows part of the human excretory system.





- (ii) Complete the diagram to show the bladder. [2]
- (iii) Name parts A, B, C and D.
  - A \_\_\_\_\_\_[1]
  - B \_\_\_\_\_\_[1]
  - C \_\_\_\_\_\_[1]
  - D \_\_\_\_\_\_[1]
- (iv) Give the function of the sphincter muscle.

(b) The diagram shows urea production.



(i) Describe what happens to excess amino acids in the blood.

	1	1
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**Examiner Only** 

(ii) Name the organ which

produces urea.

 [1]

removes urea from the blood.

(iii) Give two uses of the carbohydrate produced.

1			
1.	 	 	

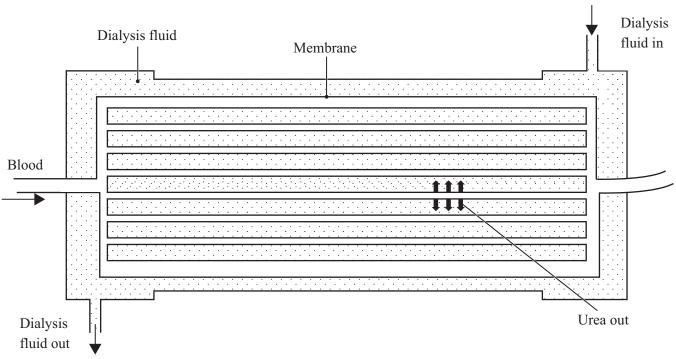
(iv) Explain why the volume of urine produced is greater in winter than in summer.

		[2

(v) Give the term used to describe the homeostatic control of water in the blood.

 [1]

(c) The diagram shows part of a kidney dialysis machine.



 $\ensuremath{\mathbb{O}}$  Biology by G & M Jones, published by Cambridge University Press, 1987. ISBN 0521338697

(i) Name **two** substances which would be in the same concentration in the blood and in the dialysis fluid.

4	E 4 T	
		1
Ι.		1
• •	1 - 1	

(ii) Explain why urea moves into the dialysis fluid.

		[2]

(iii) Suggest why the dialysis fluid must be continually replaced.

Г1
1

#### 8 (a) (i) Complete the table.

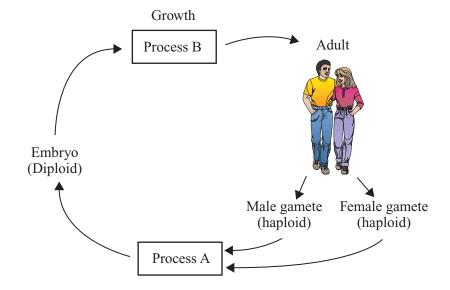
Description	Mitosis	Meiosis
Example	Skin	
Genetic information		Gives rise to variation
Number of divisions		
Number of daughter cells		

[4]

Examiner Only

Marks Remark

The diagram shows a human life cycle.



- (ii) Mark with an X on the diagram where in the life cycle meiosis occurs. [1]
- (iii) Name processes A and B.

A \_\_\_\_\_

[1]

В \_\_\_\_\_

[1]

Gametes are described as haploid.

(iv) Explain what is meant by haploid.

\_\_\_\_\_[1]

**(b)** The diagram shows a modern cloning technique used in carrots. Carrot tissue Ball of cells Nutrient agar Step 1 Step 2 Step 3 Step 4 Step 5 Carrot with Carrot chopped Carrot tissue Ball of cells grows Plantlets placed desirable up and tissue develops into a into plantlets with in pots placed on characteristics ball of cells shoots, roots and chosen nutrient agar leaves Examiner Only Marks Remark (i) Give the name of this cloning technique. [1] (ii) Suggest two features of carrots a grower might select in step 1, to make the carrot attractive to consumers. (iii) Explain why the offspring produced by this technique are described as clones. (iv) Give one other advantage of cloning. (v) Suggest two disadvantages of this technique.

[2]

	Examiner of Marks Re
Explain what is meant by resistance.	
	[1]
Explain how natural selection may lead to an increase in the number of resistant flies.	
	[3]
) Suggest <b>two</b> ways the development of pesticide resistance in t carrot fly population may be expensive for growers.	he
	[2]
	-
IS IS THE END OF THE QUESTION PAPER	-
	owers use insecticides to kill these pests but some of the flies are distant to the insecticide.  Explain what is meant by resistance.  Explain how natural selection may lead to an increase in the number of resistant flies.  Suggest two ways the development of pesticide resistance in the number.



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