WJEC GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT B1 FOUNDATION TIER 4461 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

S16-4461-01-R1

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

P.M. WEDNESDAY, 15 June 2016

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**4**	
3.	**6**	
4.	**12**	
5.	**8**	
6.	**6**	
7.	**7**	
8.	**5**	
9.	**6**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question **9**.

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Answer **all** *questions.*

1. The photographs show five organisms (**A** to **E**) and the group to which each one belongs.

Organism	**A**	**B**	**C**	**D**	**E**
Photograph					
Group	fungi	insects	bacteria	mosses	mammals
Magnifications of photograph	× 0.50	× 1.0	× 2000	× 0.40	× 0.25

(a) Use the magnifications below each photograph to place the organisms in order of size. Start with the **smallest**. One has been done for you. [3]

smallest organism: 1 .....

2 .....

3 **A**

4 .....

largest organism: 5 .....

(b) Give the names of the two groups that cause decay.

1. .....

2. ..... [1]

(c) Two of the groups belong to the same Kingdom.

Give the names of the two groups and the Kingdom to which they belong. [2]

Name of group: ..... and .....

Kingdom: .....

6

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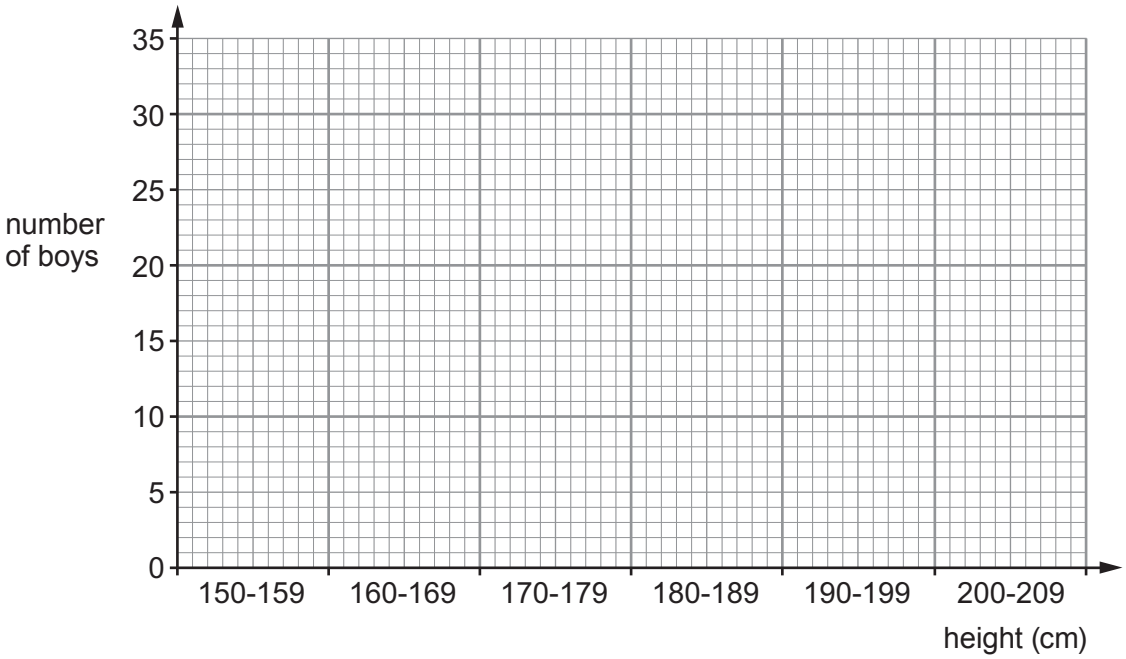
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2. The heights of 100 boys were measured on their 15th birthday.

The results are shown in the table below.

Height (cm)	Number of boys
150-159	5
160-169	16
170-179	19
180-189	25
190-199	30
200-209	5

(a) (i) Draw a bar chart of the results on the grid below. [2]



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(ii) The mean height of the boys was 180 cm.
Calculate the number of boys who were less than the mean height. [1]

number of boys .....

(b) Underline the correct word in the following sentence. [1]

The method used shows that the variation in heights **cannot** be due to differences in **age / diet / genes**.

4

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3. The photograph shows a farmer spraying crops with a pesticide.



(a) Explain why spraying crops with pesticides may increase crop yield on farms. [2]

.....

.....

.....

.....

(b) Some pesticides have harmful side effects.

Choose words from the list below to complete the following sentence. [4]

nitrates DDT toxic consumers producers disease fertility

Pesticides such as ..... may build up in food chains to ..... levels causing reduced ..... or death to third stage ..... .

6

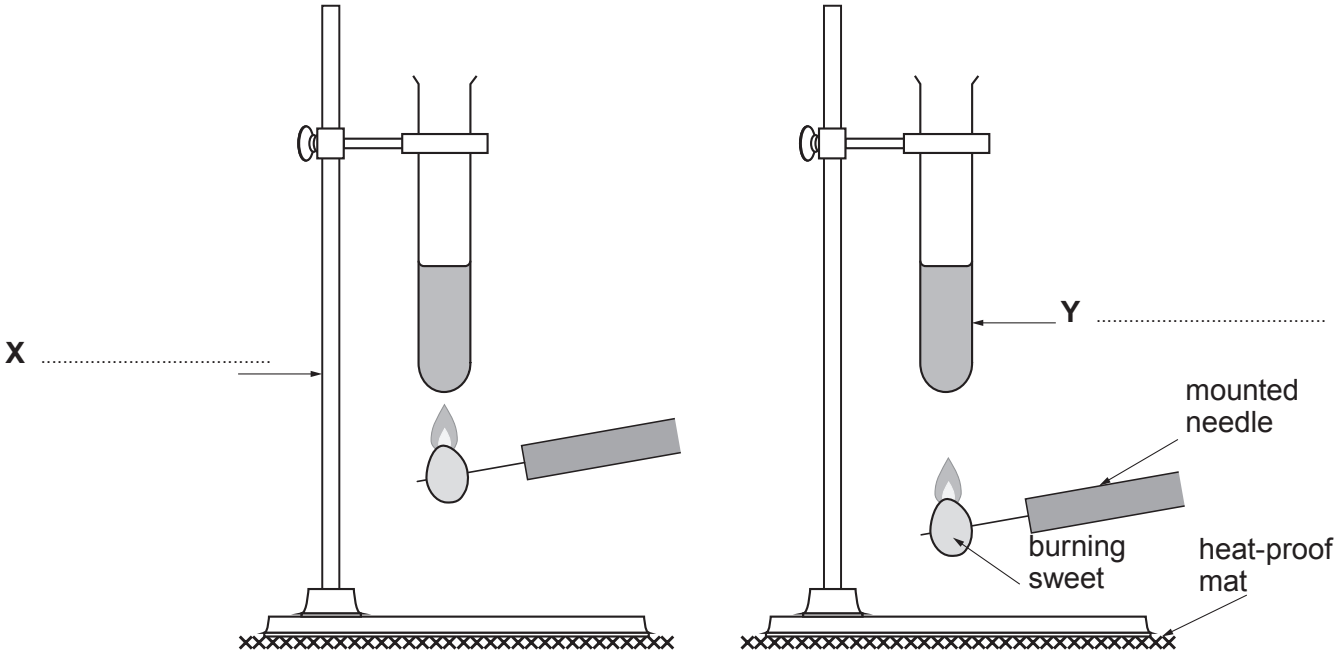
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4. In a Year 11 investigation, Dafydd and Megan compared the energy content of two sweets.

The diagrams below show one stage in Dafydd's method and in Megan's method.



Dafydd's method

Megan's method

(a) (i) Label the apparatus **X** and **Y** on the diagram. [2]

(ii) State **three** other pieces of apparatus needed for this investigation, which are **not** shown in the diagram. [3]

1. .....

2. .....

3. .....

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(b) The results of their investigation are shown in the table below.

Student	Mass of sweet (g)	Temperature of water (°C)			
		Start	End	Increase	Increase per gram of sweet
Dafydd	10	20	44	24	2.4
Megan	12	20	38	18	.....

(i) Calculate the increase in temperature per gram of Megan's sweet.
Write your answer in the table. [1]

(ii) Why did Dafydd and Megan need to calculate the increase in temperature of water per gram of sweet in this investigation? [1]

.....

(iii) Using the information in the diagram, explain why Dafydd and Megan got different results per gram of sweet. [2]

.....

.....

.....

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(c) We get energy from the sugar we eat.
The table below shows the sugar content of Megan's breakfast.

Item	Sugar content (g)
slice of toast	5.0
butter	0.0
teaspoon of honey	12.5
no fat yoghurt	5.4
glass of orange juice	20.0
total	.....

(i) Calculate the total sugar content of Megan's breakfast.
Write your answer in the table. [1]

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(ii) A recent report stated that sugar intake should be limited to 20 g a day.
Calculate the mass of sugar in excess of the stated daily limit in Megan's breakfast.
[1]

mass of excess sugar ..... g

(d) In what form is excess energy stored in the body? [1]

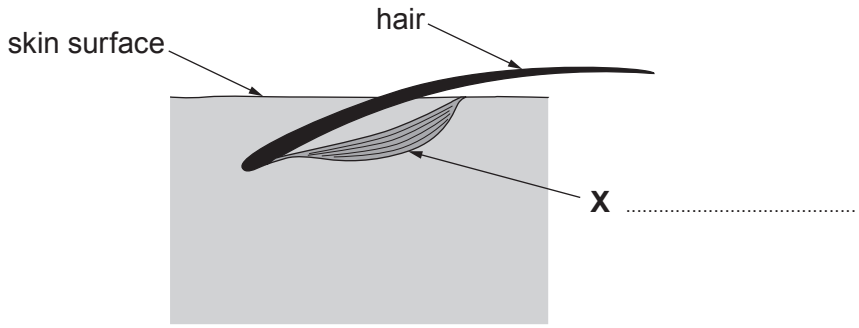
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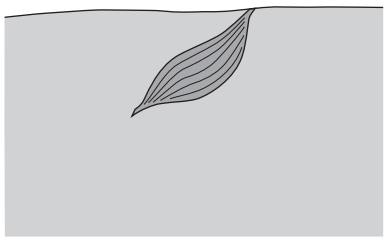
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5. *(a)* The diagram below shows a section of skin with the position of a hair on a hot day.



(i) Label structure **X** on the diagram. [1]

(ii) Complete the diagram below by drawing in the position of the hair on a **cold** day. [1]



(iii) State how structure **X** causes the change in the position of the hair on a cold day. [1]

.....

(iv) Describe how hair reduces heat loss from the surface of the skin. [2]

.....

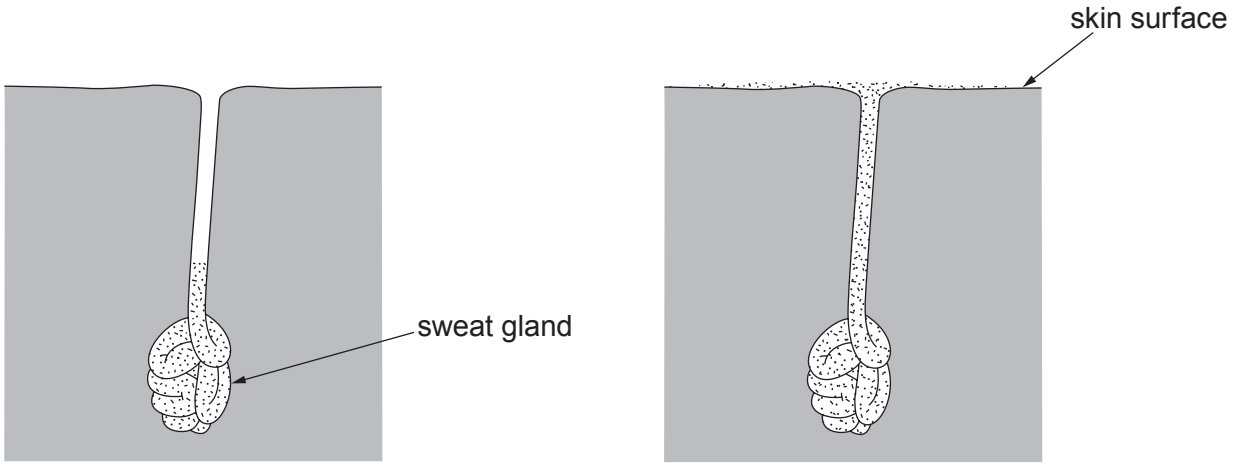
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(b) The diagram shows a section through the skin on a cold day and on a hot day.



cold day **hot day**

Use the diagram to describe and explain how the processes taking place in the sweat gland **and on the skin surface** help to cool the body on a **hot** day. [3]

.....

.....

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8

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6. *(a)* (i) Gregor Mendel crossed purple flowered pea plants with white flowered pea plants. All the **F1** generation were purple flowered. Show this cross by completing the Punnett square below.
Use the letter **D** to represent the purple allele and the letter **d** to represent the white allele. [2]

	Gametes		
F1			

(ii) When Mendel selfed the **F1** generation he obtained a ratio of 3 purple : 1 white flowered pea plants in the **F2** generation. In the space below construct and complete a Punnett square to show this cross. [2]

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(b) Mendel's experiments on genetics were carried out with garden peas *(Pisum sativum)*. In each of his experiments he used thousands of pea plants.
State the importance of the use of such a large number of plants. [1]

.....

(c) Mendel published his work on the genetics of pea plants in 1866. The significance of his work was not recognised until it was replicated in the early 1900s. Why is it important for scientists to replicate the work of other scientists? [1]

.....

6

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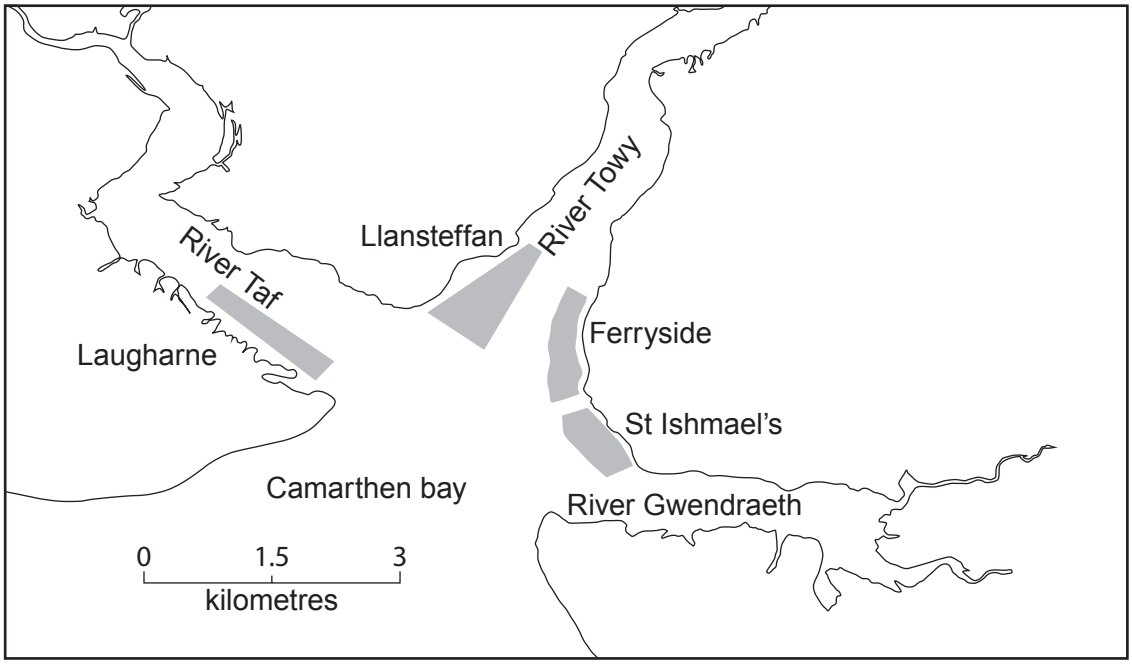
7. There is an increasing demand for food to feed the growing human population. This has both worldwide and local effects on wildlife and on the environment.

Cockles *(Cerastoderma edule)*



In 1984 a survey found that there was a small cockle fishery in the Three Rivers area of Carmarthenshire, South Wales with a few people harvesting the cockles. By 2014 the Three Rivers Cockle Fishery had become an important industry in South Wales with many fishermen harvesting the cockles for human consumption. The cockles are harvested from sandy mudflats at low tide.

Map showing the Three Rivers Cockle Fishery



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The table shows the number of fishermen that harvested cockles from the Llansteffan cockle bed on 4 days in the summer of 2007.

Date	Number of fishermen	Mass of cockles harvested (tonnes)
Tuesday 26 June	292	129
Tuesday 3 July	257	102
Tuesday 10 July	330	142
Tuesday 17 July	100*	37

*Tide not suitable for harvesting cockles

(a) Calculate the mean mass of cockles harvested per fisherman on Tuesday 26 June. Use the space below for your calculation. [2]

mean mass = ... tonnes

(b) (i) Cockles can only be harvested if there is a minimum of 50 cockles per m^2 of mud flats. If the number falls below this level then the Welsh Government closes the fishery. Suggest a reason why the fishery is closed if the number of cockles is less than 50 cockles per m^2. [1]

.....

(ii) Suggest a way in which the mass of cockles harvested could be managed effectively. [1]

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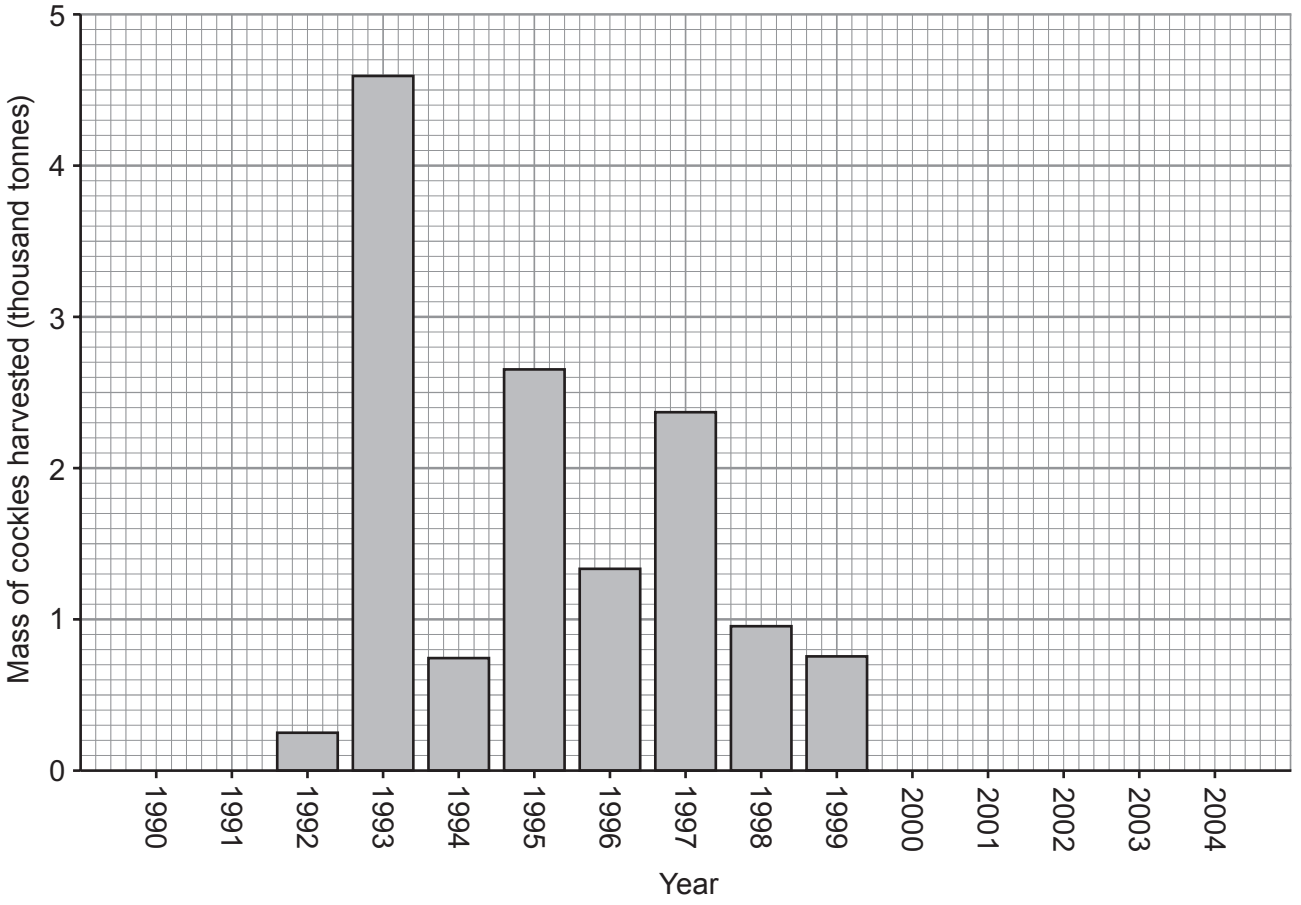
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(c) The graph below shows the mass of cockles harvested in the Three Rivers Fishery between 1990 – 2004.



Adapted from South Wales Sea Fisheries Committee

Suggest **two** possible reasons why no cockles were harvested from 2000 to 2004. [2]

I. .....

II. .....

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(d) Oystercatchers *(Haematopus ostralegus)* are birds which often feed on cockles.



In recent years there has been an increase in the number of oystercatchers *(Haematopus ostralegus)* moving into the Three Rivers area. Cockles are a major source of food for oystercatchers.

Suggest **one** possible reason for this increase. [1]

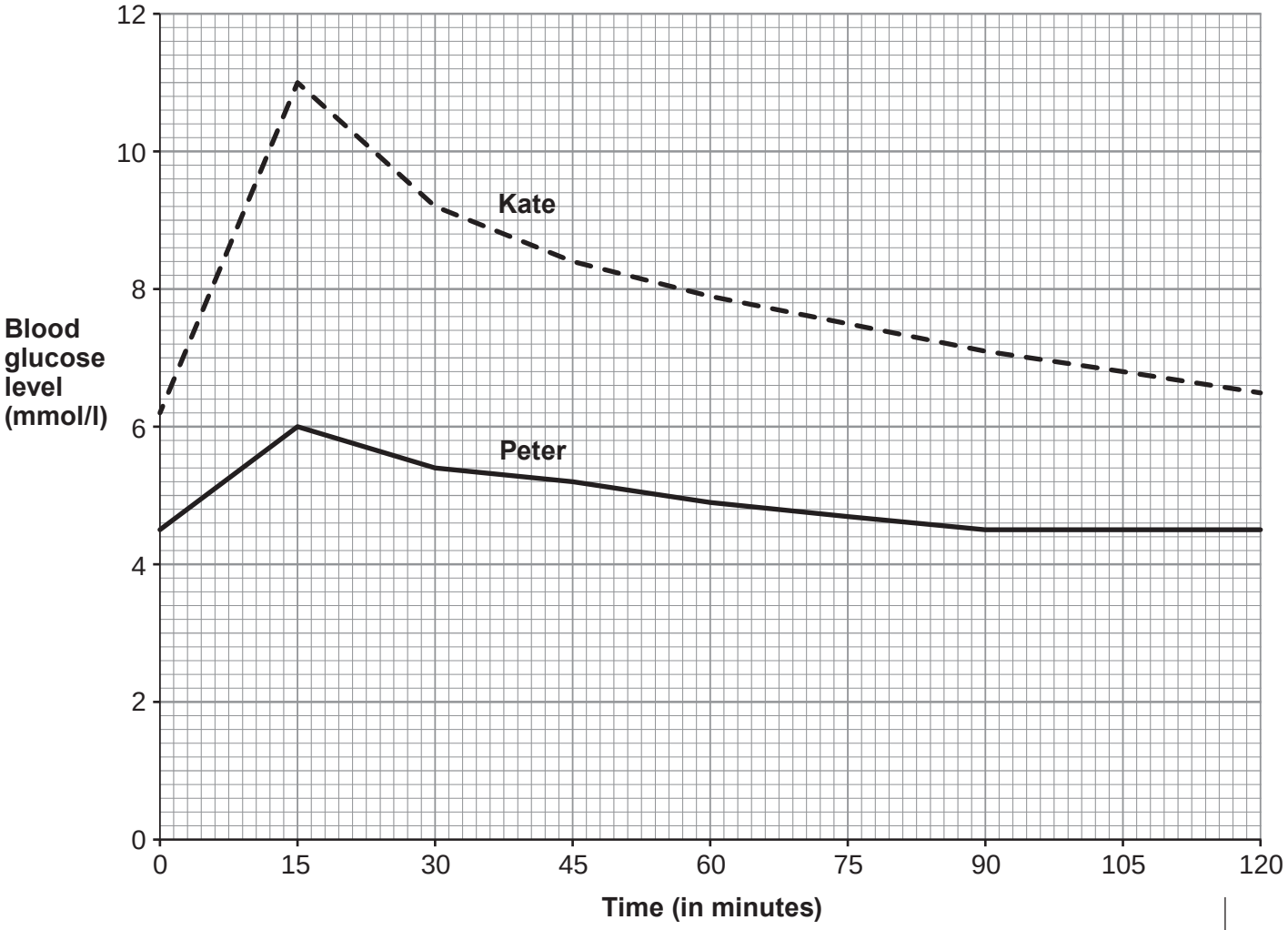
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8. The graph below shows the blood glucose levels of Kate and Peter, after eating the same mass of sugary cereal at breakfast time. The normal blood glucose range before meals is 4.0 – 5.9 mmol/l.



(a) Explain why Peter's blood glucose level rises then falls. [3]

.....

.....

.....

.....

.....

(b) State **two** pieces of evidence, shown in the graph, which indicate that Kate has diabetes. [2]

I. .....

II. .....

5

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9. Explain how the leakage of untreated sewage into an unpolluted pond can result in the death of fish living in the pond. [6 QWC]

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6

END OF PAPER

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GCSE MARKING SCHEME

SUMMER 2016

SCIENCE – BIOLOGY B1
4461/01/02

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)			3	1 C/ bacteria 2 B/insects 3 A *(given)* 4 D/ mosses 5 E/ mammals all 4 correct = 3; 2/3 correct = 2; 1 correct = 1;			
		(b)			1	Fungus **and** bacteria; *either order* *BOTH required for the mark*			letters
		(c)			1 1	insects ***and*** mammals; *either order.* *BOTH required for the mark* animal; 2nd MP linked to first - cannot access second mark if wrong organisms or no organisms given in first marking point If B and E given for first marking point – no credit, but can award second mark if correct			letters
		Total Mark			6				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
2		*(a)*	(i)		2	all six bars plotted and drawn accurately;; 2 marks one error; 1 mark ±½ small square tolerance on height Ignore differing widths Reject line/ stick graphs			
			(ii)		1	40;			
		(b)			1	<u>age</u>;			
		Total Mark			4				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)			2	(pesticide) {kills/ destroys} {pests/animals/weeds/insects/fungi }; that would {eat/kill/harm/damage/compete with/ feed on} {it/them/crop/plant};	named pest	get rid of/ stop named weed	 Bacteria
		(b)			4	DDT; toxic; fertility; consumers;			
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)	(i)		2	X = (clamp)stand; Y = boiling tube;	test tube		
			(ii)		3	Any three from • measuring cylinder/syringe • thermometer • Bunsen (burner) • balance • safety glasses/ goggles	weighing scales/ digital scale		measuring jug scales glasses
		(b)	(i)		1	1.5; No unit needed	answer not in table but in answer space (must have unit - °C)		
			(ii)		1	to make a fair comparison/ OWTTE; e.g. to work out if the results would be the same if the sweets weighed the same			Fair test
			(iii)		2	more {heat/energy} lost (in Megan's method); as the {sweet/flame} was held {lower/further away} (from the boiling tube); ORA			

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
		(c)	(i)		1	42.9;	answer not in table but in answer space must have unit (g)		
			(ii)		1	22.9; Ecf from (i) Answer from (i) – 20 = award 1 mark			
		(d)			1	fat;	glycogen		
		Total Mark			12				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)	(i)		1	<u>erector muscle</u>;			
			(ii)		1	Hair shaft to be shown raised; Hair should be higher than first diagram and no higher than 90° and should attach to the correct end of the muscle. Hair must protrude from the surface of the skin.			
			(iii)		1	it contracts/ contracting/ contraction;			Tenses/ pulls/ tightens/ shortens
			(iv)		2	traps layer of air; which is an insulator	Holds air/ keeps layer of air Poor conductor of heat	 Keeps heat in	Traps heat
		(b)			3	• <u>more</u> sweat produced (on a hot day); • {comes onto/spread over} the {skin/surface}/ comes through the (sweat) pore; evaporation (takes heat out);			
		Total Mark			8				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6	**1**	(a)	(i)			**F1** Gametes: **D** **D** **d**: **Dd** **Dd** **d**: **Dd** **Dd**			
					1 1	Gametes correct 1 mark Mechanics of cross correct 1 mark If use different letters cannot award gametes mark but can award mechanics mark			

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<table>
<tr><th colspan="2">Question Number</th><th colspan="3" rowspan="2">Sub-section</th><th rowspan="2">Mark</th><th rowspan="2">Answer</th><th rowspan="2">Accept</th><th rowspan="2">Neutral answer</th><th rowspan="2">Do not accept</th></tr>
<tr><th>FT</th><th>HT</th></tr>
<tr><td>6</td><td>1</td><td>(a)</td><td>(ii)</td><td></td><td>1
1</td><td>F2
<table>
<tr><td>Gametes</td><td>D</td><td>d</td></tr>
<tr><td>D</td><td>DD</td><td>Dd</td></tr>
<tr><td>d</td><td>Dd</td><td>dd</td></tr>
</table>
Gametes correct 1 mark
Must use any two of their F_1 offspring from (i)
Mechanics of cross correct (must generate a 3:1 ratio)
[If incorrect letters are used in (a)(i) allow ECF for (a)(ii) to access both marks]
If different letters used in second punnett square to first = 0 marks</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(b)</td><td></td><td></td><td>1</td><td>repeatability/increased confidence in results</td><td>Identify anomalies</td><td></td><td>Reliability/ accuracy/ validity/ reproducibility</td></tr>
<tr><td></td><td></td><td>(c)</td><td></td><td></td><td>1</td><td>So that the {work/results/experiments} can be {verified/confirmed}/
to see if they get the {same/ similar/different} results/ reproducibility;</td><td></td><td>To see if Mendels work was right/ correct/ true</td><td>Repeatability/ validity/ accuracy/ reliability</td></tr>
<tr><td colspan="3"></td><td colspan="2">Total Mark</td><td>6</td><td></td><td></td><td></td><td></td></tr>
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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	**2**	(a)			1 1	0.44/ 0.4/ 0.442/ 0.44178082 (tonnes) Correct answer = 2 marks If answer incorrect allow 1 mark for 129 ÷ 292			
		(b)	(i)		1	Any one from: • to allow stocks time to recover • ref to sustainability • because unless harvesting stops fishery will die out/ • conserve stock • allows them to reproduce to reach harvestable levels		Conservation/ to allow cockles to breed	Extinction/ species running out
			(ii)		1	• restrict harvesting to specified time e.g. once a week/ • quota scheme/ • collect a certain {mass/ weight} • limit number of fishermen allowed If state a {mass/ weight} it must be realistic (less than 2 tonnes/ day)			

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
		(c)			2	Any two from: fishery closed/ disease/ pollution/ number of cockles dropped below 50/m^2 / cockle beds have died out	All the cockles have been harvested		
		(d)			1	Any one from: other (cockle) beds have died out/ more {food/cockles/prey} (in Three Rivers area) must be comparative		Lots of food	
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	**3**	(a)			3	• (it rises because) glucose is {absorbed into/enters} the blood (stream); • pancreas {secretes/ releases/ produces/ makes} insulin; • which converts (excess) glucose to glycogen (in liver) (so blood glucose falls); Correct spelling for glycogen			
		(b)			2	any two from: • {glucose/ sugar} level is above {5.9 mmol/l/ normal}{before her meal/ at the start}/ {glucose/ sugar} level was higher than normal before she ate; • rises to a {very/abnormally/ unusually} high level; • hasn't fallen back to her starting level (after 120 minutes)/ takes longer to return to her starting level; • Her (blood) glucose level is always above normal;			
		Total Mark			5				

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Question Number			
FT	HT	Mark	Answer
9	**4**	6 QWC	**Indicative content:** • untreated sewage contains nutrients/nitrate/phosphate (NOT fertilisers) • which are (absorbed/ taken in/ taken up/ enters) by {plants/algae/photosynthesisers} • results in {growth/excessive growth/overgrowth (of plants)/ algal bloom/ rapid growth} • {sunlight/ light} blocked • plants die and are decayed by microbes/bacteria/ decomposers • microbes/bacteria increase in number • use up O_2 in respiration • fish suffocate/ fish die from lack of oxygen NOT fish die unqualified **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)	(i)		3	**Any three from:** • At {0/ 20} minutes the root is horizontal; • At 8 minutes the root {curves/ turns/ grows } upwards; • The root gets longer; • The {curvature increases/angle of curvature increases/ roots bend more/ root dips more }; • {At 35min/ after 20 min} the roots start to {bend/ grows/ curves/ turns/ dips } downwards;	Shows negative gravitropism Shows positive gravitropism	roots grow downwards at any point between 50-200	Roots grow towards gravity/ roots grow downwards unqualified
			(ii)		1	<u>positive</u> gravitropism/geotropism;			
		(b)	(i)		1	The tissues/cells/part of root on the upper grow {quicker/ more} (than on the lower surface) ;	reverse argument		
			(ii)		1	hormone/plant hormone/phytohormone;	auxin		
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			2	{Plants / crops} {absorb / take up} nitrates (when growing in the autumn); (More) run off (from bare soil) / (less) run off {when plants are growing/ in growing season};	Not washed away	Fertiliser	Nitrogen
		(b)			1	Provides <u>oxygen</u> for {microorganisms / decomposers/ bacteria / fungi} for <u>respiration</u>;			
		(c)			2	<u>Protein</u> {changed/ broken down} to ammonia by bacteria; Ammonia {changed/ built up} to nitrates by (nitrifying) bacteria;			Denitrifying bacteria Ammonia broken down to nitrates
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)			1	Genetically identical/ {identical / same} {genes / alleles/ genomes / DNA/ genetic code/ genotype/ genetic makeup};			
		(b)			2	Cannot show variation; So cannot have types resistant to the fungi;			They are all the same immune
		(c)			4	• Pesticides enter {rivers/water}; • Bioaccumulation/ {build up/ accumulate} in food chain/ OWTTE; • Pesticide reaches toxic {concentration / level/ amount}/ OWTTE Answer must be in context of food chain; • Reduces fertility / prevents {reproduction / egg laying} in Caiman;			
		Total Mark			7				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	8	(a)	(i)		1	B;			
			(ii)		1	A;			
		(b)			1	{Genetic/ DNA/ gene} <u>profiling;</u>			Genetic analysis/ DNA testing/ chromosome profiling/ genetic fingerprinting
		(c)			1	Species; (correct spelling)			
		(d)			1	iii;			
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(a)			2	25 × 25 = 625 ×4 = 2 500 Answer = 1 in 2 500 or 1/2500 or 1:2500 or 0.04% or 0.0004 or 4 x 10^{-4}; Correct answer = 2 marks Incorrect answer but evidence of correct working = 1 mark			
		(b)			1	They produce {increased / more/ build up/ thick} mucus;		Sticky mucus	Too much mucus
		(c)			1	Healthy lungs have donor's {allele/ genes} / do not have cf {allele/ gene} /they are not nn;	They have dominant/ normal alleles		
		(d)	(i)		1	Use of inhaler / they are inhaled/ they are breathed in;	Asthma type inhaler	virus	Asthma inhaler
			(ii)		1	Lung cells with introduced alleles wear out and are replaced by cells with cf allele / owtte;			
		(e)			1	To check there are no side effects / check there are no long term (harmful) effects;	To check that it is safe		
		Total Mark			6				

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Question Number			
FT	HT	Mark	Answer
	10	6 QWC	**Indicative content:** • The gene for sugar attraction was mutated. • This led to variation – some populations/ individuals/ cockroaches} were not attracted to sugar. • Those not attracted to sugar did not eat the poison so survived/ selective advantage/ natural selection • these then reproduce • And passed on the advantageous gene. No upper or middle band for those who describe{ resistance/ immunity} <u>to insecticide.</u> **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		7	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

W16-4461-01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

A.M. THURSDAY, 7 January 2016

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**8**	
3.	**7**	
4.	**4**	
5.	**8**	
6.	**6**	
7.	**7**	
8.	**5**	
9.	**6**	
Total	**60**	

4461 010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question **9**.

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Answer **all** *questions.*

1. The diagram shows a grassland food chain.

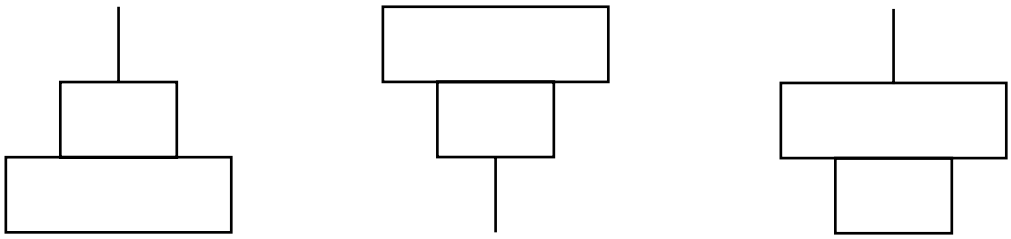


(a) Which **one** of the following words describes the rabbits? [1]

Underline the correct answer.

Rabbits are: producers herbivores carnivores

(b) Which of the following pyramids of number (**A**, **B** or **C**) matches the food chain? [1]



Answer .....

4461 010003

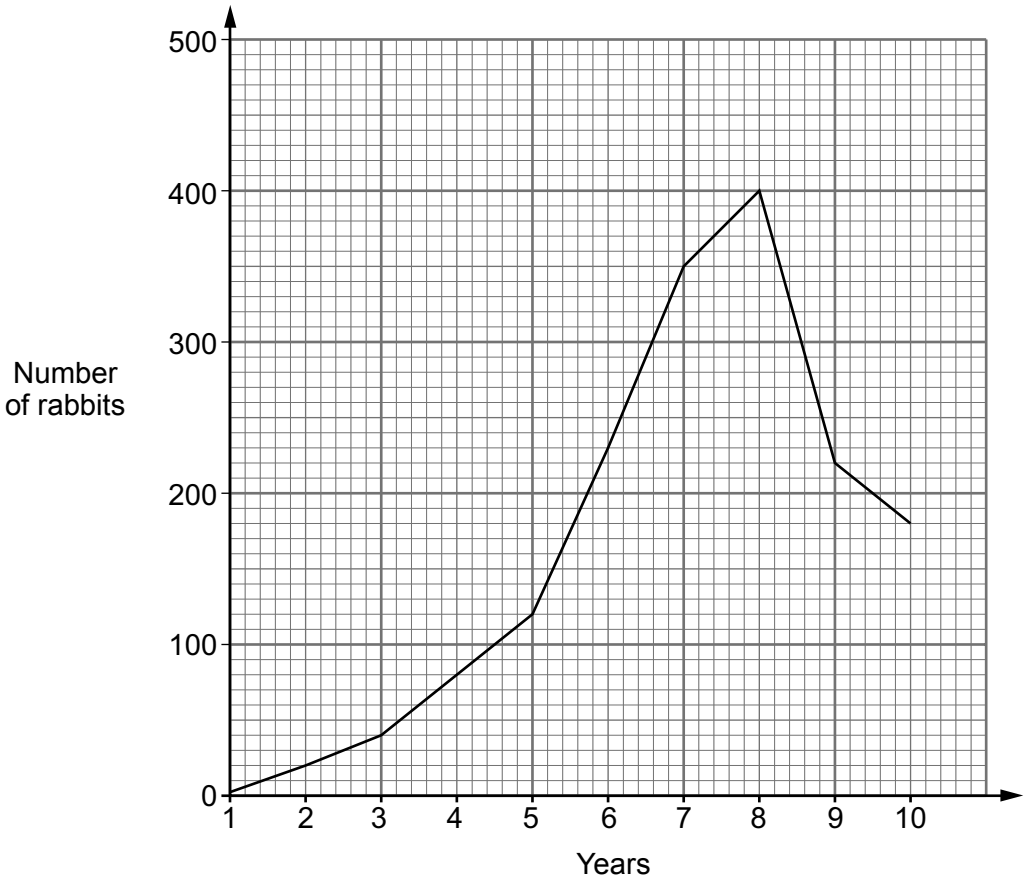
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(c) Rhian uses a computer model to investigate the population growth of rabbits on an island. The computer produces a graph of how the number of rabbits on the island might change over ten years.



Use the data from the graph to answer the following questions:

(i) In which two year period was population growth the fastest? [1]

Between year ..... and .....

(ii) State the number of rabbits on the island in year 8. [1]

.....

(iii) The island has an area of 2000 m^2.
At the start, there are 2 rabbits on the island, so the area for each rabbit is 1000 m^2.
Calculate the area for each rabbit in year 8. [1]

Answer ..... m^2

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(iv) Calculate the fall in the number of rabbits between years 8 and 10. [1]

Answer .....

(d) Rhian said 'the number of rabbits has fallen because they don't have enough space'.

Apart from lack of space, suggest **three** other reasons that might cause the number of rabbits on the island to decrease. [3]

1. .....

2. .....

3. .....

9

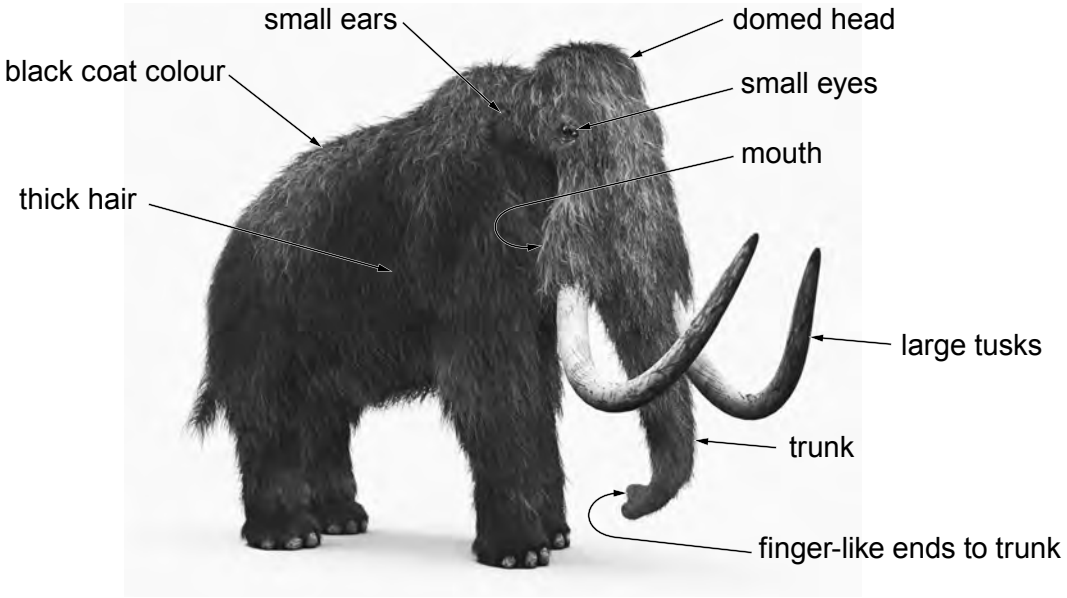
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2. The drawing shows an extinct mammal called the woolly mammoth *(Mammuthus primigenius)*.



(a) (i) Woolly mammoths lived at a time when the climate was very cold.

Some of the labelled adaptations helped woolly mammoths keep warm.

Choose **two** of the adaptations and state how each one helped woolly mammoths keep warm. [4]

I. .....

.....

.....

II. .....

.....

.....

(ii) Woolly mammoths ate plants.

Suggest how the trunk is adapted to help woolly mammoths pick up their food. [1]

.....

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(b) In May 2013, the frozen body of a woolly mammoth was recovered from thick ice in Russia.
Although the animal died 10 000 years ago, it was still well preserved.

Explain why the animal was well preserved. [3]

.....

.....

.....

.....

.....

.....

8

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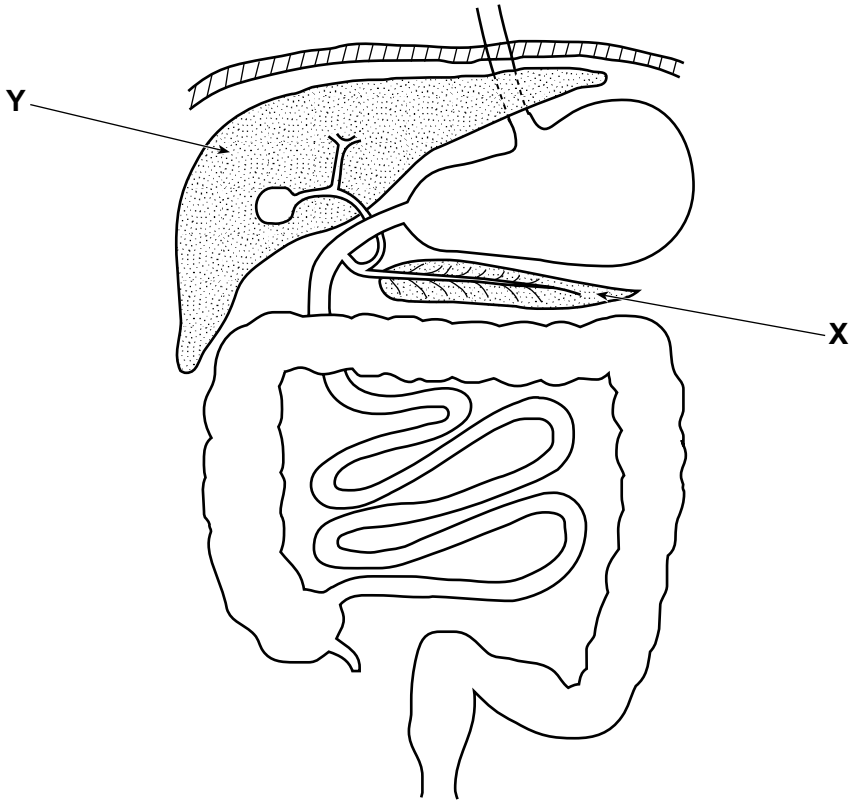
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3. This question is about the control of blood sugar.

(a) The diagram shows part of the human body with two labelled organs, **X** and **Y**.



(i) Insulin is produced in organ **X**.

State the name of organ **X**. [1]

.....

(ii) Insulin has its effect in organ **Y**.

State the name of organ **Y**. [1]

.....

(iii) How does insulin travel from organ **X** to organ **Y**? [1]

.....

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(b) In Wales, in 2010, the cost of treating diabetes was £500 million.

1. The percentage of the population with type 2 diabetes is increasing.
2. The percentage of the population who are obese is increasing.
3. The population is increasing.

Using the three statements above, which of the following (**A**, **B** or **C**) shows that the cost of treating diabetes will increase in the future? [1]

A. 1

B. 1 and 2

C. 1, 2 and 3

Answer .....

(c) Complete the following sentence. [1]

Diabetes may be diagnosed by testing a sample of urine for presence of

..... .

(d) Suggest **two** healthy lifestyle choices which might help prevent the development of type 2 diabetes. [2]

.....

.....

.....

.....

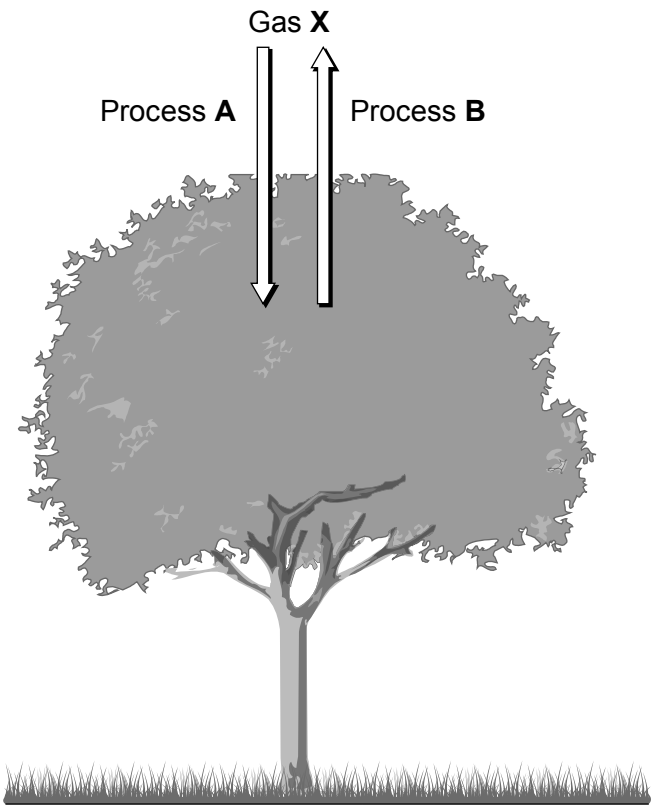
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7

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4. The diagram shows the role of a tree in part of the **carbon cycle**.



(a) From the diagram of part of the carbon cycle, state the name of:

(i) process **A**, which uses gas **X** to make sugar ..... [1]

(ii) process **B**, which releases gas **X** ..... [1]

(iii) gas **X** ..... [1]

(b) The fallen leaves of the tree are collected and burnt.

How does burning (combustion) affect the carbon cycle? [1]

.....

4

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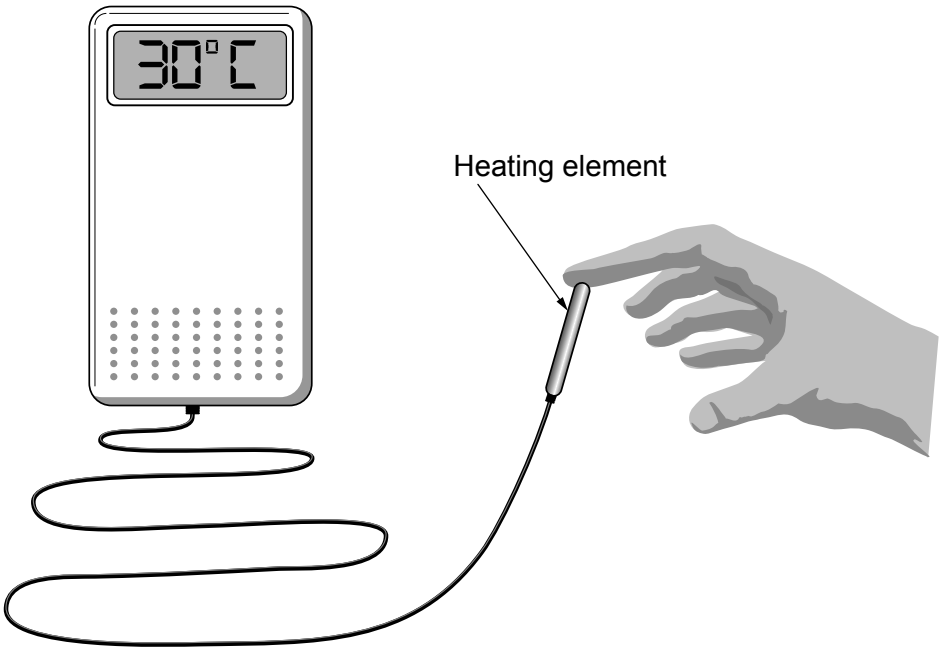
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5. Harri used the apparatus shown below to investigate the sensitivity of the skin to changes in temperature.



This is Harri's method.

- He placed the heating element, set at 30°C, to a fingertip of one student.
- He increased the temperature of the heating element in 0.1°C steps.
- He noted the temperature at which the student said she could feel the increase in temperature.
- He called this temperature the **end temperature**.

He repeated this method on the lips, cheek and elbow.

(a) Harri then tested three other students in his class.
The results are shown in the table below.

student	end temperature (°C)			
	finger tip	lips	cheek	elbow
1	30.5	30.4	30.5	30.8
2	30.4	30.2	30.6	31.0
3	30.4	30.3	30.6	30.9
4	30.6	30.3	30.7	31.4
mean	30.5	30.3	30.6	31.0

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Use the data from the table opposite to answer the following:

(i) Which skin part is the most sensitive to temperature change? [1]

.....

(ii) Which skin part has the widest range of readings? ..... [1]

(b) Harri then tested five of his teachers. The mean results are shown below.

mean end temperature (°C)			
finger tip	lips	cheek	elbow
30.6	30.3	31.3	32.0

Using only the results in the two tables, describe the effect of ageing on skin sensitivity. [2]

.....

.....

.....

(c) Complete the table below. [4]

sense organ	stimuli detected
skin	temperature and .....
eye	.....
.....	sound
tongue	.....

8

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6. Phenylketonuria (PKU) is an inherited disease caused by a recessive allele. PKU results in damage to the nervous system in the early years of life.

Key – **N** represents the allele for **not** having PKU

n represents the allele for having PKU

A couple, neither of whom suffer from PKU, have a child who is found to have PKU.

(a) (i) State the genotype of: [1]

I. the mother .....

II. the father .....

(ii) Complete the Punnett square below to show the possible genotypes of the children produced by this couple. [2]

Gametes		

(iii) Place a circle in the Punnett square around the genotype of a child suffering from PKU. [1]

(iv) From your Punnett square, what is the probability of a child **not** having PKU? [1]

.....

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(b) At birth a sample of blood is taken from babies to check for PKU.



Suggest why the screening of newborn babies for genetic conditions like PKU is important. [1]

.....

.....

6

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Examiner only

7. Vitamin A deficiency occurs when humans do not obtain enough of this vitamin from their food. It is very common in developing countries. It can result in blindness and between 250 000 and 500 000 children in these countries go blind each year from vitamin A deficiency. Approximately half of these children die within one year of becoming blind.

Golden Rice is a genetically modified (GM) crop plant which contains high levels of vitamin A. It was developed to help prevent vitamin A deficiency and has been grown in field trials in the Philippines, Taiwan and other countries.



(a) State the meaning of the term genetically modified (GM). [1]

.....

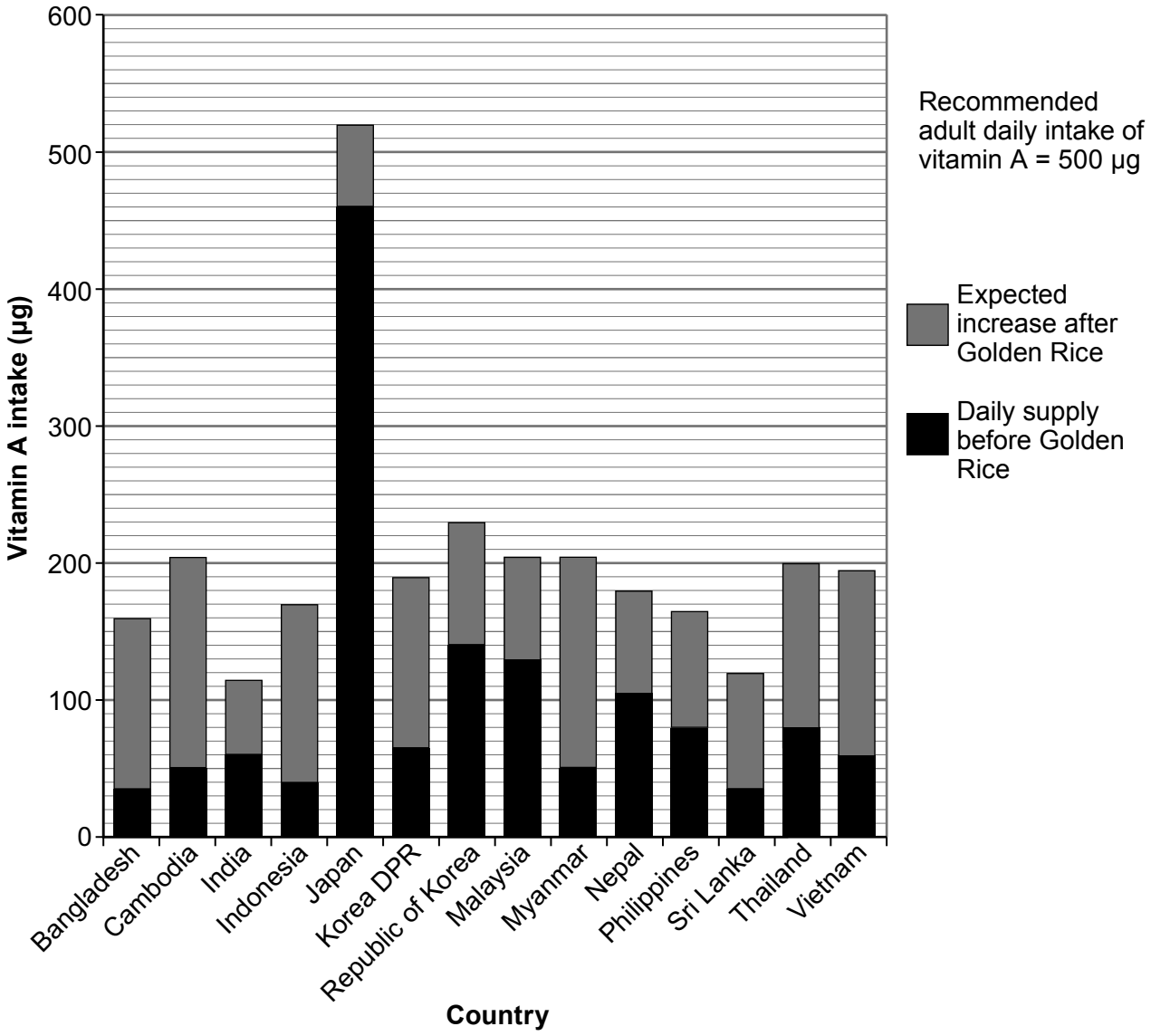
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(b) The graph below shows the mass of additional vitamin A which could be obtained each day if the countries indicated were to replace the rice varieties they grow with Golden Rice.



(i) In which of the countries in the graph would the people have sufficient vitamin A each day if they grew Golden Rice? [1]

.....

(ii) In how many of the countries shown could the people increase the intake of vitamin A per day by 50% or more if they grew Golden Rice? [1]

.....

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(iii) Since the data for the graph were obtained, a new variety of golden rice, Golden Rice 2, has been developed. The table below shows the potential benefits of Golden Rice 2 in Bangladesh.

	Adults	Children under 7 years of age
Recommended daily intake of vitamin A (µg)	500	450
Vitamin A provided by Golden Rice 2 (µg)	775	338
Vitamin A provided by other food eaten (µg)	245	112

Explain the effect of a diet containing Golden Rice 2 on the number of cases of blindness caused by vitamin A deficiency in Bangladesh. [2]

.....

.....

(c) In August 2013 a crop of Golden Rice that was being grown in a field trial was destroyed by protesters in the Philippines. The protesters said they had many concerns about the growth of GM crops.

Suggest what **two** of these concerns might have been. [2]

.....

.....

.....

7

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8. *(a)* (i) What is meant by the term indicator species? [1]

.....

(ii) Name **one** factor of water quality which can be assessed by using indicator species. [1]

.....

(b) Lichens can be used as indicators of air quality and are often found covering the bark of trees. The amount of tree bark covered with lichen is known as the percentage cover. In the photograph below the lichen is covering about 40% of the bark i.e. the percentage cover is 40%.

Lichen on the bark of a tree



The table below shows the pH of the bark of ash trees and the percentage (%) cover of a lichen which is very sensitive to air quality. The data were collected along a 19 mile line, starting from the centre of a large industrial city.

Distance from city centre (miles)	0	1.0	1.7	3.0	4.7	6.0	6.5	7.0	8.0	9.0	9.5	10.5	12.5	14.5	16.5	19.0
pH	3.2	3.4	3.4	3.5	3.4	3.6	3.6	3.7	3.6	3.9	4.4	4.4	4.3	4.3	4.5	4.5
% cover of lichen	0	0	0	0	0	0	0	0	1	12	23	25	54	57	66	66

Describe and explain the change in the percentage (%) cover of lichen as you move out of the city centre. [3]

.....

.....

.....

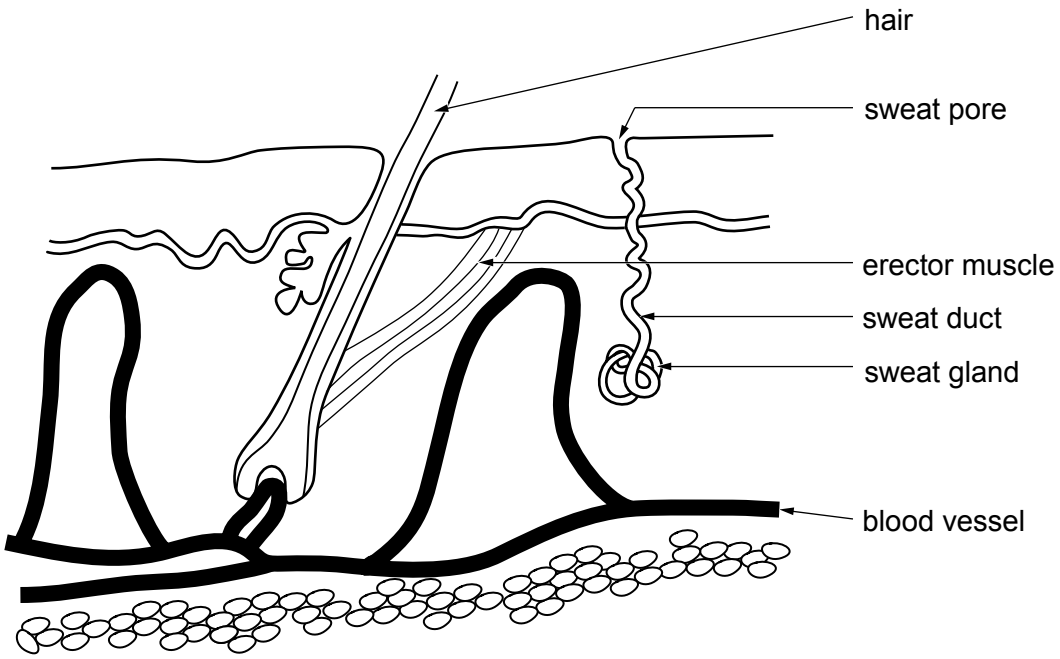
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5

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9. Explain how human skin helps to control body temperature in hot conditions. Use the features labelled on the diagram below to help with your answer. [6 QWC]



END OF PAPER

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GCSE MARKING SCHEME

JANUARY 2016

SCIENCE – BIOLOGY 1
4461/ 01/02

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INTRODUCTION

This marking scheme was used by WJEC for the January 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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Biology 1 Foundation Tier

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
1		(a)			1	herbivores;			
		(b)			1	A;			
		(c)	i		1	5 and 7;			
			ii		1	400;			
			iii		1	5(m^2);	ecf (ii)		
			iv		1	220;			
		(d)			3	**any three from:** • {not enough/ competition for} {food/grass}/ not enough to eat; • disease; • (qualified reference to weather/climate) e.g. too hot/ too cold; • increase in {predators/ hunters/OWTTE}; • {not enough/ competition for} water;	drought	Ref to reproduction alone	No/ less/ lack of food illness Climate change
		Total Mark			9				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		(a)	i		4	**one mark** for **correct adaptation** plus **one** for a **correct explanation**. **any two from:** • <u>thick</u> hair; good insulator/ reduces heat loss; • <u>black</u> coat colour; {absorbs/takes in} heat ; • <u>small</u> ears; <u>reduced surface area</u> for heat loss;	Keeps <u>more</u> heat in solar energy /sun's <u>energy</u>		Keeps heat in/ keeps it warm Attracts heat
			ii		1	it has finger like ends on the trunk;			
		(b)			3	<u>{Too/very}</u> cold/ temperature is low}; for {bacteria/fungi/micro-organisms/decomposers}; so no {decay/decomposition};	Correct reference to micro-organisms		Killing bacteria/ no bacteria
		Total Mark			8				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
3		(a)	i		1	pancreas;			pancrease
			ii		1	liver;			
			iii		1	in the blood(stream);	blood vessels/ veins/ arteries/ capillaries		in blood cells
		(b)			1	C;	1,2 and 3		
		(c)			1	glucose;	sugar		blood sugar
		(d)			2	{regular / description of regular} exercise/ exercise often; eat less {carbohydrate/starch/ sugar/ fat};			more exercise/ keep fit eat less food/ control the quantity of fat/ eat no fat
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)	i		1	photosynthesis;			
			ii		1	respiration;			
			iii		1	carbon dioxide;	CO_2		
		(b)			1	{releases/ adds/ produces/ more} carbon dioxide;	CO_2/ gas X if named in iii		CO^2/ Co_2
		Total Mark			4				

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<tr><th colspan="2">Question Number</th><th colspan="3" rowspan="2">Sub-section</th><th rowspan="2">Mark</th><th rowspan="2">Answer</th><th rowspan="2">Accept</th><th rowspan="2">Neutral answer</th><th rowspan="2">Do not accept</th></tr>
<tr><th>FT</th><th>HT</th></tr>
<tr><td>5</td><td></td><td>(a)</td><td>i</td><td></td><td>1</td><td>lips;</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>ii</td><td></td><td>1</td><td>elbow;</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(b)</td><td></td><td></td><td>2</td><td>{skin becomes/ it becomes/ fingertips, cheek and elbow become} less sensitive;
no effect on lip sensitivity/ lip sensitivity stays the same;</td><td>skin becomes less sensitive except the lips = 2 marks</td><td></td><td>reference to any less than the three areas for the 1st mark point</td></tr>
<tr><td></td><td></td><td>(c)</td><td></td><td></td><td>4</td><td><table><tr><th>sense organ</th><th>stimulus detected</th></tr><tr><td>given</td><td>touch/ pressure;</td></tr><tr><td>given</td><td>light;</td></tr><tr><td>ear;</td><td>given</td></tr><tr><td>given</td><td>chemical(s);</td></tr></table></td><td></td><td></td><td></td></tr>
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<tr><th>FT</th><th>HT</th></tr>
<tr><td>6</td><td>1</td><td>(a)</td><td>i</td><td></td><td>1</td><td>the mother Nn and
the father Nn ;
(both correct for 1 mark)</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>ii</td><td></td><td>1
1</td><td>gametes correct from ai;
mechanics of cross correct – this mark can be awarded even if the gametes are incorrect;
<table>
<tr><td></td><td>N</td><td>n</td></tr>
<tr><td>N</td><td>NN</td><td>Nn</td></tr>
<tr><td>n</td><td>Nn</td><td>nn</td></tr>
</table></td><td>ecf from ai

Use of wrong letters from ai (except X and Y)</td><td></td><td>Any reference to X and Y</td></tr>
<tr><td></td><td></td><td></td><td>iii</td><td></td><td>1</td><td>circle around nn;</td><td></td><td></td><td>any other letters</td></tr>
<tr><td></td><td></td><td></td><td>iv</td><td></td><td>1</td><td>¾/ 75%/ 0.75/ three out of four;
must relate to their Punnett square</td><td></td><td></td><td>ratio/ no credit if any letters other than Nn used</td></tr>
<tr><td></td><td></td><td>(b)</td><td></td><td></td><td>1</td><td><u>early</u> {treatment/ cure}/ treatment straight away/ {quicker/ sooner} treatment;</td><td>gene therapy as equivalent of treatment</td><td></td><td></td></tr>
<tr><td colspan="4">Total Mark</td><td>6</td><td></td><td></td><td></td><td></td></tr>
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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	**2**	(a)			1	the transfer of {genes/DNA} from one organism to another/ the {modification/altering} of {genes/ DNA} within an organism; (OWTTE)	species/ living thing as equivalent to organism		
		(b)	i		1	Japan;			
			ii		1	9;			
			iii		2	number of cases of blindness decreases/ no blindness/ prevents blindness; Because {they / both groups} are now {reaching RDA/ having enough vitamin A}; **2nd mark linked to 1st**	plenty of vitamin A/ stops vitamin A deficiency		more vitamin A
		(c)			2	health concerns from <u>eating</u> GM foods/ <u>eating</u> GM crops {will harm them/ have side effects}; concerns about GM organisms breeding with native organisms;	eating GM crops will poison them/ they do not if it is safe to eat		
		Total Mark			**7**				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	**3**	(a)	i		1	{organism/species/ animal/ plant} which {indicates/shows} the {presence/level} of {pollution/pollutants/ named pollutant};			
			ii		1	pH/ {oxygen/ O_2};	numbers of bacteria		sewage/ PH/ ph
		(b)			3	(greater the distance from city) pH {increases/ becomes less acidic}/ less acidic gases/ less correctly named gases}; (greater the distance from city) {lichen increases/ less lichen destroyed/ more lichen survives }; (greater the distance from city) less <u>pollution</u>; **3rd marking point linked to 1st or 2nd marking point**	reverse argument for all marking points it= lichen		
		Total Mark			**5**				

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Question Number			
FT	HT	Mark	Answer
9	**4**	6 QWC	**Indicative content** • under warm conditions erector muscle relaxes • hair lies flat • reducing insulation • blood vessel widens/dilates/ vasodilates • more blood flows through skin • more heat lost • more sweat produced • onto the surface of the skin/ out of the sweat pore • evaporation removing heat **TOP BAND** must have reference to all three structures. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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<table>
<tr><th colspan="2">Question Number</th><th colspan="3" rowspan="2">Sub-section</th><th rowspan="2">Mark</th><th rowspan="2">Answer</th><th rowspan="2">Accept</th><th rowspan="2">Neutral answer</th><th rowspan="2">Do not accept</th></tr>
<tr><th>FT</th><th>HT</th></tr>
<tr><td></td><td>5</td><td>(a)</td><td></td><td></td><td>1</td><td>carbohydrate/starch/bread/potato/rice/pasta;</td><td>any other source of carbohydrate /starch</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(b)</td><td></td><td></td><td>1
1</td><td>pancreas {secretes/ produces/ makes/ releases} insulin;
which converts glucose into glycogen;</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(c)</td><td></td><td></td><td>1</td><td>blood glucose {<u>rises/ increases</u>} to high level/
<u>slow fall</u> in blood glucose levels/
blood glucose levels do not fall to {between 3.5 – 7.5 mmol/l/ normal};</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(d)</td><td></td><td></td><td>2</td><td>1 mark for first two columns circled correctly
1 mark for correct result (linked to first column, even if process incorrect)
<table>
<tr><th>Chemical test used</th><th>Process used</th><th>Result of test</th></tr>
<tr><td>Biuret test</td><td>Dip in urine sample</td><td rowspan="4">Brown (diastix)
blue/purple (clinistix)

yellow/ green/ orange/ (brick) red (Benedicts)</td></tr>
<tr><td>Benedict’s test</td><td>Mix with urine sample
and heat gently</td></tr>
<tr><td>Iodine test</td><td>Mix with urine sample
and cool in refrigerator</td></tr>
<tr><td>Diastix/ Clinistix</td><td>Mix with urine sample
and heat strongly</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Total Mark</td><td>6</td><td colspan="5"></td></tr>
</table>

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			2	4 correct – 2 marks 2/ 3 correct – 1 mark **A** **D** **B** **C**			
		(b)			5	protein/urea in sewage; protein/urea changed to ammonia; ammonia changed to nitrate; by bacteria; (must be correct context if mentioned) reference to higher temperature (in May) affecting bacteria;			
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)			1	50 (ppm);			
		(b)			3	<u>lead</u> {accumulates/ not broken down/ passed up / builds up / concentration increases} in the {food chain/tissues/ organism}/ lead bioaccumulates; {poisons/ kills} gulls/is toxic to gulls; reduces {fertility/reproduction/breeding};			It accumulates
		(c)			1	carbon dioxide;	methane		biogas
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			1	polar bear + grizzly bear + brown bear;			
		(b)	i		2	Grizzly bear + brown bear; same genus;		same family/ both Ursus	
			ii		1	genetic profile /DNA profiling;			Fingerprinting
		(c)			2	Red panda and giant panda are in different families; Red panda and racoon share <u>more recent</u> common ancestor;	Red panda and racoon are in the same family		
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(a)	i		1	DNA;			
			ii		4	chloroquine killed (most) non-resistant Plasmodium ; resistant ones were at an advantage / OWTTE; (survived/selected) to breed/reproduce/ multiplied; {gene <u>for resistance</u> / <u>mutated</u> gene / <u>advantageous</u> gene} passed on;			
		(b)			1	some non-resistant ones had survived the chloroquine previously/ (another) mutation had taken place;			
		Total Mark			6				

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Question Number			
FT	HT	Mark	Answer
	10	6 QWC	**Indicative content** **Obesity:** • Link between diet and obesity e.g. excess fat in diet: • (High cholesterol) resulting in {cardio-vascular disease / heart disease / Blood (/coronary) vessels blocked / heart attack/ high blood pressure} • Joint problems/ mobility reduced • Type 2 diabetes • Cancer **Alcohol:** • Cardio vascular / heart disease • Liver damage/ Brain damage/ kidney damage • Cancer • Addiction • Reaction time increased (qualified) **TOP BAND** answers must refer to both obesity and alcohol and include diet for obesity and a range of factors for alcohol **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

S15-4461-01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

P.M. TUESDAY, 9 June 2015

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**6**	
3.	**5**	
4.	**10**	
5.	**5**	
6.	**6**	
7.	**7**	
8.	**6**	
9.	**5**	
10.	**6**	
Total	**60**	

4461 010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question **10**.

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Answer **all** *questions.*

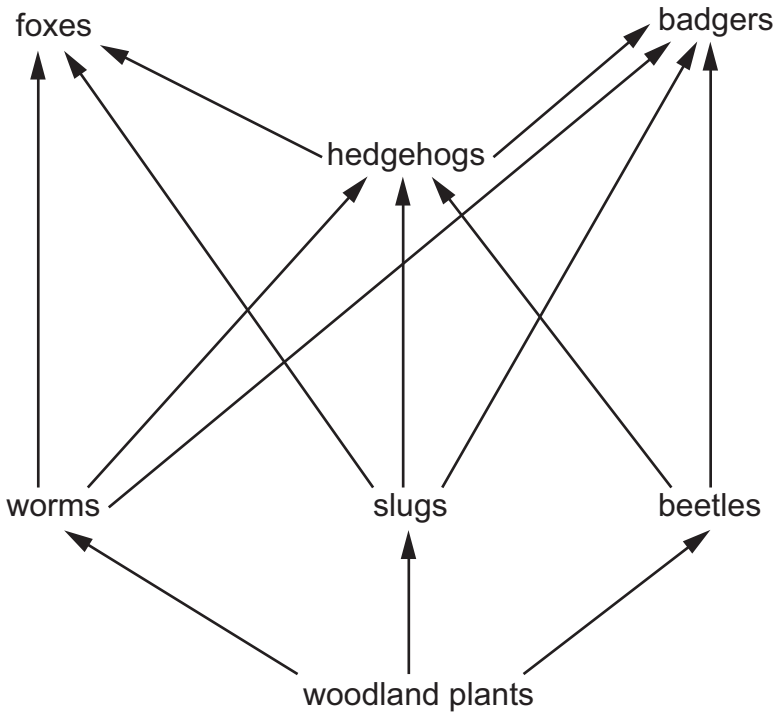
1. The photograph shows a hedgehog.



(a) Hedgehogs are carnivores. What does the term *carnivore* mean? [1]

.....

(b) The diagram below shows a woodland food web that includes hedgehogs.



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Use information in the food web opposite **and** your own knowledge to answer the following question.

In recent years, the number of hedgehogs in the UK has decreased.
Tick (✓) the **three** factors in the following table that could cause hedgehog numbers to decrease. [3]

factor	causes hedgehog numbers to decrease
a disease harming the badgers	
an increase in the number of foxes	
the arrival of a new second stage consumer species	
an increase in the number of beetles	
a decrease in the area of woodland	

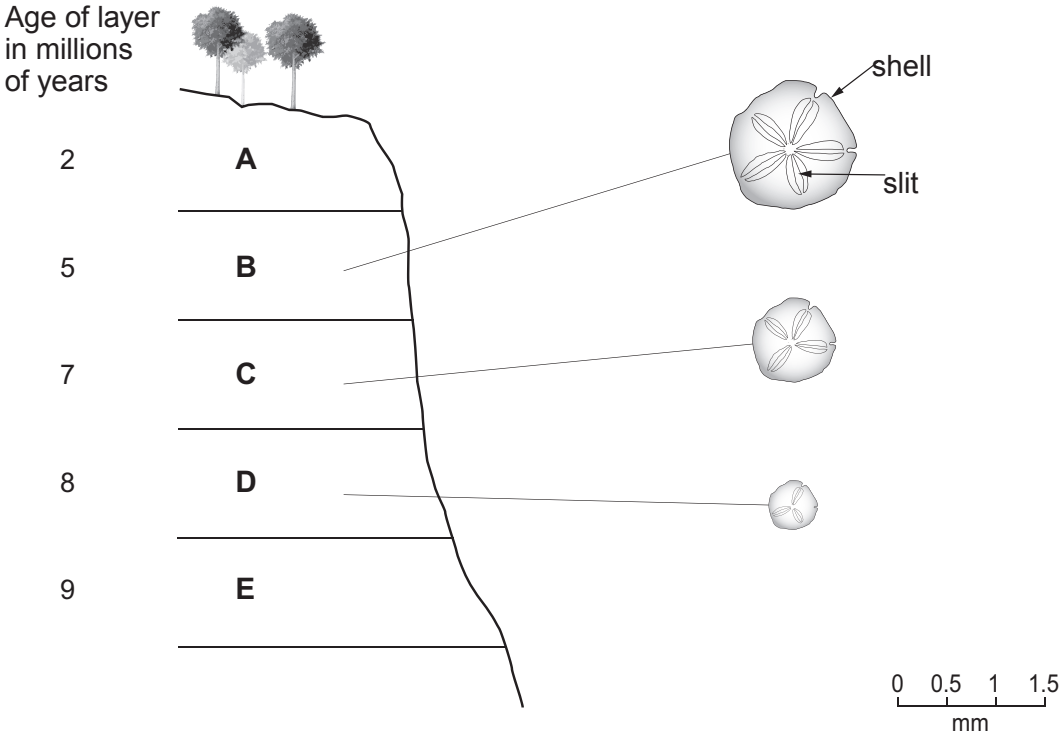
4

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2. *(a)* Scientists found fossilised shells of one species of animal in the rock layers of a cliff. The age of each layer (**A**-**E**) is shown.



(i) Use the scale bar to give the diameter of the oldest shell. [1]

Diameter = ... mm

(ii) Describe **two** ways that the shell evolved (changed) over time. [2]

.....

.....

(iii) Species that fail to evolve may become extinct. What is the meaning of the term extinct? [1]

.....

(iv) Scientists think that this species became extinct about 2 million years ago. Give the evidence in the diagram that supports this idea. [1]

.....

(b) Species evolve by natural selection.
Give the name of the scientist who first described evolution by natural selection. [1]

.....

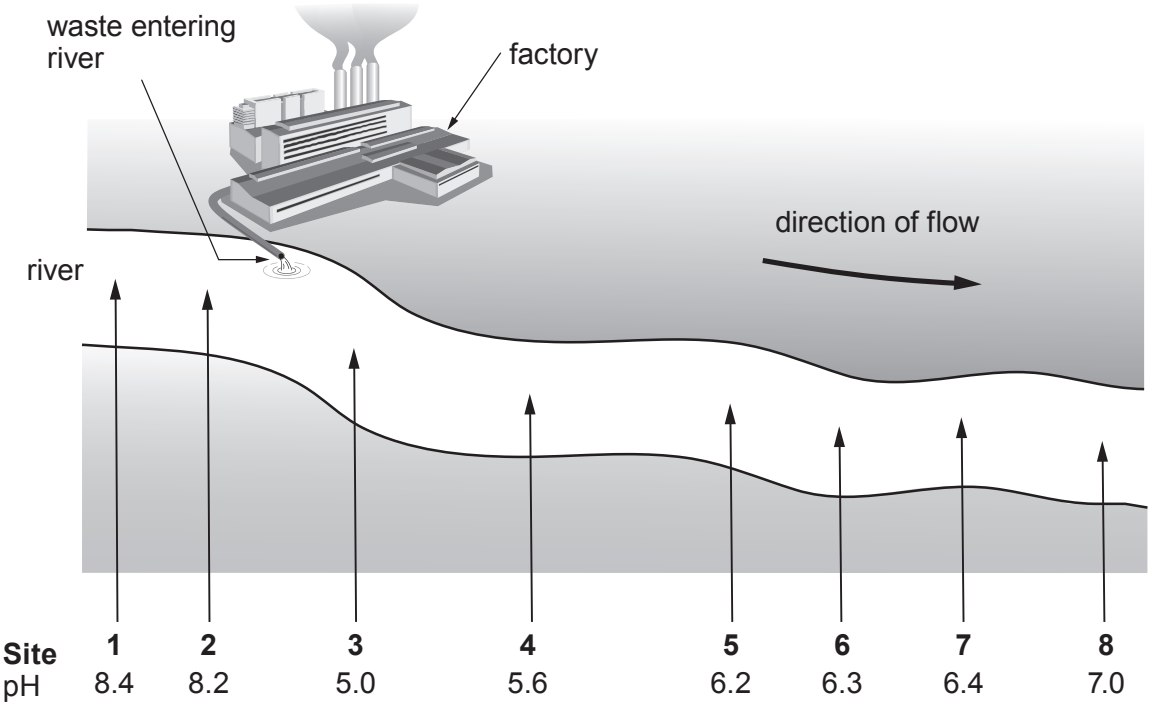
6

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3. A factory discharged waste into a river. Gaynor tested the pH of the water in the river at 8 sites. She recorded her results on a map of the river, as shown below.



(a) (i) At how many of the 8 sites is the water alkaline? ..... [1]

(ii) What is the evidence that factory waste entering the river is acidic? [1]

.....

(b) Gaynor recorded the presence (✓) or absence (***x***) of three species of invertebrates at each of the sites in the river as shown in the table.

	site	1	2	3	4	5	6	7	8
	pH	8.4	8.2	5.0	5.6	6.2	6.3	6.4	7.0
Species	mayfly nymph	✓	✓	***x***	***x***	***x***	***x***	***x***	✓
	bloodworm	✓	***x***	✓	***x***	***x***	✓	✓	✓
	rat tailed maggot	***x***	✓	✓	✓	✓	✓	***x***	✓

(i) Use the table to state the name of the invertebrate which is a useful indicator species in this investigation. [1]

.....

(ii) Explain your answer to part (i). [2]

.....

.....

.....

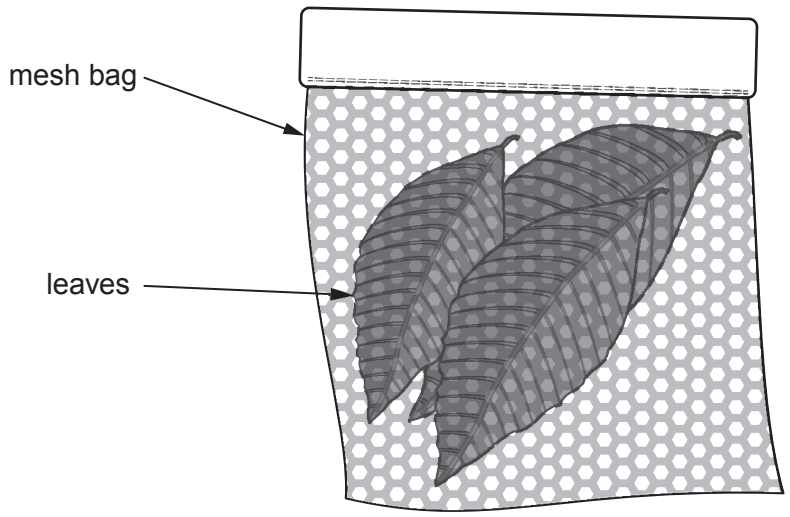
4461 010005

5

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4. Students investigated the decay of leaves in woodland soil. The students put the leaves in bags of two different mesh sizes. The bags were buried in soil for four months. One of the bags is shown below.



The bags were dug up at the end of each month and the percentage (%) decay was measured. The results are shown in the table.

mesh size (mm)	percentage (%) decay			
	month 1	month 2	month 3	month 4
1.0	20	30	35	55
0.1	13	23	26	42

(a) (i) Complete a line graph of these results on the grid opposite.
The results for one mesh size have been plotted for you.

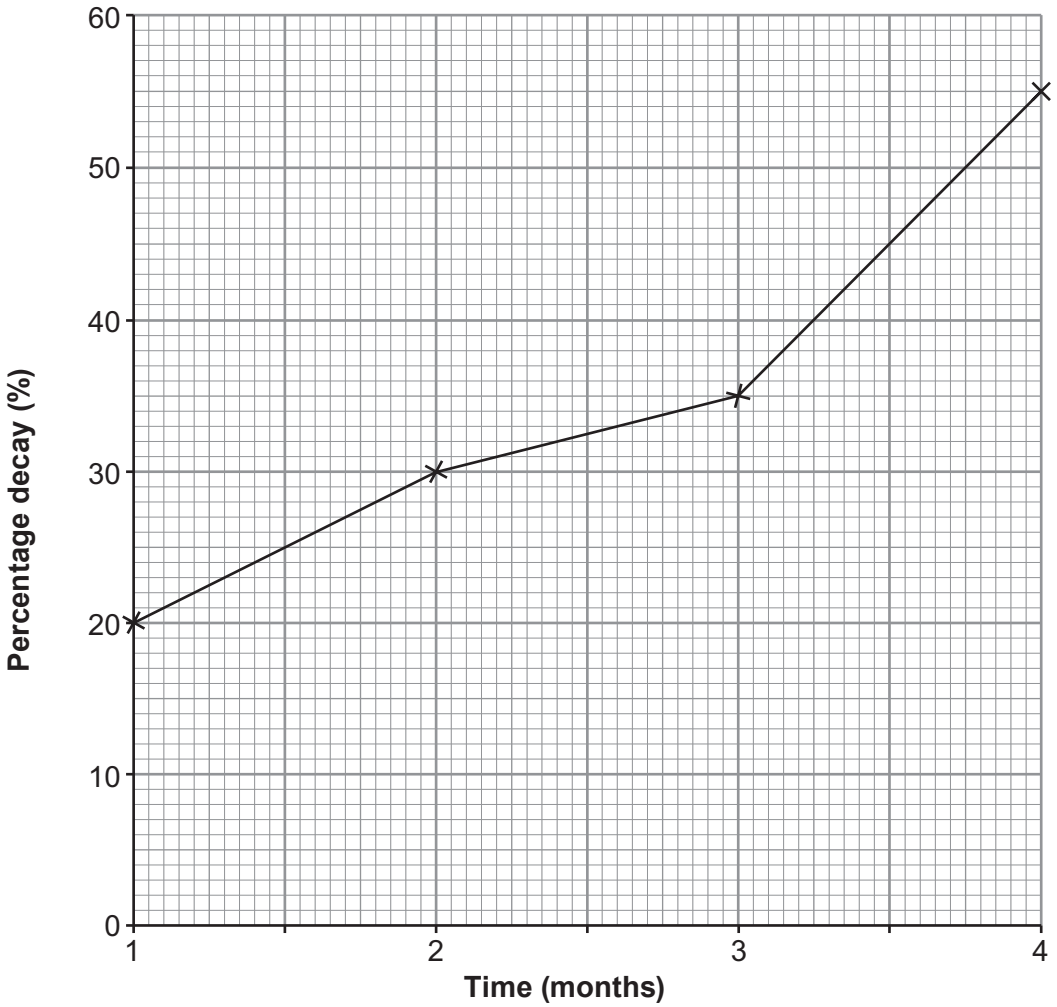
I. plot the points for the other mesh size, [2]

II. join the points with a ruler, [1]

III. label the **two** lines. [1]

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(ii) Describe the effect of **mesh size** on the percentage decay of the leaves. [1]

.....

.....

(iii) Give **two** features of **the leaves** that should be controlled at the start of the investigation. [2]

I. .....

II. .....

(iv) The decay is caused by microorganisms. Give the name of **one** type of decay causing microorganism. [1]

.....

(v) Suggest **one** reason why the leaves decayed more slowly between months **2** and **3**. [1]

.....

(b) State the importance of decay for plant growth. [1]

.....

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4461 010007

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5. Gareth takes a penalty kick.



He **watches** the moving ball speed towards the goal.

The list below describes how the nervous system takes part in some of the above events, but not in the correct order.

1 The impulses pass along neurones.

2 The receptor cells respond to this stimulus.

3 Light from the moving ball strikes receptor cells in his eye.

4 The central nervous system processes the information.

5 Electrical impulses are produced.

(a) Place the five statements above in the correct order. [3]

..... → ..... → ..... → ..... → .....

(b) The eye is a sense organ.
State the name of **one** *other* sense organ and the stimulus it detects. [2]

Sense organ .....

Stimulus it detects .....

5

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Examiner only

6. Insulin has an important role in the control of blood glucose.

(a) What type of substance is insulin? [1]

Underline the correct answer:

fat

hormone

nutrient

(b) Use your knowledge to complete the following sentences about the control of blood glucose. [3]

As blood glucose level rises, insulin is released from the

.....

The insulin travels in the blood to the liver.

The liver then converts the excess ..... into an insoluble form

called .....**.**

(c) Some people have a medical condition in which they cannot control their blood glucose. State the name of the condition and describe **one** method of treating it. [2]

.....

.....

.....

6

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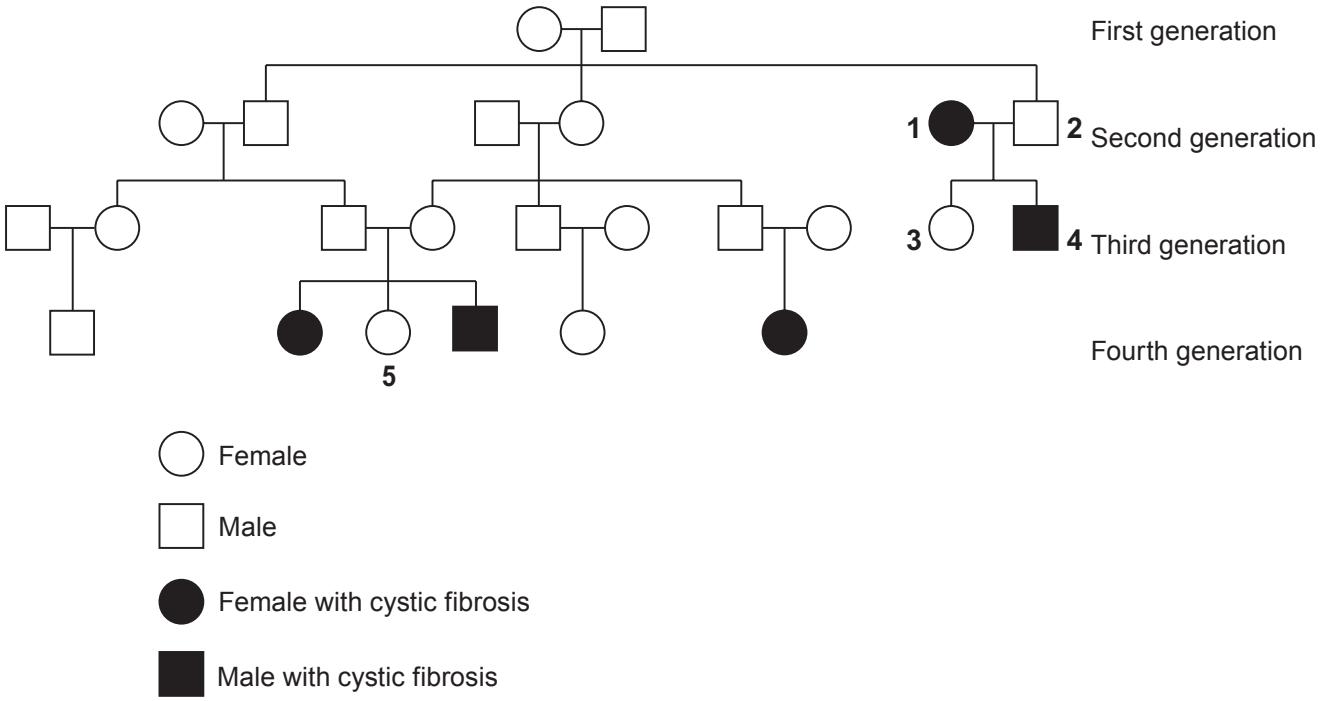
Turn over.

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Examiner only

7. Cystic fibrosis is a hereditary disease that affects around 1 in every 2 500 babies born in the UK. It affects several organs in the body including the lungs and pancreas. The disease is caused by a recessive allele (**n**).

The family tree below shows the history of the inheritance of cystic fibrosis.



(a) (i) State the genotype of person number **2**. ..... [1]

(ii) Explain your answer. [2]

.....

.....

.....

(b) (i) State the genotype of person number **3**. ..... [1]

(ii) Explain your answer. [2]

.....

.....

.....

(c) What is the probability of person number **5** being homozygous dominant? [1]
Place a circle around the correct answer.

25% 50% 75% 100%

7

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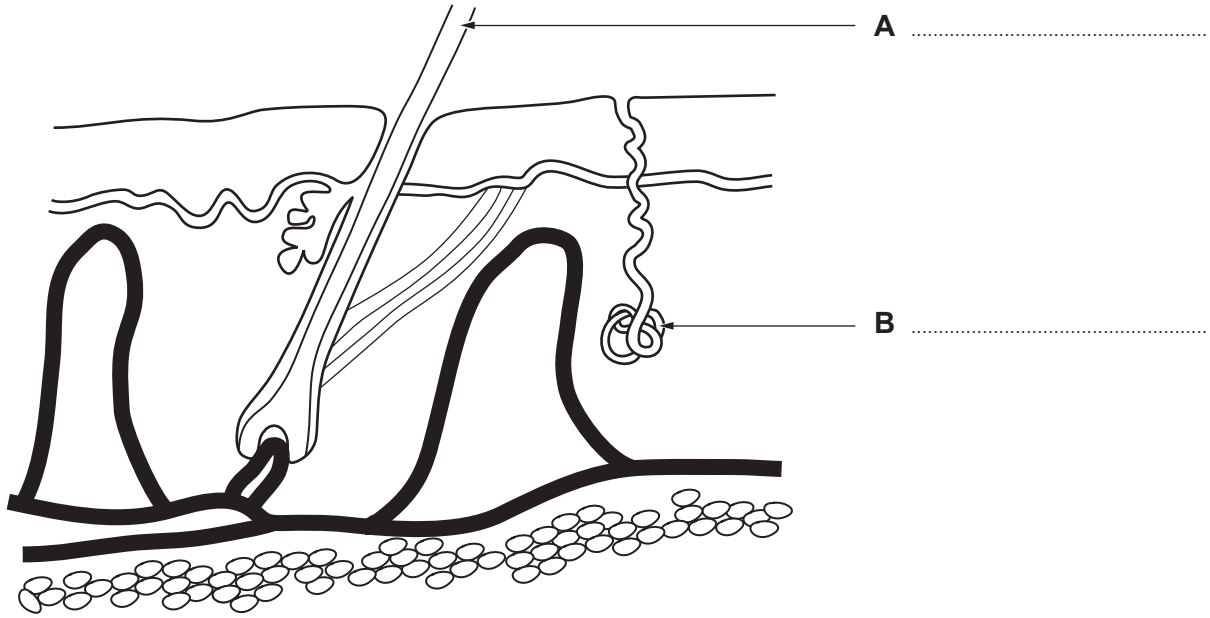
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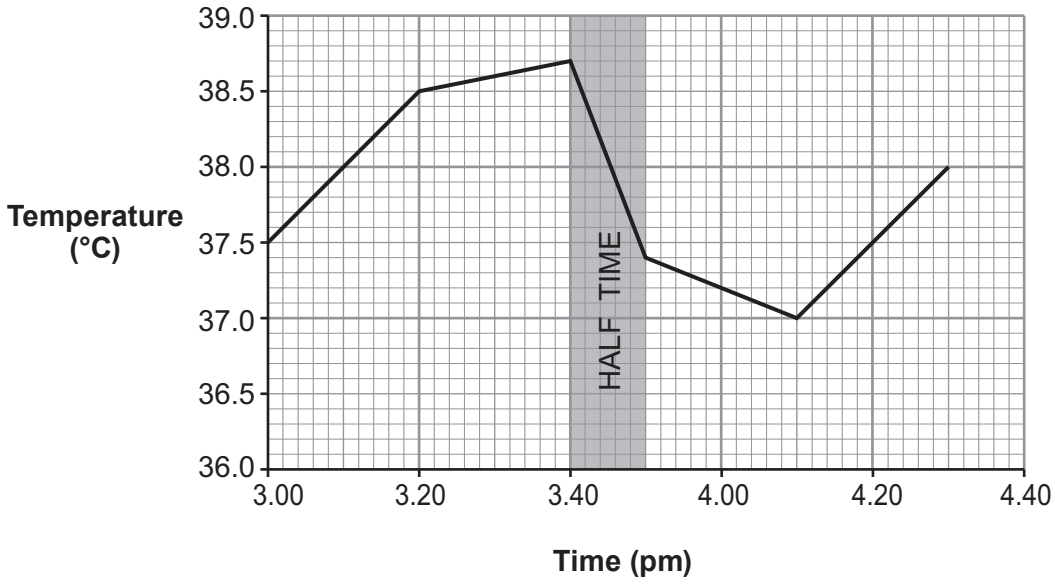
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8. The diagram shows a section through the skin.



(a) Label parts **A** and **B** on the diagram. [2]

(b) The graph shows the body temperature of a player during the course of a rugby match.



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(i) State **two** responses made by the skin to cause the change in body temperature observed between 3.40pm and 4.10pm. [2]

I. .....

II. .....

(ii) Explain how the narrowing of blood vessels in the skin helps maintain body temperature in cold conditions. [2]

.....

.....

.....

.....

6

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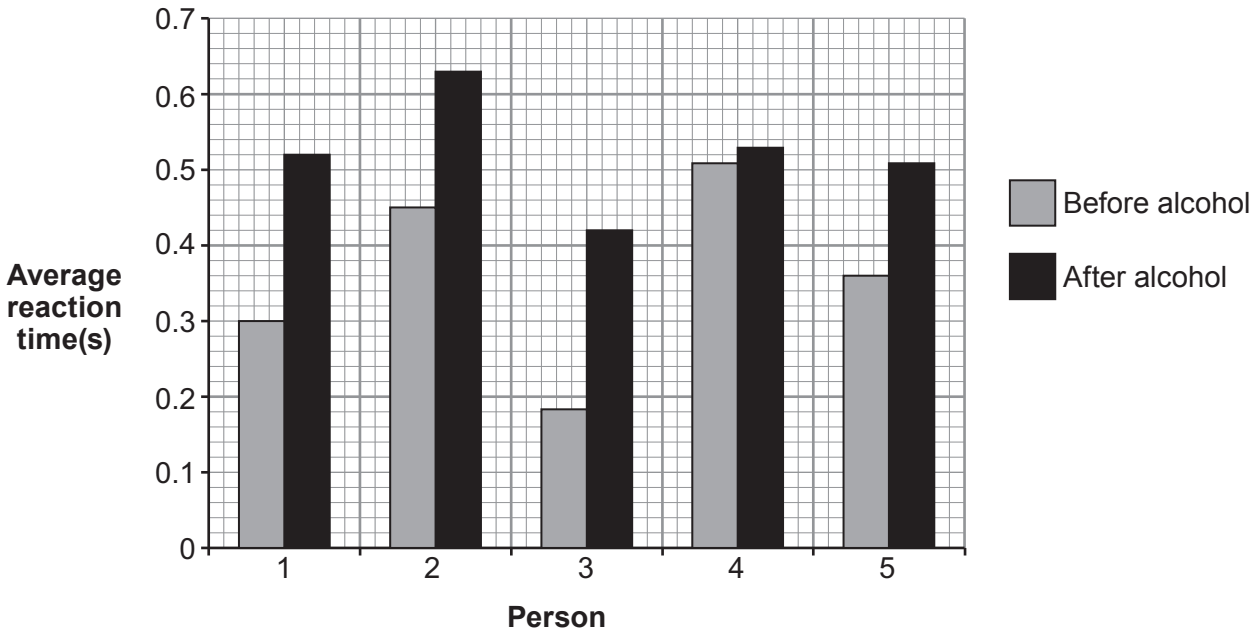
Examiner only

9. *(a)* State **two** ways in which excessive alcohol consumption can cause long-term physical damage to the body. [2]

(i) .....

(ii) .....

(b) An investigation was carried out into the effect of alcohol on reaction times. Five people were asked to drink some alcohol and the time taken to respond to a stimulus was recorded. Reaction times before drinking the alcohol were also recorded. The results are shown in the graph below.



(i) What conclusion can be drawn from the results shown in the graph? [1]

.....

.....

(ii) Which person has the longest reaction time after drinking alcohol? [1]

.....

(iii) How does drinking alcohol before driving a car increase the risk of having a road traffic accident? [1]

.....

.....

5

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10. John is a severely obese 27 year old man. He weighs 31 stone and takes no exercise. For his height John should weigh about 14 stone. A typical lunch for John would include:

- 2 double cheeseburgers
- 2 litre bottle of cola.

The table below shows the nutrition facts for **one** double cheeseburger and **one** litre of cola. It also shows the Guideline Daily Amount (GDA) for an adult man.

Nutrition Facts

	Guideline Daily Amount (GDA)	double cheeseburger (220g serving)	cola (per litre)
energy (kcal)	2500.0	1120.0	400.0
carbohydrate (g)	300.0	47.0	108.0
of which sugars (g)	70.0	8.0	108.0
fat (g)	95.0	105.6	0.0
protein (g)	55.0	25.0	0.4
sodium – from salt (g)	2.4	2.0	0.12

Using the information and data above, and your own knowledge, describe the ways in which John's lifestyle and diet could lead to health problems. [6 QWC]

END OF PAPER

6

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

SUMMER 2015

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2015 examination in GCSE SCIENCE - BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
B1	1
B2	19
B3	34

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<table>
<tr><td colspan="2">Question Number</td><td colspan="3"></td><td></td><td></td><td></td><td></td></tr>
<tr><td>FT</td><td>HT</td><td colspan="3">Sub-section</td><td>Mark</td><td>Answer</td><td>Accept</td><td>Neutral answer</td><td>Do not accept</td></tr>
<tr><td>1</td><td></td><td>(a)</td><td></td><td></td><td>1</td><td>Eats meat/ other animals;</td><td></td><td>insects</td><td></td></tr>
<tr><td></td><td></td><td>(b)</td><td></td><td></td><td>3</td><td><table><tr><th>factor</th><th>Tick (✓) the three correct boxes</th></tr><tr><td>A disease harming the badgers</td><td></td></tr><tr><td>An increase in the number of foxes</td><td>✓;</td></tr><tr><td>The arrival of a new second stage consumer species</td><td>✓;</td></tr><tr><td>An increase in the number of beetles</td><td></td></tr><tr><td>A decrease in the area of woodland</td><td>✓;</td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="3">Total Mark</td><td>4</td><td></td><td></td><td></td><td></td></tr>
</table>

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		*(a)*	i		1	0.5;	0.55		
			ii		2	larger; more slits/number slits from 3 to 5;			
			iii		1	dies out/ *idea of* gone for ever/ no longer exists/ wiped out;	None left		disappeared
			iv		1	no {shells/fossils} {in top layer/ in layer A/ in that layer}/ no shells after {5 million years/ 2 million years}/ last found in layer B;			
		(b)			1	(Charles) Darwin;	(Alfred) Wallace		
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)	i		1	2;			
			ii		1	pH <u>falls</u>/ water <u>becomes</u> {acidic/pH5};			PH/ Ph/ pH is acidic
		(b)	i		1	mayfly (nymph);			
			ii		2	¶ (mayfly nymph) is not found in acid water/ <u>only</u> found in {neutral <u>and</u> alkaline water/ water at pH 7 and above}; ¶ {bloodworms/rat tailed maggots/ the others} are found in acidic (water); The only <u>one</u> that is found in <u>only</u> neutral <u>and</u> alkaline water/ only <u>one</u> not found in acidic water = 2 marks			
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)	i		4	I accurate plotting;; all correct = 2 marks one error = 1 mark more than one error = 0 marks II one accurate line through centre of plots; III lines labelled – 1.0 mm **and** 0.1mm;			
			ii		1	{1 mm/large/larger/ higher} mesh size has {higher/ more} (%) decay/ ORA;			Not quicker decay
			iii		2	any **two** from: mass; (leaf) area; {species/tree}; age; moisture content;	weight		type of leaf/ type of tree/ size of leaf/ amount of leaf/ same shape leaf
			iv		1	bacteria/fungi/mould;			
			v		1	too {cold/hot/dry/wet}/ hotter/ colder/ drier/ wetter;	pH too {high/ low}		Climate/ weather
		(b)			1	{Releases/ puts back/ restores/ gives/ recycles} {nutrients/ minerals/ ions/ named nutrient};			
		Total Mark			10				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)			3	3 → 2 → 5 → 1 → 4 Correct placement All 5 correct;;; 3 marks 4/3 correct;; 2 marks 2 correct; 1 mark 0/1 0 marks			
		(b)			2	one mark for a named sense organ and the second mark for the <u>correct</u> stimulus;; one correct pair from: ear; sound/vibrations; or tongue/nose; chemical; or skin; touch/pain/temperature/pressure;			Noise Taste Heat
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6		(a)			1	<u>hormone</u>;			
		(b)			3	pancreas; (phonetic spelling) glucose; (correct spelling) glycogen; (correct spelling)			pancrease
		(c)			2	(type 1 or type 2) diabetes; **one** from: <u>low</u> {sugar/ carbohydrate} {diet/foods}/ {injections/shots} of insulin/ insulin pen/ insulin pump/ pancreas transplant/ <u>named</u> tablets (e.g. novonorm/metformin);			Take insulin/ take tablets
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	**1**	(a)	i		1	Nn;	heterozygous		
			ii		2	He does not have cystic fibrosis therefore must have a {**N/dominant allele**} / He has to have a {**N /dominant allele**} to give to {the child without cystic fibrosis/ child **3**}; Has to have a {**n/recessive allele/ allele for cystic fibrosis** } to give to {child with cystic fibrosis/ child **4**} {child **4**/ child with cystic fibrosis} has to have a {**n/recessive allele**} from him**;**			
		(b)	i		1	Nn;	heterozygous		
			ii		2	She does not have cystic fibrosis and therefore must have a{ **N** allele/dominant allele}/ person **3** gets { **N** allele/dominant allele} from person **2**; Her mother has {cystic fibrosis/ **nn**} and therefore must give one {**n** allele/recessive allele}/ person **3** gets {**n** allele/recessive allele} from person **1**;			
		(c)			1	25%;			
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	**2**	(a)			2	A hair B sweat gland			Hair follicle Sweat duct
		(b)	i		2	any **two** from ¶ sweating/ produces sweat; ¶ vasodilation/ blood vessels widen; ¶ hairs lying flat/ hairs lie {flat/down}/ hairs lowered;		Erector muscle relaxes	sweat Blood vessels {open/ get bigger/ larger/thicken/ enlarge}/ expand. hairs are flat
			ii		2	<u>Less/not as much</u> blood flowing (through the blood vessels); therefore <u>less/not as much</u> heat is {lost/ radiated} 2nd mark linked to 1st mark			Any reference to blood vessels moving {up to/ down from} skin surface. No heat is lost
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	**3**	(a)			2	any **two** from: ¶ liver {damage/ failure/disease}/ cirrhosis of the liver; ¶ circulatory disease; ¶ heart {damage/failure/disease}; ¶ brain damage; ¶ {throat/tongue/oesophagus/liver/breast/bowel} cancer; ¶ kidney {disease/damage/failure};	kills brain cells		Liver problems Heart attack
		(b)	i		1	alcohol consumption {increases/slows} reaction time/ alcohol consumption slows {reactions/ reaction speed};			Less reaction time/ reaction time decreases
			ii		1	person 2;			
			iii		1	take longer to {react/brake/swerve} to avoid an accident/ longer to react to {danger/changes in road};		take longer to stop (needs to be qualified)	
		Total Mark			5				

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Question Number			
FT	HT	Mark	Answer
10	**4**	6 QWC	*Indicative content:* *Credit should only be given where health issue is linked to the excess in the diet* ¶ **ENERGY**: too much energy (taken in at lunch – excess energy stored as fat) leading to obesity ¶ **SUGAR:** too much sugar (taken in at lunch) - this could possibly lead to diabetes (type 2)/ obesity/tooth decay ¶ **FAT:** too much fat (taken in at lunch) - (possibly) leading to obesity/ heart disease/circulatory disease ¶ **SODIUM:** too much salt (taken in at lunch) - could lead to high blood pressure ¶ **EXERCISE**: ref to lack of exercise affecting circulation/heart For marks in 5-6 range: Account needs to recognise, at least once **EITHER** that the GDA is being exceeded **OR** that only one meal is being looked at and therefore when all the daily meals are considered then the overshoot of the GDAs are very great indeed. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)	i		2	<u>different</u> {size/ length/ depth/ width}; <u>different</u> shape;			They are all pointed
			ii		1	They can eat <u>different</u> types of food/prey;		More food	
		(b)			3	any **three** from: ¶ restriction on {number of tourists/ months allowed to land/ time allowed on island}; ¶ restrict access to wildlife sites; ¶ restrict building houses/ restrict building {hotels/ accommodation for tourists}; ¶ educate tourists about endangered species; ¶ {development/ road building} is carried out which causes minimal harm to wildlife/limit number of vehicles; ¶ reduction of {litter/ pollution} from increased number of visitors and residents;			Stop tourism
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			1	1985-1986;			
		(b)	I& II		1	1980 **and** 1990;			
		(c)			3	Line begins at 1980 above 0 and rises; peaks between1985-7; Then drops but not to 0;			
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)			1	*Muddy sand;*			
		(b)			1	birds*;*			
		(c)	i		1	(The level/concentration of lead) decreases/ becomes less;			
			ii		2	(18/20) x 100; 90; Correct answer = 2 marks			
			iii		2	Measure the {concentration/mass} of lead; In each (growth) ring/ in every fifth growth ring;	Measure how much lead		amount
		Total Mark			7				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	8	(a)			1	Less objection/ more agreement / more positive /more accepted /more popular;			Crop increased
		(b)			2	<u>gene for herbicide resistance</u> from {bacteria / plant / organism /species}; {Inserted into/ added into} {chromosome/ DNA} (of host plant / soya plant);	weed		
		(c)			3	Any **three** from ¶ Crop yield increases with use of GM; ¶ GM crop not 100% resistant; ¶ GM plants not resistant to sap sucking insects/ sap sucking insects are not affected; ¶ GM effective against leaf eating insects/ GM plants are resistant to leaf eating insects; ¶ Less <u>total</u> insecticide used with GM crops/ less insecticide used to control leaf eating insects with GM crops; ¶ A correct statement relating to data in table;			
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(a)	i		1	Discontinuous;			
			ii		1	No black <u>allele</u> in white turkeys/ white allele is recessive/ white turkey is homozygous recessive;	Homozygous expressed as symbols		gene
		(b)	i		1	A **and** C;			
			ii		2	D **and** E; All (of the clones with the inherited disease) would <u>pass it on</u>;			
			iii		1	3;			
		Total Mark			6				

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Question Number			
FT	HT	Mark	Answer
	10	6 QWC	Indicative content Bacteria and Fungi are decomposers Decomposers decay dead organisms/waste Conversion of protein to ammonia Conversion of urea to ammonia Ammonia converted to nitrate Nitrate taken up by plant (roots) Nitrate used to make protein Factors that affect the activity should include oxygen, temperature, pH and heavy metals (some factors must be present to access marks in the range 5-6) **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

W15-4461-01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

A.M. WEDNESDAY, 7 January 2015

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**5**	
3.	**7**	
4.	**9**	
5.	**4**	
6.	**5**	
7.	**6**	
8.	**6**	
9.	**6**	
10.	**6**	
Total	**60**	

4461 010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **10**.

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Answer **all** *questions.*

1. *(a)* The table below shows changes in the populations of some farmland birds between 1980 and 2010.

bird	population (millions)		percentage fall (%)
	1980	2010	
Starling	85	40	53
Sparrow	53	25	53
Linnet	37	15	59
Dove	13	4	69
Bunting	6	1	83

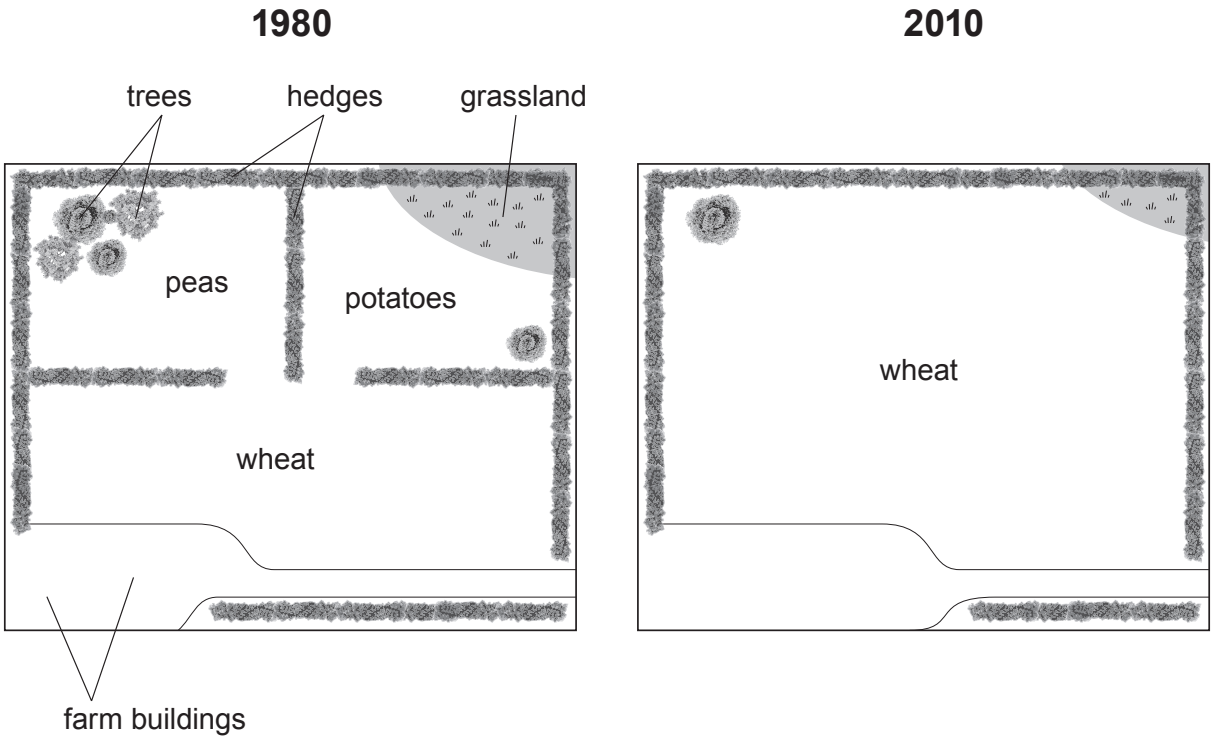
(i) Which bird had the greatest **percentage** fall? [1]

.....

(ii) Which bird had the greatest fall in **population**? [1]

.....

(b) The diagram shows land use on a farm in 1980 and in 2010.



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(i) The farmer cut down most of the trees in 1981.

From the diagram, give **two** *other* changes to land use on the farm that affected the farmland birds. [2]

1 .....

2 .....

(ii) The farmer will plant more trees on his farm next year.

Suggest **two** ways that trees help birds to live on the farm. [2]

1 .....

2 .....

6

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2. Classification of the cow *(Bos taurus)* and a part classification of the horse *(Equus ferus)* are shown in the box below.

Cow		**Horse**	
Kingdom	Animal	Kingdom	Animal
Phylum	Vertebrates	Phylum	.....
Class	Mammals	Class	Mammals
Genus	*Bos*	Genus	.....
Species	*taurus*	Species	.....

(a) Complete the classification of the horse in the box above. [3]

(b) In 2013, scientists made genetic profiles of meat taken from some beef burgers.

(i) State the chemical that is studied in a genetic profile.

..... [1]

(ii) Two *different* genetic profiles were found. The scientists then concluded that the beef burgers had meat from cows **and** horses.

Complete the following sentence by underlining the correct word. [1]

The samples had two different genetic profiles because they contained meat from animals of two different **herds** / **breeds** / **species**.

5

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3. The table below lists some human conditions and their causes.

(a) Complete the table by placing a tick (✓) in each row to show a possible cause of each condition. *The first row has been done for you.* [3]

condition	cause			
	bacteria	**excess alcohol**	**excess energy in food**	**excess salt in food**
high blood pressure				✓
infection				
drug dependence				
obesity				

(b) Which of the above conditions may be treated by:

(i) antibiotics; ..... [1]

(ii) reduced fat in the diet? ..... [1]

(c) Cystic fibrosis is a disease that affects the lungs.

Why do people with cystic fibrosis have difficulty breathing? [2]

.....

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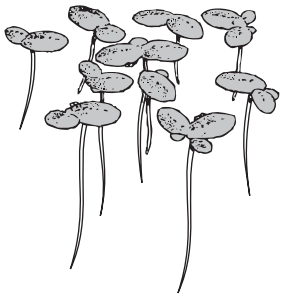
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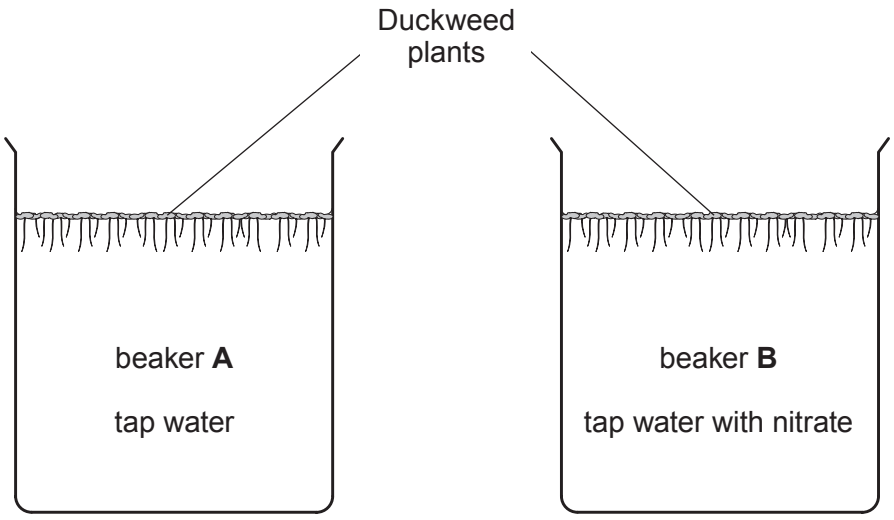
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4. The drawing shows some water plants called Duckweed *(Lemna minor)*.



Students investigated the effect of nitrate on the numbers of living Duckweed plants growing in beakers as shown below.



The results are shown in the table below.

day	number of living plants	
	beaker A	beaker B
1	100	100
2	120	140
3	160	180
4	180	280
5	200	360
6	210	340
7	220	300

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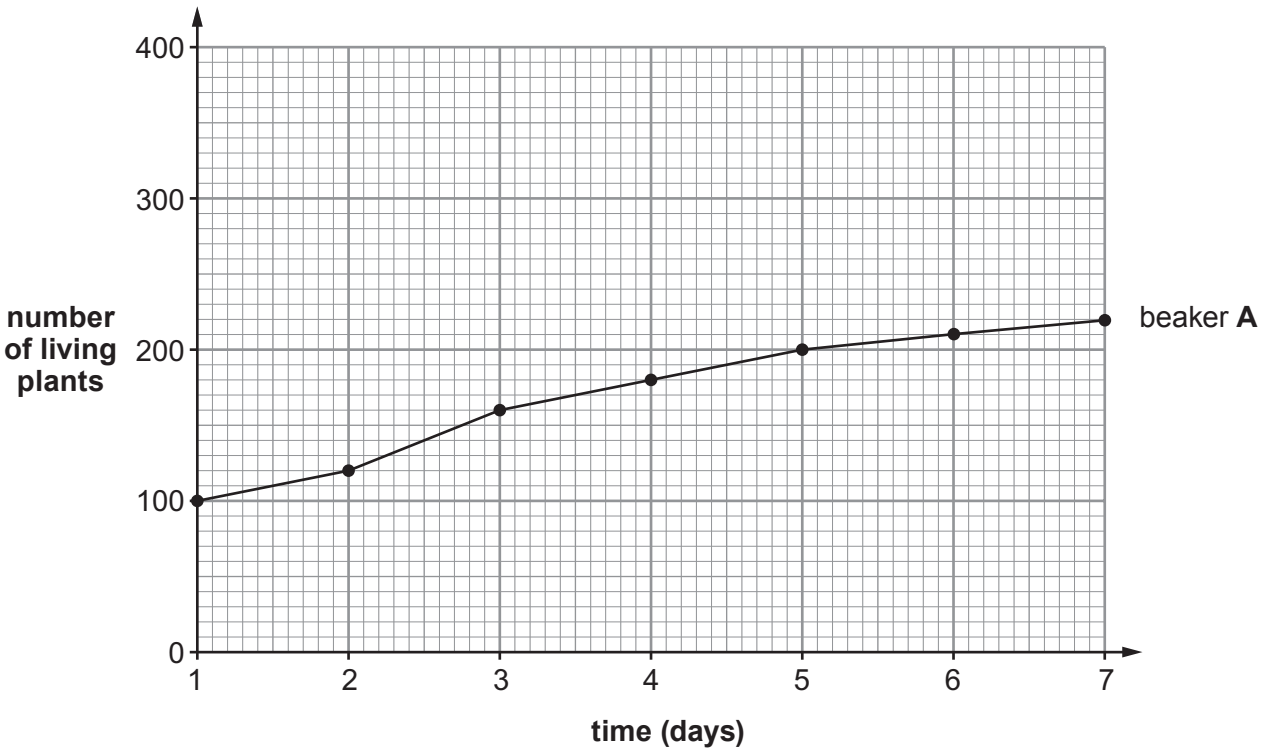
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(a) Complete the graph below to show the changes in the number of living plants in beaker **B** by:

(i) plotting the points; [2]

(ii) joining the points with a ruler. [1]



(iii) From the graph, describe the changes in the number of living plants in beaker **B** between days **1** and **7**. [1]

.....

.....

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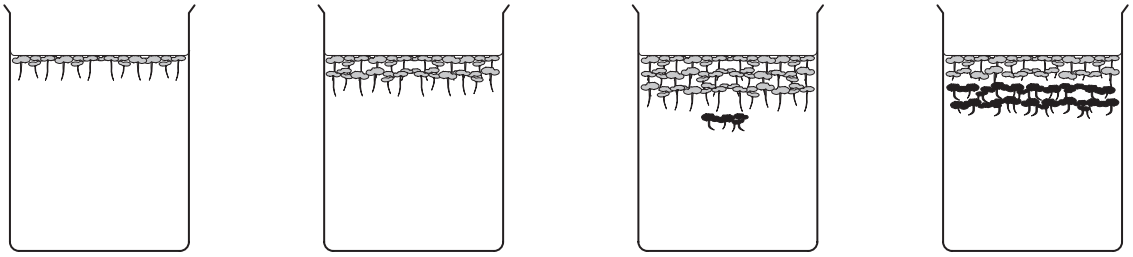
(b) The results in beaker **A** (the control) allow a comparison to be made with the results in beaker **B**.

Why is it necessary to compare the results in this investigation? [1]

.....

(c) The diagrams show the plants in beaker **B** during the investigation.

Beaker **B**



Key

	living plants
	dead & decaying plants

(i) From the diagram above, on which day (**1, 3, 5 or 7**):

I is the level of dissolved oxygen in the water lowest?

Day ..... [1]

II are the number of bacteria in the water highest?

Day ..... [1]

(ii) Explain why the level of dissolved oxygen in beaker **B** changes during the investigation. [2]

.....

.....

.....

.....

.....

.....

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5. *(a)* A human body cell has 46 chromosomes.

How many chromosomes are in an **egg** cell? ..... [1]

(b) Male body cells have XY chromosomes. Female body cells have XX chromosomes.

Complete the diagram below to show how sex is inherited in humans by:

(i) completing the gametes present; [1]

	Jim	Siân
genotype	XY	XX
gametes	X Y	X .....

(ii) completing the Punnett square. [2]

Jim \ Siân	X	
X	XX	

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4

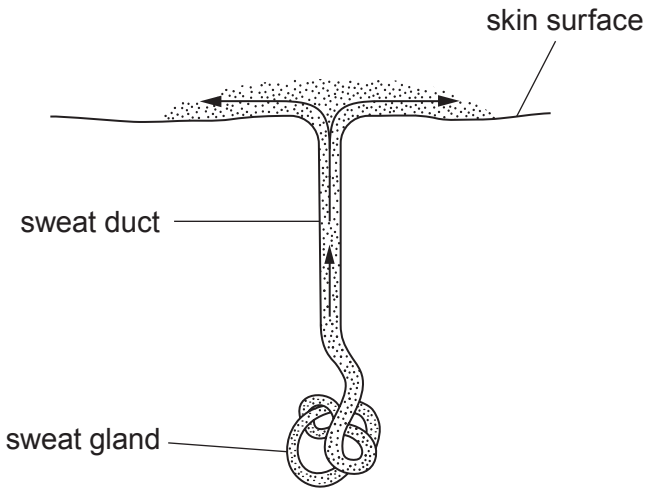
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6. The diagram shows an active sweat gland in the skin on a hot day.



(a) Use the structures named in the diagram above to describe the processes taking place. [2]

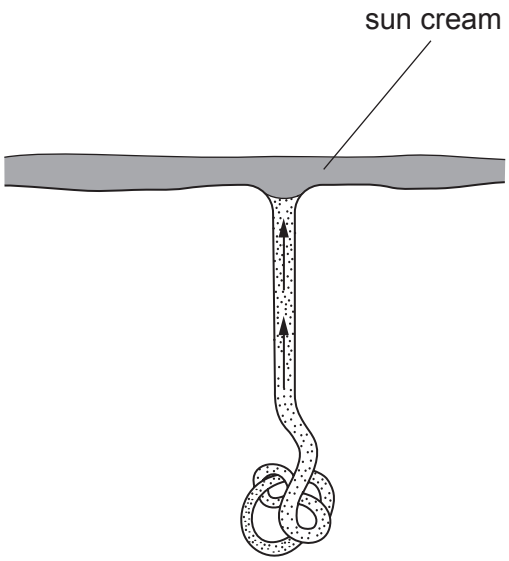
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(b) The diagram below shows sun cream spread on the skin surface.



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Use the information in **both** diagrams opposite to describe and explain how sun cream affects temperature control. [3]

.....

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5

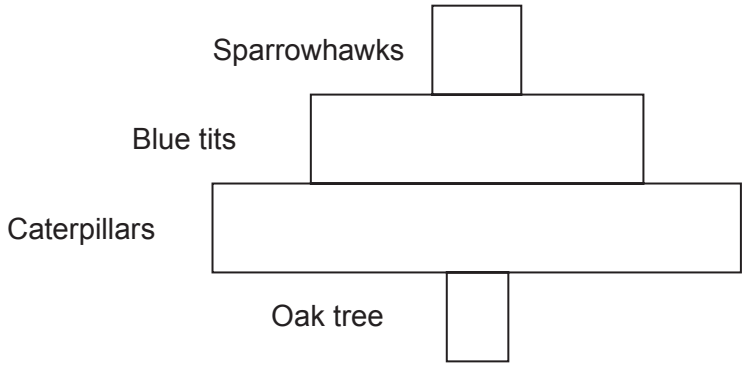
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7. The diagram below shows the pyramid of numbers for a food chain found in a small wood.



(a) (i) Show the correct relationship in the food chain by adding **one** of the following numbers to **each** of the feeding levels in the above pyramid of numbers. [1]

1 17 3456 2

(ii) I In the space below draw a **labelled** pyramid of biomass for this food chain. [1]

II Show the correct relationship in the food chain by adding **one** of the following masses to **each** of the feeding levels in **your pyramid** of biomass shown in *a*(ii)I. [1]

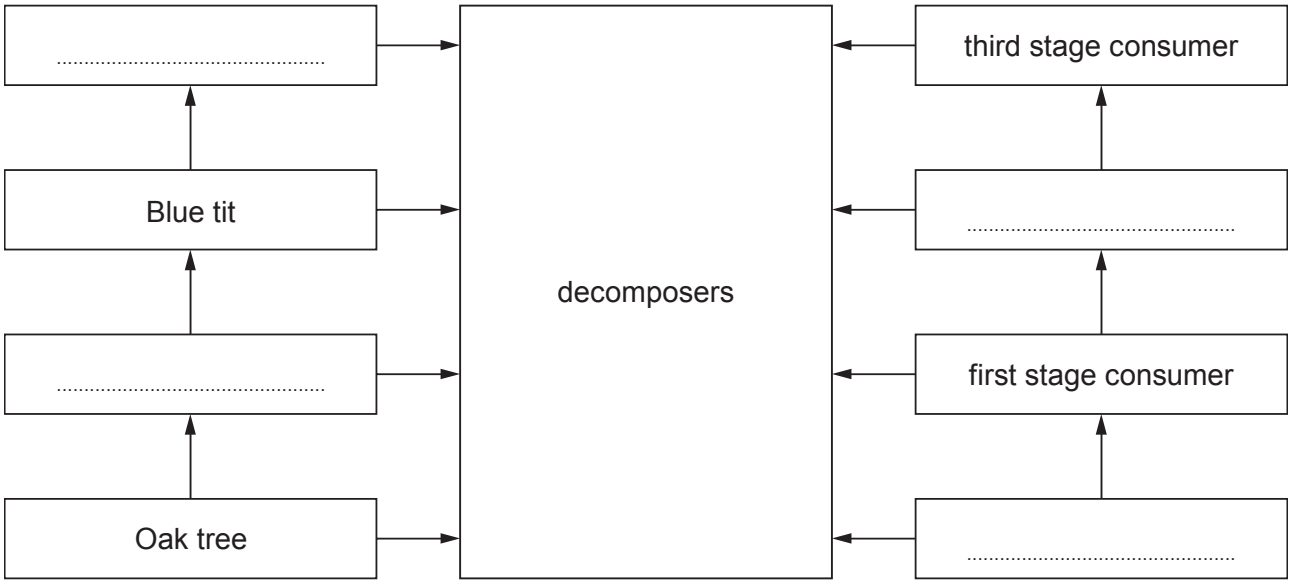
0.18 kg 5137 kg 1.2 kg 43 kg

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(b) Use the information on the opposite page and your own knowledge to complete the following diagram. [2]



(c) In which of the following do **all** of the processes **add** carbon dioxide to the air? Underline the correct answer. [1]

(i) decomposition *and* respiration *and* photosynthesis

(ii) decomposition *and* respiration *and* photosynthesis *and* combustion

(iii) respiration *and* combustion *and* photosynthesis

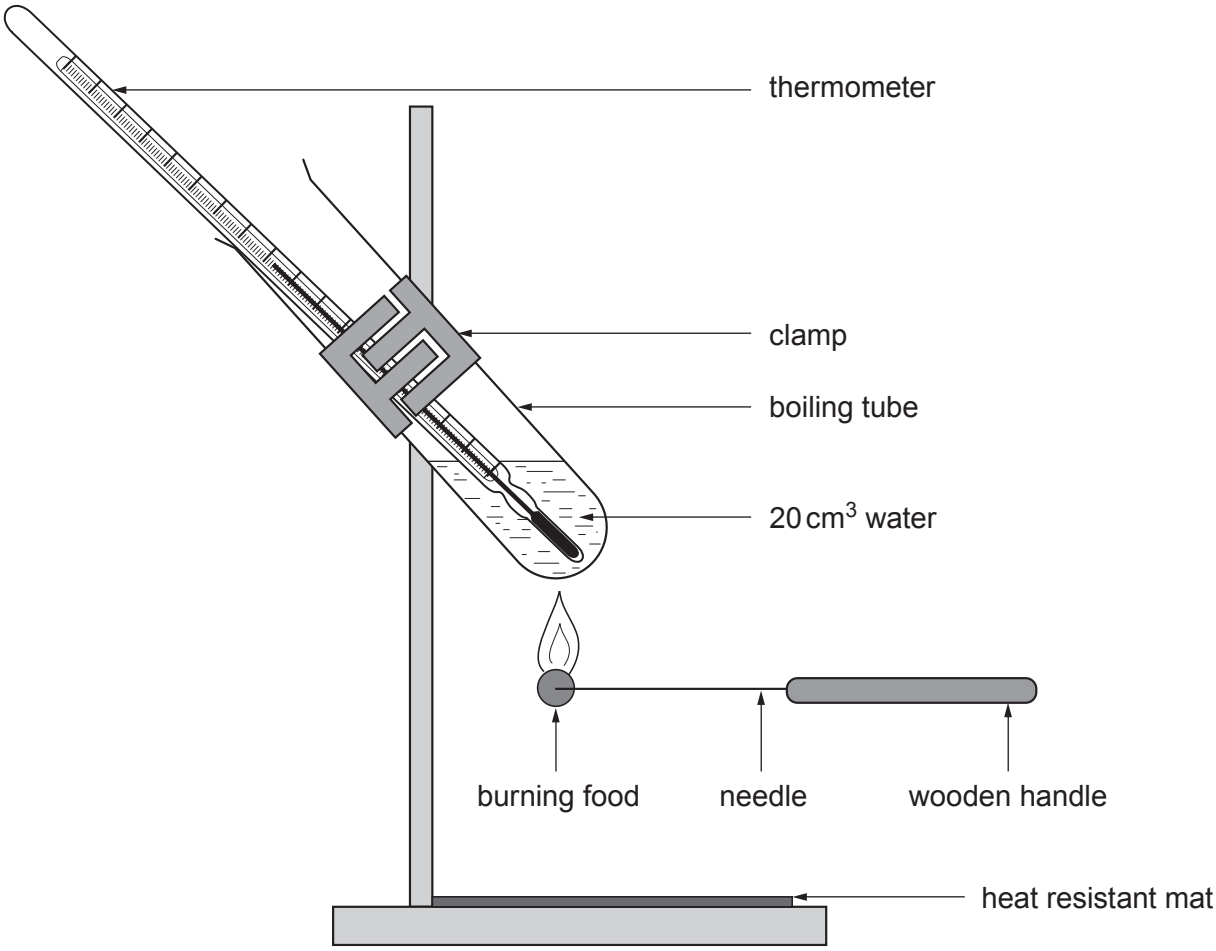
(iv) respiration *and* combustion *and* decomposition

6

Turn over.

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8. Rhys used the apparatus shown below to find the energy in a piece of food.



(a) The first time Rhys carried out the experiment he obtained the following results.

initial temperature of water (°C)	final temperature of water (°C)
19	35

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(i) Use the formula below to calculate the energy content of this piece of food. Show your working. [2]

Energy content (J)= rise in temperature (°C) x volume of water (cm^3) x 4.2

Energy content ..... J

(ii) The mass of this piece of food was 0.2 g. Calculate the energy content of 1 g of this food. [1]

Energy content ..... J

Rhys repeated the experiment and obtained the following results.

repeat	energy content of food (J/g)
1	5049
2	7260
3	6800
4	4896
5	5724

(b) Suggest **three** possible reasons why the measured energy content in J/g of the food differed each time Rhys carried out the experiment. [3]

(i) .....

.....

(ii) .....

.....

(iii) .....

.....

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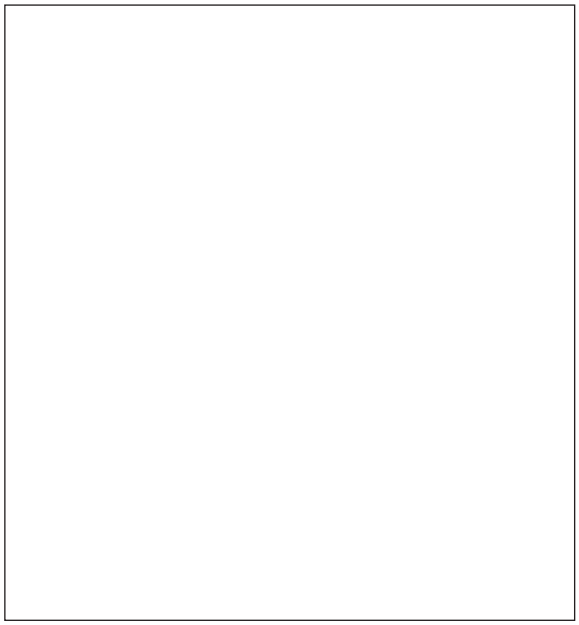
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9. Intensive farming methods use very large amounts of chemical pesticides to increase crop yields.

The Western flower thrips *(Frankliniella occidentalis)* is an insect which eats crops, including fruit and vegetables, causing world-wide damage.



A Western flower thrips

Scientists at Swansea University have done research into pest control using bacteria which naturally live only in the thrips. The bacteria affect a gene which controls eating in the thrips. The thrips stops feeding and dies. The bacteria pass naturally between the thrips.

(a) Use the information above to suggest **one** advantage to the farmer of using this new method of pest control over the use of chemical pesticides. [1]

.....

.....

(b) Apart from the use of pesticides state **one** *other* method farmers use to increase crop yields. [1]

.....

.....

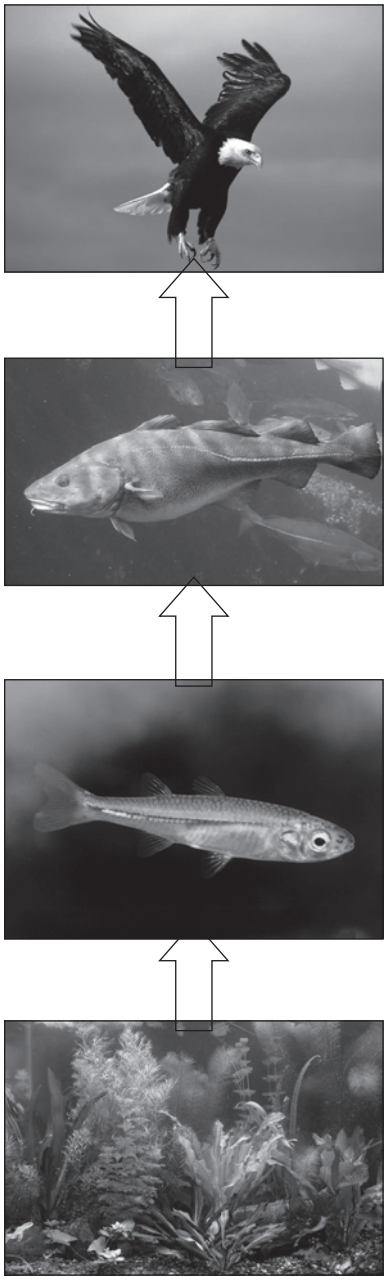
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(c) DDT is a powerful insecticide which was extensively sprayed onto crops in the middle part of the twentieth century. Its use is now banned in many regions of the world because it resulted in the death of many top predators. One of the top predators affected was the American Bald Eagle *(Haliaeetus leucocephalus)* whose numbers in the USA dropped to only 834 in 1963.

The food chain below shows the concentration of DDT in ppm (parts per million) in the tissues of the organisms in a food chain.



American Bald Eagle
13.8 ppm

large fish
2.07 ppm

small fish
0.23 ppm

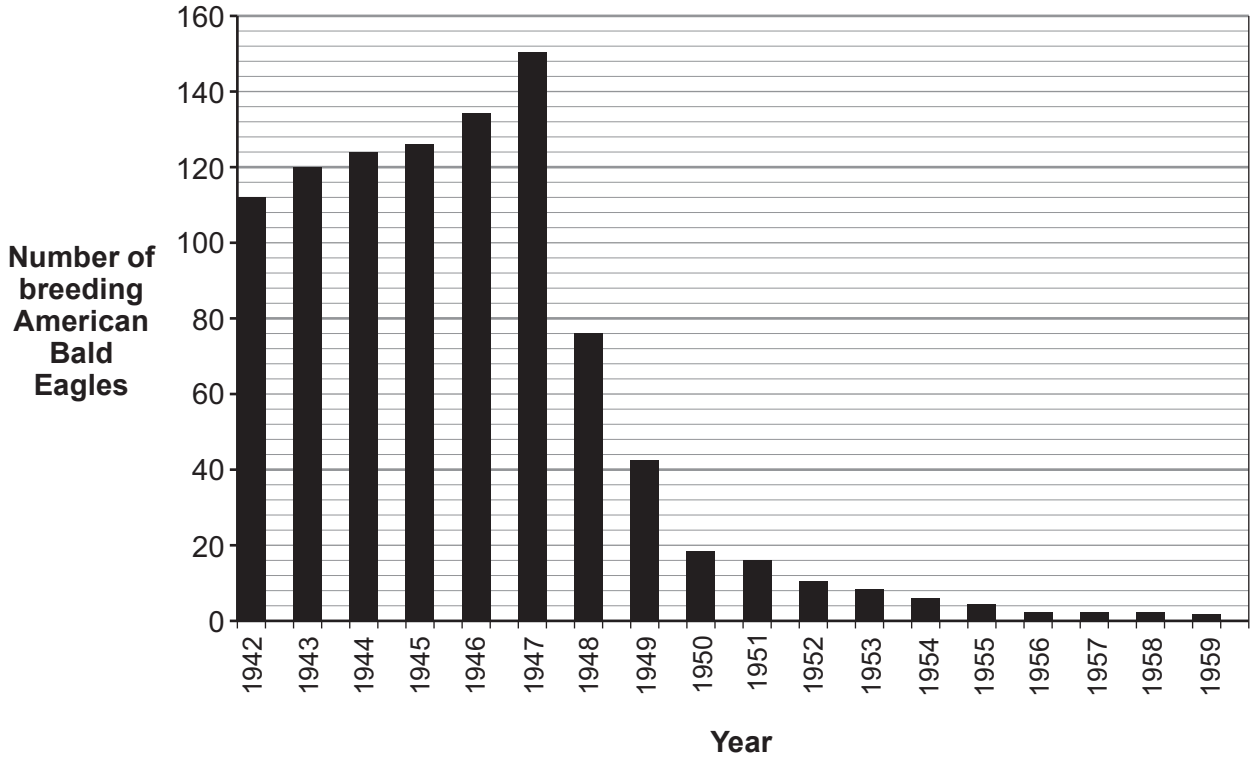
Aquatic plants
0.04 ppm

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The graph below shows the number of breeding American Bald Eagles in Florida between 1942 and 1959.



(i) From the graph, suggest the year in which DDT was first used in Florida as an insecticide. [1]

.....

(ii) Suggest why DDT is found in the aquatic plants if it is only sprayed onto crops grown on land. [1]

.....

.....

(iii) The aquatic plants and fish are not killed by the DDT but the American Bald Eagle is. Explain the reason for this. [2]

.....

.....

.....

.....

6

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10. The level of blood glucose must be kept within a very narrow range. It must not be allowed to rise too high or fall too low.

After a meal the blood glucose level begins to rise. Describe the processes which occur in the human body to bring the level of glucose in the blood back down to its normal level. [QWC 6]

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6

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

JANUARY 2015

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2015 examination in GCSE SCIENCE - BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT B2	18

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GCSE BIOLOGY - B1

JANUARY 2015 MARK SCHEME

Question			Marking details	Marks Available
1	*(a)*	(i)	Bunting	1
		(ii)	Starling	1
	(b)	(i)	any **two** from: ¶ {some/most} hedges {gone/cut down}/{fewer/ loss of} hedges; ¶ {Less/loss of} grassland; ¶ reduced crop {variety/ types/OWTTE}/ no {peas/potatoes} grown/only wheat grown; ¶ more buildings; NOT less trees	2
		(ii)	any **two** from: habitat/ place to live/shelter/cover/hide from predators; NOT hide alone Food/ to get prey; nest sites/place to lay eggs;	2
			Question 1 total	**[6]**

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Question			Marking details	Marks Available
2	*(a)*		vertebrates; *Equus;* *ferus;* correct spelling for all three answers upper case 'E', lower case 'f'	3
	(b)	(i)	DNA;	1
		(ii)	<u>species</u>;	1
			Question 2 Total	**[5]**

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Question			Marking details	Marks Available
3	*(a)*		<table><tr><th rowspan="2">condition</th><th rowspan="2">bacteria</th><th colspan="3">excess</th></tr><tr><th>alcohol</th><th>energy in food</th><th>salt in food</th></tr><tr><td>**high blood pressure**</td><td></td><td></td><td></td><td>given</td></tr><tr><td>**infection**</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>**drug dependence**</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>**obesity**</td><td></td><td></td><td>✓</td><td></td></tr></table>	3
	(b)	(i)	infection;	1
		(ii)	obesity;	1
	(c)		{Thick/excessive} mucus; NOT mucus alone {Blocking/clogging} bronchioles; Reject lungs/trachea	2
			Question 3 Total	**[7]**

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Question			Marking details	Marks Available
4	*(a)*	(i)	all plots correct;; +/- ½ small square tolerance 0 errors = 2 marks 1 error = 1 mark 2 errors = 0 marks	2
		(ii)	correct line through the plots;	1
		(iii)	(nitrate makes it) increase, then fall;	1
	(b)		To show that the {effect/difference} is due to nitrate;	1
	(c)	(i)	I 7; II 7;	2
		(ii)	1 number of dead/decaying plants increase; 2 (bacteria/decomposers/fungi) use oxygen/respire; *point 2 is dependent on point 1* Alternative 1 number of living plants increase; 2 plants produce oxygen/photosynthesise; *point 2 is dependent on point 1*	2
			Question 4 Total	**[9]**

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Question			Marking details	Marks Available
5	*(a)*		23;	1
	(b)		X;	1
			<table><tr><td></td><td>given</td><td>X</td></tr><tr><td>given</td><td>given</td><td>XX</td></tr><tr><td>Y</td><td>XY</td><td>XY</td></tr></table>	2
			one mark for correct gametes; one mark for correct mechanics from correct gametes; NO ecf from (i)	
			Question 5 total	**[4]**

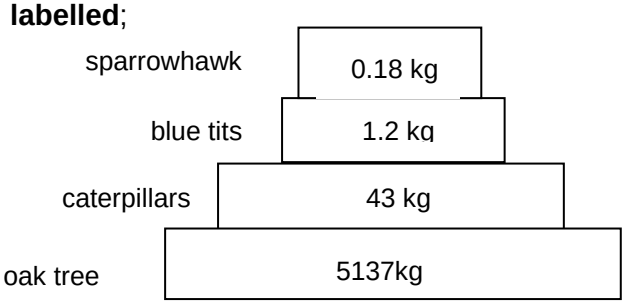
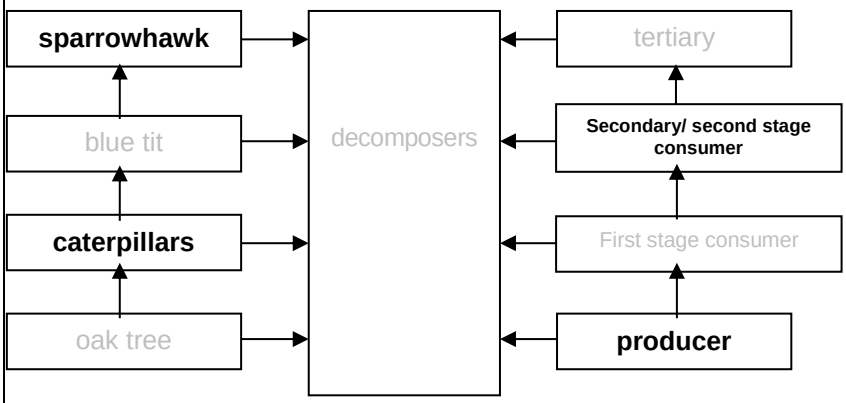
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Question			Marking details	Marks Available
6	*(a)*		Sweat gland {produces/releases/creates} sweat; Travels up sweat duct **and** onto the (skin) surface;	2
	(b)		¶ blocks {pore/duct}/sweat cannot get out/no sweat on surface; NOT no sweat {produced/released} alone/no sweating ¶ {less/no} {cooling/heat loss}; ¶ {No/less} evaporation;	3
			Question 6 Total	**[5]**

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Question			Marking details	Marks Available
7/1	*(a)*	(i)	2 17 3456 1 all correct 1 mark	1
		(ii)	I **Four** trophic levels showing the correct **shape** and **labelled**;  II All masses correct including units; (independent of shape)	1 1
	(b)		Food chain column correct; Trophic level column correct;  	1 1
	(c)		iv	1
			Question 7/1 total	**[6]**

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Question			Marking details	Marks Available
8/2	*(a)*	(i)	1344;; *If answer incorrect award 1 mark for* *16 x 20 x 4.2*	2
		(ii)	6720 (ecf from a(i));	1
	(b)		**Any 3 from: 1 mark each** ¶ Time between igniting the food and placing it under the boiling tube varies (OWTTE); ¶ Distance of the burning food from the boiling tube varied/ not placed in the same spot; ¶ {Type/ kind} of food (burnt) varied; ¶ Incomplete burning; NOT {mass/size} of food varied/different volume of water/ not burnt for same length of tome/ different food	3
			Question 8/1 total	**[6]**

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Question			Marking details	Marks Available
9/3	*(a)*		Any **one** from: ¶ Does not kill/ harm} {insects/ organisms} {which are beneficial/ that pollinate crops/ which are useful}/ ORA; ¶ Only 1 application/ it is cheaper/ ORA; NOT bioaccumulation ¶ No (chemical) pollution/ ORA;	1
	(b)		Fertilizers/GM (crops)/ selective breeding/named fertilizer/ manure/slurry/biological control/genetic engineering; NOT reference to pesticide use/herbicides	1
	(c)	(i)	1947/ 1948 ;	1
		(ii)	Leaching/run off/spray carried by air onto water/(rain) {carried/ washed} it into rivers ; NOT DDT sprayed onto water/rain leaked it into rivers	1
		(iii)	It (bio)accumulates/builds up (in tissues)/it is persistent/it concentrates in tissues/it is not destroyed after it enters the body; At the concentration found in the Bald Eagle it is {toxic/poisonous}/ORA; NOT kill/lethal 2nd mark linked to 1st	2
			Question 9/3 Total	**[6]**

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Question			Marking details	Marks Available
10/4			**Indicative content:** Pancreas Secretes insulin Travels in blood stream To liver Glucose is converted to glycogen Glycogen stored in the liver **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question 10/4 Total**	6 **[6]**

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<table>
<tr><th colspan="3">Question</th><th>Marking details</th><th>Marks Available</th></tr>
<tr><td>5</td><td>(a)</td><td>(i)</td><td>One {form/version/variant} of <u>a</u> gene/{two/different}{forms/ types/versions} of {the <u>same/a</u>} gene;</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>¶ In a {heterozygous organism/OWTTE} the allele that is not {expressed/shown}/
¶ only {expressed/shown} {when homozygous/when in a pair of recessive alleles}/</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Gametes correct (must use correct letter for this mark);

Mechanics of cross correct;
Allow ECF of incorrect gametes but must use B/b

<table>
<tr><td>Gametes</td><td>B</td><td>b</td></tr>
<tr><td>B</td><td>BB</td><td>Bb</td></tr>
<tr><td>b</td><td>Bb</td><td>bb</td></tr>
</table></td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>75%/ 0.75/ ¾/ 3 in 4;
NOT ratio</td><td>1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>3 : 1 ;</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Question 5 Total</td><td>[6]</td></tr>
</table>

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Question			Marking details	Marks Available
6	*(a)*		There are {46 chromosomes/(23) pairs/has a diploid number/ not haploid/has both X and Y;	1
	(b)		No {corresponding/matching} part of chromosome (for paired allele)/only has one X chromosome/ only has one {copy of the gene/allele};	1
	(c)		Linearly/in a line/in a row;	1
			Question 6 total	**[3]**

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Question			Marking details	Marks Available
7	*(a)*		*Penaeus japonicus;* *Correct spelling and format*	1
	(b)		*Penaeus kerathurus;* *Correct spelling and format* The {DNA/genetic} profile is <u>most</u> similar to the unknown species/ both are in the same genus/both have the same first {scientific/latin} name/<u>most</u> similar <u>DNA banding pattern</u>; NOT genetic fingerprint/ genotypes/genus	2
	(c)		They use the same name of genus and species/same {scientific/universal/Latin/international/binomial} name/scientific name is universal;	1
			Question 7 total	**[4]**

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Question			Marking details	Marks Available
8	*(a)*		As the nitrate concentration increases, the gap between the shells increases (up to 4mm) and <u>levels off</u>;	1
	(b)		Any two from: Predation; Disease; flow of water/tides/current other named chemical (e.g. phosphates/sewage/oil/salt) competition for {food/space}; pH; temperature; oxygen; NOT weather/climate	2
	(c)		(Nitrate causes) excess plant growth/ algal bloom/OWTTE; Plants {die/decay}/OWTTE; NOT bacteria eat plants {Bacteria/decomposers/ fungi} use oxygen for respiration; 3rd mark point linked to 2nd mark point	3
			Question 8 Total	**[6]**

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Question			Marking details	Marks Available
9	*(a)*		655 – 280 = 375 375 x 100 = 655 = 57.25/ 57.3% NOT 57.0/57 Correct answer = 2 marks Allow 1 mark for correct working but incorrect answer	2
	(b)	(i)	Flatworms compete with hedgehogs for {food/ invertebrates}; Therefore hedgehogs eat more birds' eggs (avoiding the competition); (must be linked for second mark)	2
		(ii)	Numbers of {some birds/named birds (Snipe/Dunlin)} dropped (without introduction of hedgehogs);	1
		(iii)	{Lack of/no/less} {predators/carnivorous mammals/carnivores}; Abundance of {food/ eggs}/large variety of food/less competition for food;	2
			Question 9 Total	**[7]**

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Question			Marking details	Marks Available
10	*(a)*		One axis labelled- number of leaves and other axis labelled – length of leaf(mm); Suitable linear scales (including origin) + at least half of grid used; Bars correct heights (drawn with ruler);	3
	(b)		Continuous;	1
			Question 10 Total	**[4]**

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Question			Marking details	Marks Available
11			**Indicative content** Agouti/coat gene appeared as a mutation led to variation in the fur colour colour change was an advantage because of camouflage allowed the mutant to survive to breed mutant gene was passed on DNA comparison between modern deer mice and the remains of ancient ones. **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question 11 Total**	6 **[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

P.M. TUESDAY, 10 June 2014

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**5**	
3.	**6**	
4.	**4**	
5.	**7**	
6.	**5**	
7.	**5**	
8.	**6**	
9.	**6**	
10.	**6**	
11.	**6**	
Total	**60**	

4461
010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **11**.

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Answer **all** *questions*

1. The photograph below shows an insect called a water boatman *(Notonecta sp.)*.

(a) Water boatmen are invertebrates.
State what is meant by the term invertebrate. [1]

.....

(b) Read the following statements about water boatmen.

Water boatmen:

A live at the surface of ponds

B have long, flat back legs to help them swim

C have large eyes

D can dive below the surface of the water

E lay eggs on plants in the water

F have hairs sensitive to movement in water

Water boatmen feed on small fish in the water.
Which **four** statements (**A** to **F**) are adaptations to help water boatmen **find** their food? [3]

....

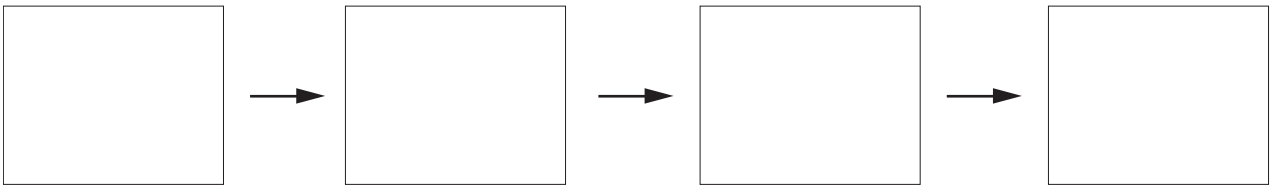
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2. The photographs below show a food chain.



grass snail thrush hawk

(a) State the source of the energy used by the grass. [1]

.....

(b) Complete the following sentence:

Arrows in the food chain show the flow of ..... [1]

(c) The table below shows how much energy enters each organism in the food chain in one day.

organism in food chain	energy entering each organism (kJ)	percentage energy in grass passed on (%)
grass	2500	
snail	500	.....
thrush	25	1
hawk	0.5	0.02

(i) Use data in the table to calculate the percentage of the energy **entering the grass** that is passed on to the **snail**. Show your working below and write your answer in the table. [2]

(ii) State the process occurring in cells that releases energy. [1]

.....

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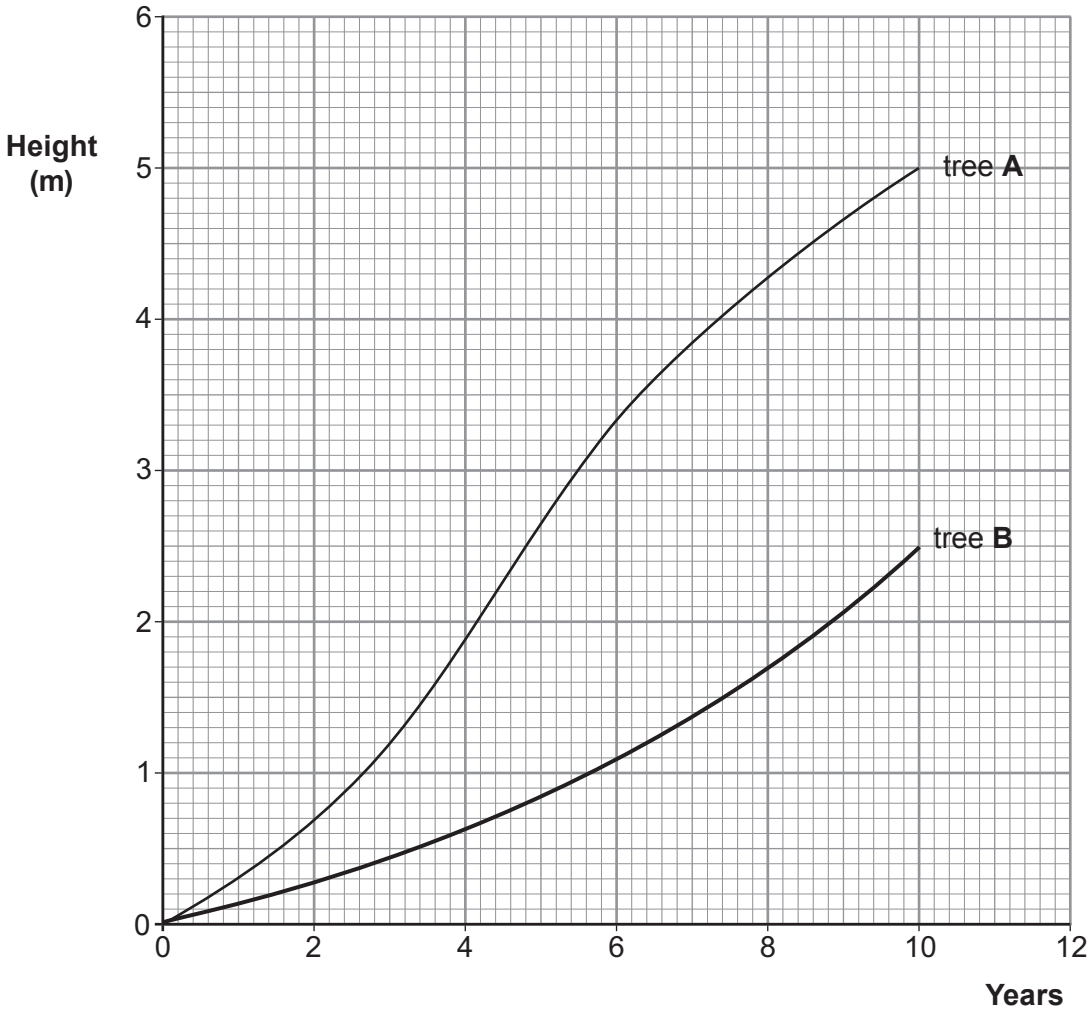
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4461 010003

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3. The graph below shows the growth of two trees (**A** and **B**) during a period of 10 years.



(a) Give the difference in height between trees **A** and **B** at 10 years. [1]

..... m

(b) The mean (average) growth rate for tree **A** over 10 years was 0.5 m per year. Calculate the mean growth rate for tree **B**. [1]

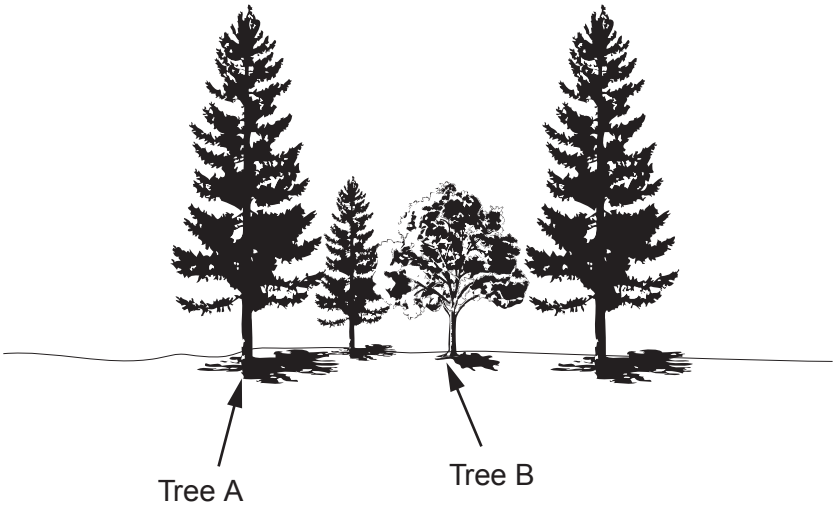
..... m per year

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(c) The trees were growing in a wood as shown in the diagram below.



Trees compete for resources.
Use the diagram above and your knowledge to give **three** resources for which trees compete. [3]

1 .....

2 .....

3 .....

(d) Suggest **one** reason, apart from competition for resources, for the difference in mean growth rate between the two trees. [1]

.....

.....

6

4461 010005

Turn over.

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4. The photograph below shows maggots. Maggots are the larvae (young) of flies.



Read the following information.

- In the First World War, many soldiers died from infection of their wounds by bacteria.
- Sometimes, maggots would hatch in the wounds from eggs laid by flies.
- An army doctor called William Baer observed that soldiers whose wounds had maggots were more likely to survive than soldiers who did not have maggots.
- The maggots seemed to clean the wound.
- He reasoned that maggots ate bacteria and dead flesh around the wound.
- Baer published his ideas in 1931. Since then, using maggots to treat wounds has become common.

(a) From this information:

(i) What was Baer's observation? [1]

.....

.....

(ii) What was Baer's hypothesis? [1]

.....

.....

(iii) Suggest why it was important for Baer to publish his ideas. [1]

.....

.....

(b) Suggest **one** reason (apart from cost) why using maggots to treat wounds may be preferred instead of using antibiotics on patients. [1]

.....

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5. *(a)* Use words from the list below to complete the following sentences about chromosomes. [3]

nucleus **cytoplasm** **circle** **gene** **protein** **membrane**

Chromosomes are found in the ..... of a cell. Sections of DNA form units of inheritance. Each unit is called a ..... . Each unit is a code for the production of one ..... .

(b) The table below gives the number of chromosomes in the **body** cells of some animals.

animal	number of chromosomes in body cells
human	46
meerkat	36
kangaroo	16
fruit fly	8
mosquito	6

The diagram below shows the chromosomes from an **egg cell** in one of the animals in the table above.



(i) I How many chromosomes are shown in the diagram above? ..... [1]

II State the animal from which this egg cell was taken. Give a reason for your answer. [2]

.....

.....

.....

(ii) State the chromosome number in a **fertilised** egg cell of a meerkat. [1]

.....

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6. Some rats have evolved a resistance to the rat poison warfarin.

(a) The information below shows some stages in the development of this resistance **but not in the correct order**.

1 so the useful mutation is passed on to offspring

2 a mutation occurred in a gene

3 the mutation is useful

4 rats with the mutation survive to reproduce

5 as a result, there is an increase in the population of rats with the mutation

Complete the sequence below to show the stages in the correct order. *One has been done for you*.

2 → ..... → ..... → ..... → ..... [4]

(b) What may happen to **species** that do not adapt to new environmental conditions? [1]

.....

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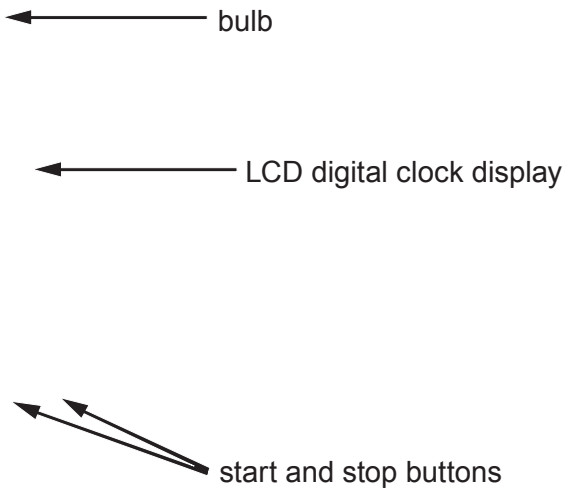
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7. Megan wanted to know if playing music affected Bob's reaction time.

She used a reaction timer as shown in the photograph below.



Method

- The clock started timing as soon as the bulb lit up.
- When Bob saw the bulb light up, he pressed the stop button as fast as he could.
- Bob's reaction time with no music playing and then with music playing was recorded.

The results for five trials are shown below.

trial number	reaction time with no music playing (s)	reaction time with music playing (s)
1	0.20	0.53
2	0.20	0.44
3	0.20	0.40
4	0.20	0.38
5	0.20	0.25

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(a) What conclusions can be made from the results of the experiment? [2]

.....

.....

.....

.....

(b) (i) State the name of the sense organ that detects light. [1]

.....

(ii) Describe how information gets from sense organs to the brain. [2]

.....

.....

5

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8. Some organisms living in a large lake and their total biomass in kg are shown below.

They are **not** drawn to scale.

Snails
4 500 kg

Pike
250 kg

Aquatic plants
45 000 kg

Minnows
500 kg

Beetles
800 kg

(a) (i) Which of the organisms above are likely to be present in the least numbers? [1]

.....

(ii) The organisms above all form part of the same food chain.
In the space below, draw a **labelled** diagram to show a pyramid of biomass containing **all** of these organisms. [2]

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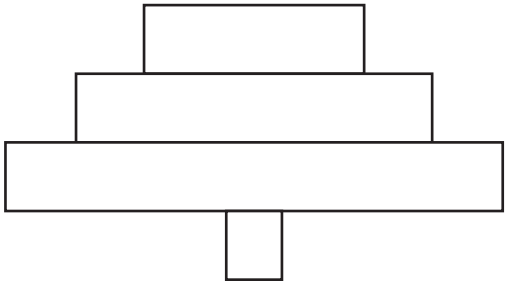
(iii) The pike in the lake are affected by a parasite, called a fish louse, which lives on their skin. There would be many of these parasites on each pike but their biomass would be less than the biomass of the pike.

How would you add this information to the pyramid you drew in *(a)*(ii)?

Tick (✓) the correct answer. [1]

- Place them at the tier above the pike ☐
- Place them at the bottom of the pyramid ☐
- Place them below the minnows ☐
- Place them in the tier below the pike ☐

(b) Explain how a pyramid of **numbers**, for some organisms living on land, could look like the one shown below: [2]



.....

.....

.....

6

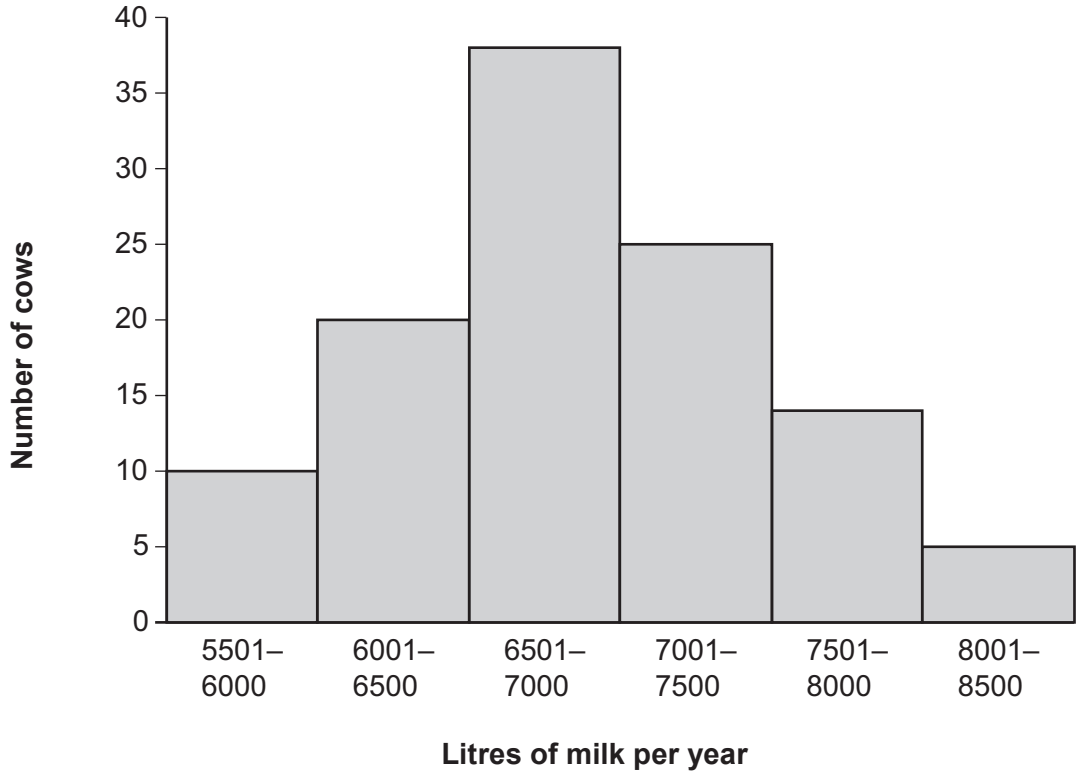
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9. *(a)* The graph below shows the variation in the volume of milk produced by a herd of cows in one year. All the cows were the same breed.



(i) During the winter months, the herd is kept indoors in large barns. All the cows in the herd are fed exactly the same quality and quantity of food. Suggest a reason why the volumes of milk produced by the cows varied during the winter months. [1]

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.....

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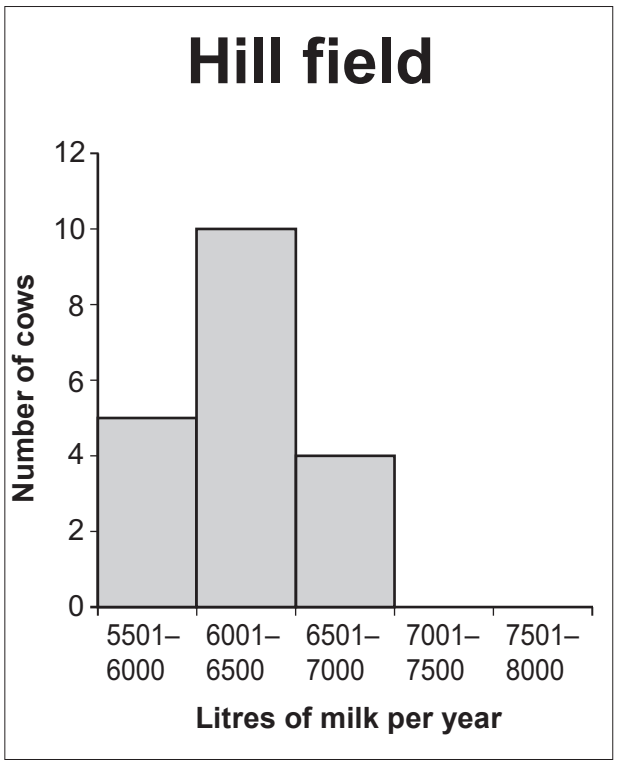
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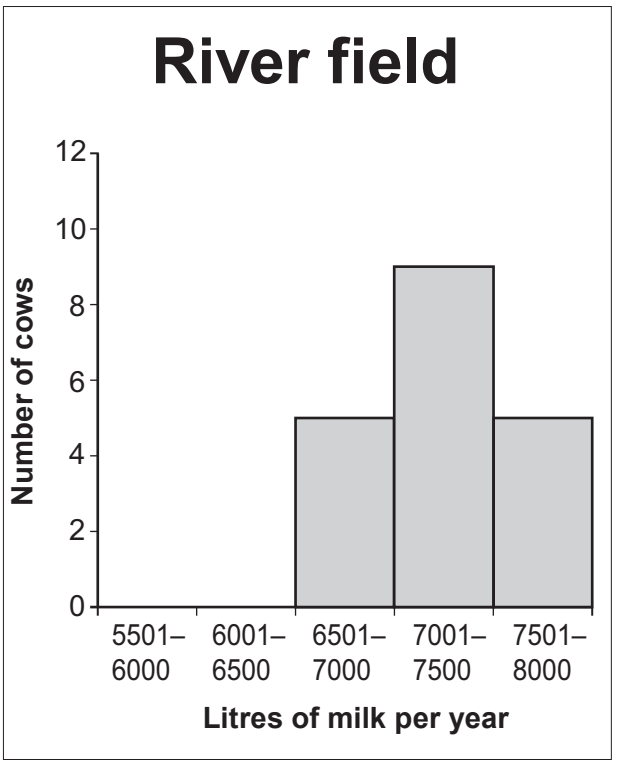
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During the summer months, the farmer noticed that the volume of milk produced by the cows varied depending on which fields on the farm the cows were grazing on.

He divided the cows that produced 6501 – 7000 litres of milk per year into two groups. One of these groups grazed on a field by the river and the other on a field on the hill.

The graphs below show the results.





(ii) Explain the differences in the results shown in the graphs. [2]

.....

.....

.....

.....

(iii) When the farmer breeds from his cows he uses a method called artificial insemination (AI). The sperm are introduced into the cows mechanically rather than by using a bull directly.
How does this information suggest that AI is a method of sexual reproduction? [1]

.....

.....

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(b) The table below shows the milk composition of five breeds of dairy cattle.

	milk composition (g/l)		
breed	fat	protein	milk sugar
Ayrshire	3.97	3.26	4.63
Brown Swiss	3.80	3.18	4.80
Guernsey	4.58	3.49	4.78
Holstein	3.56	3.02	4.61
Jersey	4.97	3.03	4.70

Milk from which breed of cattle would you recommend to a person suffering from heart disease? Give a reason for your answer. [2]

.....

.....

.....

.....

6

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10. The diagram below shows the hairs on the surface of the skin of a cat at different air temperatures.

Diagram A

Mean air temperature 6.4°C

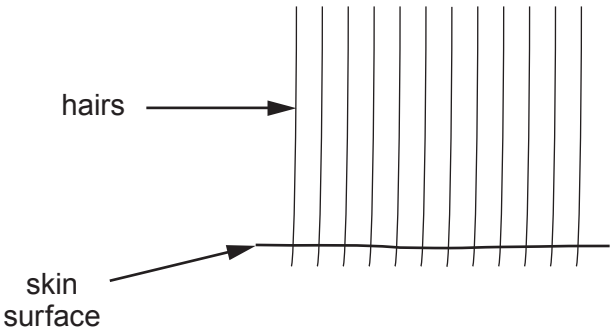
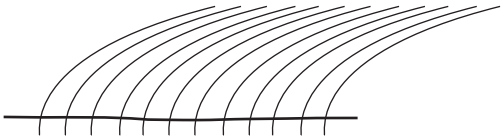


Diagram B

Mean air temperature 22.7°C



(a) Name the structures in the skin that raise each hair to the position shown in **Diagram A**. [1]

.....

(b) Explain why the skin in **Diagram A** loses less heat to the air than the skin in **Diagram B**. [3]

.....

.....

.....

.....

.....

.....

(c) State **two** *other* ways in which the skin reduces heat loss from the body. [2]

I .....

II .....

6

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11. Describe an experiment you would set up to investigate the positive growth response (phototropism) of plant shoots to light coming from one side.
In your account you must explain the use of a control in your investigation. [6 QWC]

6

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE-BIOLOGY

SUMMER 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 examination in GCSE Science-Biology. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
B1	1
B2	18
B3	32

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GCSE SCIENCE - BIOLOGY

B1

MARK SCHEME - SUMMER 2014

Question		Marking details	Marks Available
1	*(a)*	No {backbone/ vertebral column/ spinal column/ vertebrae};	1
		NOT spinal cord/ bone	
	(b)	**ANY ORDER** B C D F;	3
		all four correct = 3	
		three correct = 2	
		two correct = 1	
		Question 1 total	**[4]**

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Question			Marking details	Marks Available
2	*(a)*		Sun/ solar; NOT light/ sunlight	1
	(b)		<u>Energy;</u>	1
	(c)	(i)	20; Correct answer = 2 marks If incorrect answer allow one mark for (500/2500) x 100	2
		(ii)	<u>Respiration/ respiring/ respires</u>;	1
			Question 2 Total	**[5]**

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Question		Marking details	Marks Available
3	*(a)*	2.5;	1
	(b)	0.25;	1
	(c)	Any **three** from: light/ sunlight; NOT sun water; NOT moisture/ rain nutrients/ minerals/ salts/ named mineral; NOT food/ salt space; NOT room/ area carbon dioxide/ CO_2;	3
	(d)	(**A** and **B** are) <u>different</u> {types/sorts/species/genes/DNA}/ genetically different/genetic variation/ there has been a mutation; NOT different chromosomes	1
		Question 3 Total	**[6]**

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Question			Marking details	Marks Available
4	*(a)*	(i)	Soldiers whose wounds had maggots were <u>more</u> likely to survive (than soldiers who did not have maggots)/ ORA; (comparison is needed)	1
		(ii)	Maggots ate bacteria (and dead flesh around the wound);	1
		(iii)	Make his findings known widely/ allow reproducibility/ others to test/ to confirm findings; NOT to help more soldiers;	1
	(b)		<u>Fewer</u> side effects/ drug toxicity/ bacterial resistance/ maggots are more widely available (in some parts of the world)/ some people are allergic to antibiotics; NOT some people react to antibiotics (unqualified)/ easier (unqualified)/ no side effects/ safer/ act quicker	1
			Question 4 Total	**[4]**

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Question			Marking details	Marks Available
5	*(a)*		Nucleus; Gene; Protein;	3
	(b)	(i)	I 8; II Kangaroo; (8 is/ gametes have) {half the body cell number/ half the diploid number}/ 8 is the haploid number/ {reference to fertilisation restoring the body cell chromosome number/OWTTE}; NOT half the number of chromosome 2nd mark only accessed if 1st mark credited	1 2
		(ii)	36;	1
			Question 5 total	**[7]**

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Question		Marking details	Marks Available
6	*(a)*	(2) 3 4 1 5; one mark for each number correctly positioned	4
	(b)	Become extinct/ die out/ wiped out; NOT die (unqualified)/ become endangered	1
		Question 6 Total	**[5]**

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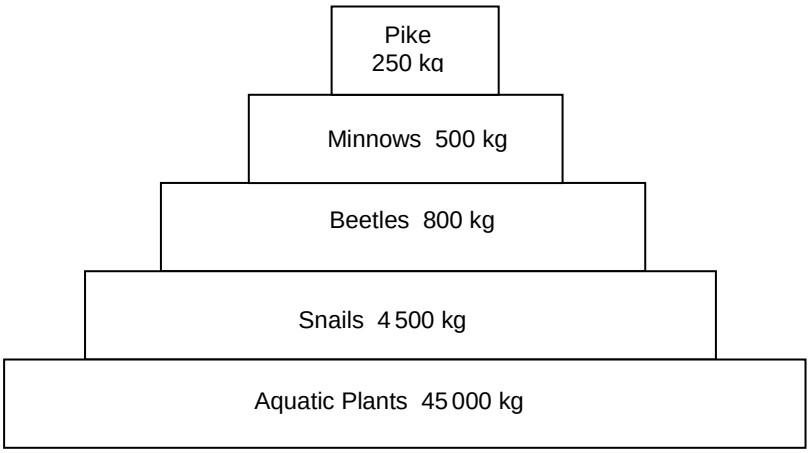
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Question			Marking details	Marks Available
7	*(a)*		1. (Playing) music {increases/slows} reaction time/ slows reactions *OR Reverse answer* Not playing music decreases reaction time/ makes reactions faster/ speeds up reaction time; NOT worse/better/improved reaction time 2. With music, reaction times are variable/ reaction time decreases with {trial number/ practice} *OR Reverse answer* Without music reaction time is constant/ steady/ the same; NOT the longer Bob listens to music the quicker his reaction time	max 2
	(b)	(i)	Eye;	1
		(ii)	Impulses/<u>electrical</u> signals; Along neurones/nerve/ nerve cells;	2
			Question 7 total	**[5]**

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Question			Marking details	Marks Available
8/1	*(a)*	(i)	Pike	1
		(ii)	Pyramid correctly drawn (accept triangle) with correct labels and biomasses with units = 2 marks Pyramid correctly drawn with names of organisms on own without masses = 1 mark Pyramid correctly drawn with biomasses on own with units without named organisms = 1 mark Incorrect order or level missing = 0 marks	2



		(iii)	Tier above the pike;	1
	(b)		{Single/one} {plant/ tree / named plant/ producer}; NOT aquatic plant On which {many organisms/ named organisms} {feed/ live off};	2
			Question 8/1 total	**[6]**

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Question			Marking details	Marks Available
9/2	*(a)*	(i)	The cows are <u>genetically</u> different/have different <u>genes</u>/ show <u>genetic</u> variation/ different ages/ variation in the milk producing genes; NOT different genetics/ sizes/ inherited it from their parents/ mutation	1
		(ii)	River field cows' milk production is higher/ ORA; there are <u>environmental</u> differences/ named environmental difference e.g. temperature/soil/nutrients/water content/ {richer/better <u>quality</u>} grass (must be comparative); 2nd mark only awarded if 1st is credited	2
		(iii)	Sperm (are used)/ two parents/ bull and cow;	1
	(b)		Holstein; it has the {low<u>est/least</u>} fat content/ lower fat than the other cows; 2nd mark point only accessed if first correct sugar=neutral	2
			Question 9/2 Total	**[6]**

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Question		Marking details	Marks Available
10/3	(a)	Erector muscle;	1
	(b)	1. Hairs {erect/raised/ stand up/ stick up/ are lifted/ pulled up/ straight up/ up};	3
		2. Trap thicker layer of air/ more air trapped; NOT trap layer of warm air (can be neutral)	
		3. Which is {an insulator/ poor conductor} / which lets less heat pass out/ which insulates/ harder for heat to escape; NOT no heat passes out	
		3rd mark only awarded if 2nd awarded	
		ACCEPT REVERSE ARGUMENT	
	(c)	Any **two** from:	2
		1. Vasoconstriction/ {capillaries/ blood vessels} {narrow/ constrict/ thinner}/ diameter gets smaller; NOT contract/ get smaller/ blood vessels moving up and/or down	
		2. shivering; {reduced/ no} sweating/ less sweat {produced/ secreted};	
		Question10/3 Total	**[6]**

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Question	Marking details	Marks Available
11/4	*Indicative content:*	6

All plants/seedlings/flowers are growing vertically straight up.

{Place plants on a window sill/ in a (blacked out) box with a hole in one side/ any method of one sided illumination}.

Leave plants for specified length of time.

Plants show growth towards light/ tips 'bend' towards light.
NOT move

Reference to involvement of hormone e.g. hormone cause shoots to bend.

Reference to control by eliminating the effect of one sided light. This should be uniform illumination.
NOT darkness

Shoots/tips don't bend towards light.

5 – 6 marks
The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3 – 4 marks
The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1 – 2 marks
The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks
The candidate does not make any attempt or give a relevant answer worthy of credit.

Question 11/4 Total **[6]**

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Question			Marking details		Marks Available
5	*(a)*		All correct 1 mark Mouse 1 **BB** - black Mouse 2 **Bb** - black Mouse 3 **bB** - black Mouse 4 **bb** - red		1
	(b)	(i)	12;		1
		(ii)	All correct no errors		1

Gametes	**B**	**B**
b	**Bb**	**Bb**
b	**Bb**	**Bb**

	(c)	(i)	25;		1
		(ii)	All correct no errors		1

Gametes	**B**	**b**
b	**Bb**	**bb**
b	**Bb**	**bb**

		(d)	Fertilization is random/ reference to death of embryos;		1
			Question 5 Total		**[6]**

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Question		Marking details	Marks Available
6	*(a)*	(88/88 000) x 100; 0.1%; Correct answer = 2 marks	2
	(b)	Accumulation of pesticides/ bioaccumulation/ increase in concentration of pesticide; Can reduce fertility/ makes them infertile/ reduce reproductive rate; NOT kills fish before they can reproduce/ less eggs fertilised 2nd mark only awarded if 1st awarded	2
		Question 6 total	**[4]**

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Question		Marking details	Marks Available
7	*(a)*	Hormone = insulin in both boxes ;	2
		Organ = pancreas;	1
		Increase = glucose;	1
		Decrease = glucose;	1
	(b)	Any **two** from	2
		Chemical messengers;	
		Carried in blood;	
		Controls {body/a} {function/process};	
		(Insulin) decreases glucose in the blood;	
		Hormones produced by {pancreas/ glands};	
		Question 7 total	**[7]**

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Question			Marking details	Marks Available
8	*(a)*	(i)	Nn;	1
		(ii)	Nn;	1
	(b)		50(%);	1
	(c)	(i)	{Genetic/ DNA} {profile/ profiling}; NOT genetic fingerprinting	1
		(ii)	DNA {has coded information/ codes for protein}; Baby's DNA is different to Mike's/ In the {DNA profiles/ genetic analysis} above, the baby {does not have any (base) A/ has one less G};	2
	(d)		Family tree only shows the {<u>chance/probability</u>} of having CF; {Profile/ analysis/it} shows the (presence of) {alleles/mutation/gene}; NOT the genotype	2
			Question 8 Total	**[8]**

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Question			Marking details	Marks Available
9	*(a)*	(i)	More {rainfall/ precipitation} therefore more {slurry/nitrates/manure} could be washed into water;	1
		(ii)	{More/ faster} absorption of nitrates (as plants are growing); NOT Less rainfall in spring	1
	(b)		{Herbicide/ pest/ fungus/ drought/ low temperature/ disease} resistance/ increase rate of photosynthesis/ any correct point; NOT pesticide resistance/ immune to herbicides/ increased yield	1
	(c)		Protein converted to ammonia/ Ammonia is converted to nitrate; By decomposers/ bacteria/ fungi; If named, bacteria must be correct. e.g. **Nitrifying** bacteria change protein to ammonia = 1 mark	2
			Question 9 Total	**[5]**

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Question	Marking details	Marks Available
10	Indicative content A gene mutates. This resulted in variation. The variation reduced water loss. This {was an advantage/ had survival value} (in the desert.) Resulted in natural selection/ survival of the fittest to breed (Advantageous altered) gene was passed on. 5 – 6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. 3 – 4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. 1 – 2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. 0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.	6
	Question 10 Total	**[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

A.M. WEDNESDAY, 8 January 2014

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**11**	
2.	**6**	
3.	**2**	
4.	**8**	
5.	**9**	
6.	**5**	
7.	**6**	
8.	**6**	
9.	**7**	
Total	**60**	

4461
010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **9**.

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Answer **all** *questions.*

1. A population of sheep lives on the Scottish island of St. Kilda.
The photograph below shows a sheep.



© soyaandboreraysheep.com

(a) Sheep are vertebrate animals.
State **one** feature common to all vertebrate animals. [1]

.....

(b) The scientific name for sheep is *Ovis aries*. Underline the correct word to complete sentences (i) and (ii) below.

In the name *Ovis aries*:

(i) *Ovis* is the **order** / **family** / **genus** / **species** [1]

(ii) *aries* is the **order** / **family** / **genus** / **species** [1]

(c) Sheep are herbivores.

What does the term *herbivore* mean? [1]

.....

.....

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Turn over.

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(d) The sheep on the island are either pale or dark in colour.

The table below gives the percentage (%) of dark sheep on St. Kilda between 1985 and 2005.

Year	Percentage (%) of dark sheep
1985	76
1990	74
1995	71
2000	70
2005	69

(i) Using the data above, plot a line graph on the grid below by:

I. Labelling the vertical axis. [1]

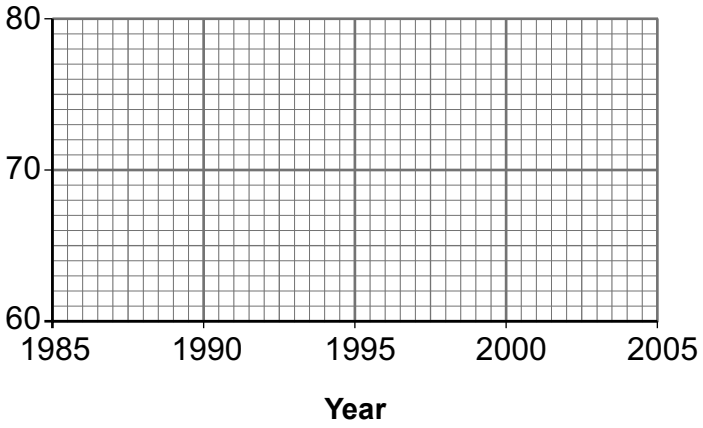
II. Plotting the points. [2]

III. Joining the points with a ruler. [1]

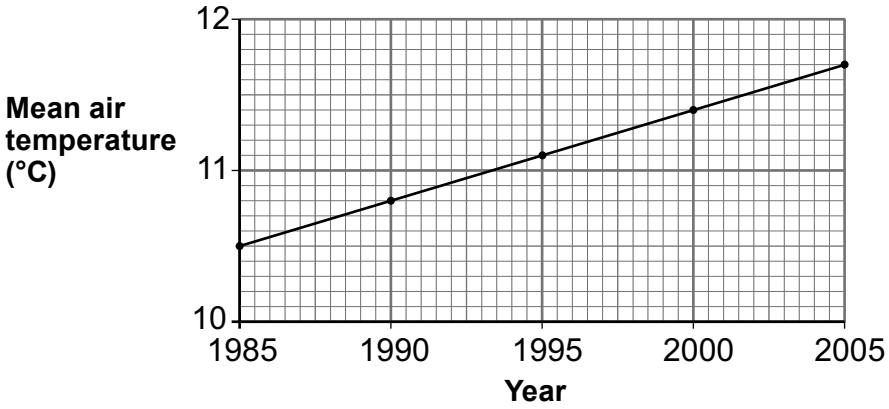
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.....

.....



(ii) The graph below shows the mean air temperature on the island over the same period.



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Some scientists have the opinion that the change in the percentage of dark sheep on the island is due to a change in the mean air temperature.

I. Using **both** of the graphs opposite, describe the evidence that supports the scientists' opinion. [1]

.....

.....

.....

II. It is not possible to be sure that the change in the percentage of dark sheep on the island is due to the change in the mean air temperature.

State **two** *other* factors that could cause the change in the percentage of dark sheep. [2]

.....

.....

.....

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11

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2. The photograph below shows a badger.



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- It is thought that badgers spread the disease bovine TB to cattle.
- Badger culls aimed at reducing bovine TB in cattle were planned for August 2012.
- In certain areas, badgers were to be shot.
- The cull would have tried to kill all the badgers in each area.
- However, some scientists thought that a badger cull might actually spread bovine TB to cattle on other farms.

Use the above information, and your own knowledge, to answer the following questions.

(a) Describe the possible link between badgers and bovine TB in cattle. [1]

.....

.....

(b) The exact areas for the culls were kept secret. Suggest why. [1]

.....

.....

(c) A successful cull would kill **all** the badgers on one farm. However, even if successful, a second cull would be needed after a few years.
Why would a second cull be necessary? [1]

.....

.....

(d) Suggest **one** reason why some scientists think a badger cull might spread bovine TB to cattle on *other* farms. [1]

.....

.....

(e) Suggest **two** *other* ways (apart from killing badgers) which would prevent the spread of bovine TB. [2]

1. .....

2. .....

6

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3. During the London Olympic Games of 2012, a government minister called for schools to promote a healthy diet and provide more sport to reduce the number of obese (overweight) teenagers in the UK.

"Teenagers need a healthy diet which balances fat intake with activity levels," he said.

(a) Give **one** health problem that may result from being obese. [1]

.....

(b) Give a reason why increased activity might help to reduce the number of obese teenagers. [1]

.....

.....

2

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4. This question is about the disease cystic fibrosis.

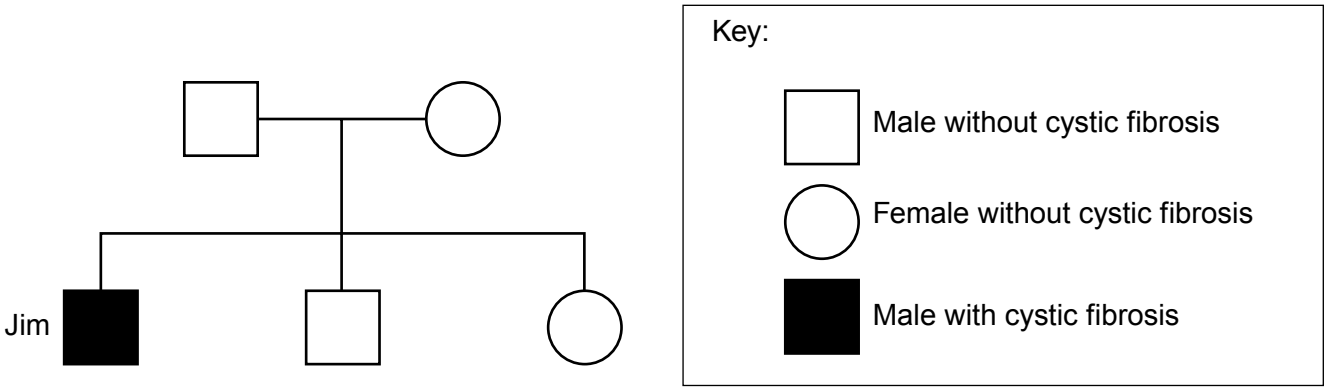
(a) Complete the following sentences by underlining the correct word or words for each.

(i) Cystic fibrosis affects
blood vessels
bronchioles
nerves [1]

(ii) One symptom of cystic fibrosis is
increased body temperature
production of thick mucus
raised blood pressure [1]

(iii) Gene therapy for cystic fibrosis uses
an inhaler
an injection
a powder taken in a drink [1]

(b) Look at the family tree below.



Use information in the family tree above, and your own knowledge, to choose the correct letter to complete the following statements.

(i) Jim inherited cystic fibrosis: [1]

A **only** from his father
B **only** from his mother
C from his father **and** his mother

.....

(ii) Jim's parents are: [1]

A heterozygous for cystic fibrosis
B homozygous dominant for cystic fibrosis
C homozygous recessive for cystic fibrosis

.....

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(iii) Jim is: [1]

A heterozygous for cystic fibrosis
B homozygous dominant for cystic fibrosis
C homozygous recessive for cystic fibrosis

.....

(iv) Jim's parents are expecting another child. The probability that the child will have cystic fibrosis is: [1]

A 25%
B 50%
C 75%

.....

(v) In the human population, cystic fibrosis affects: [1]

A **only** males
B **only** females
C males **and** females

.....

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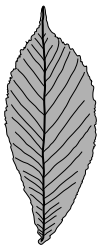
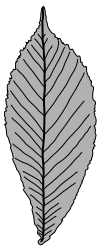
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5. Tracy investigated decay using two leaves of the same size from the same tree.

- She made a drawing of each leaf.
- She then buried each leaf in a separate beaker each containing equal volumes of soil.
- She kept one beaker at 5°C and one at 15°C.
- After one month, she removed the leaves from the soil and drew them again.

Her drawings are shown in the table below.

Temperature (°C)	Drawing of leaf	
	start	after one month
5		
15		

(a) State the name of **one** group of microorganisms that cause decay. [1]

.....

(b) Describe the results of the investigation shown by the drawings. [2]

.....

.....

.....

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(c) (i) Give **two** ways that Tracy's investigation is a fair test. [2]

I. .....

II. .....

(ii) Why is it important that an investigation should be a fair test? [1]

.....

.....

(d) Microorganisms in the soil respire.

State the name of the gas released during respiration. [1]

.....

(e) State why the level of nitrates in the soil in the beakers would increase during the investigation. [2]

.....

.....

.....

9

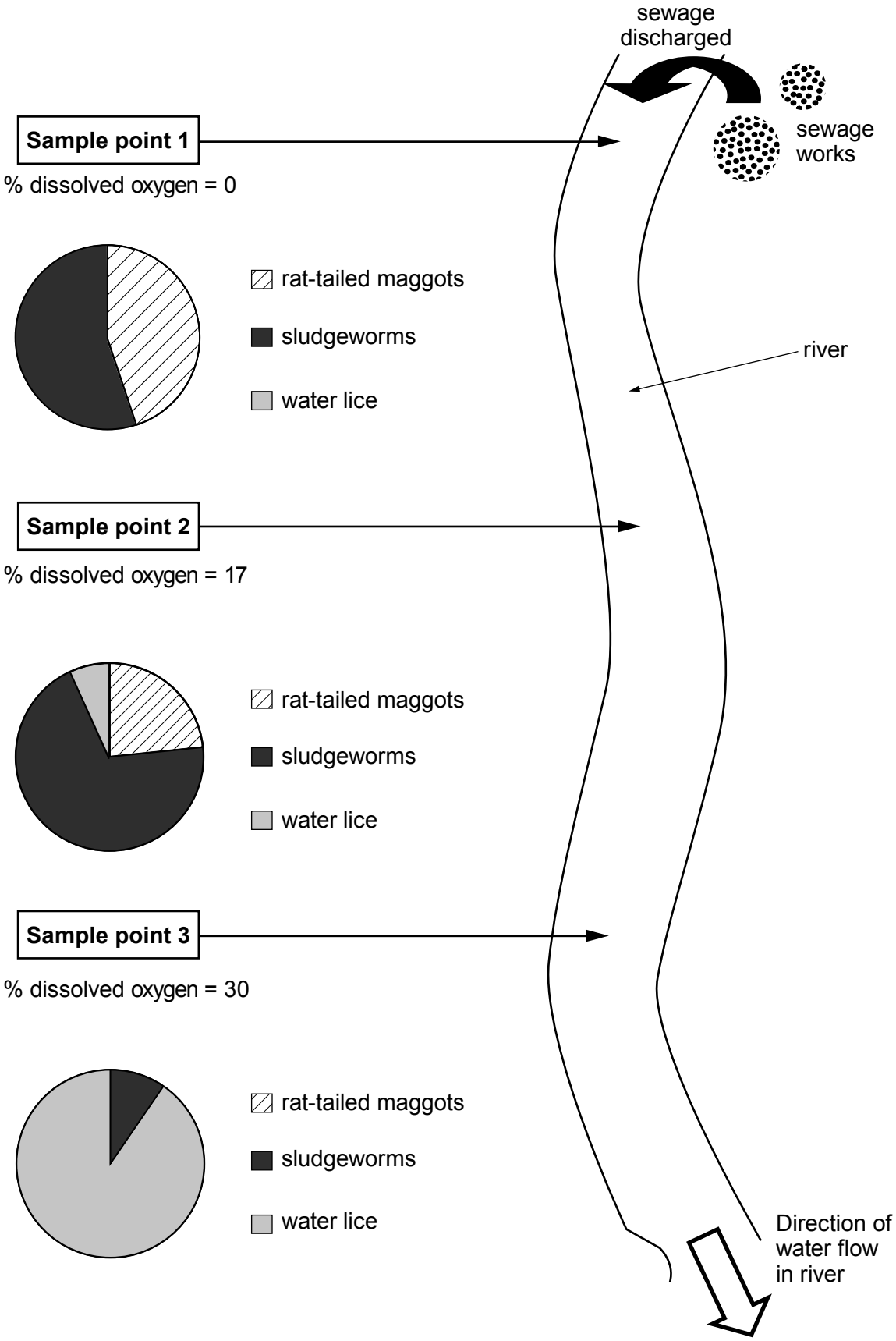
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Turn over.

6. Recent flooding in the UK caused a sewage discharge into a river. Two weeks after the discharge the Environment Agency took samples of river water at 3 sample points 0.5 km apart.

The percentage (%) of dissolved oxygen in the sample was measured and the animals in the samples were counted and the data plotted as pie charts. The results are shown below.



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Use the information from the diagram opposite to answer the following questions.

(a) The presence of which **two** animals in the samples indicates **high** levels of water pollution? [2]

....

(b) Which animal cannot live in highly polluted water? [1]

.....

(c) (i) What happens to the percentage of dissolved oxygen as the water flows downstream? [1]

.....

(ii) Rat-tailed maggots need oxygen to live. Suggest how they can live at **Sample point 1** where there is no oxygen dissolved in the water. [1]

.....

.....

5

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Turn over.

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7. Anna has been a diabetic for 6 months. She injects herself with insulin before meals in order to control the level of glucose in her blood. Like all diabetics who have not been injecting insulin for very long she finds it difficult to get the dose correct.
Before every meal Anna carries out the following procedure.

1. Measures the concentration of glucose in her blood.

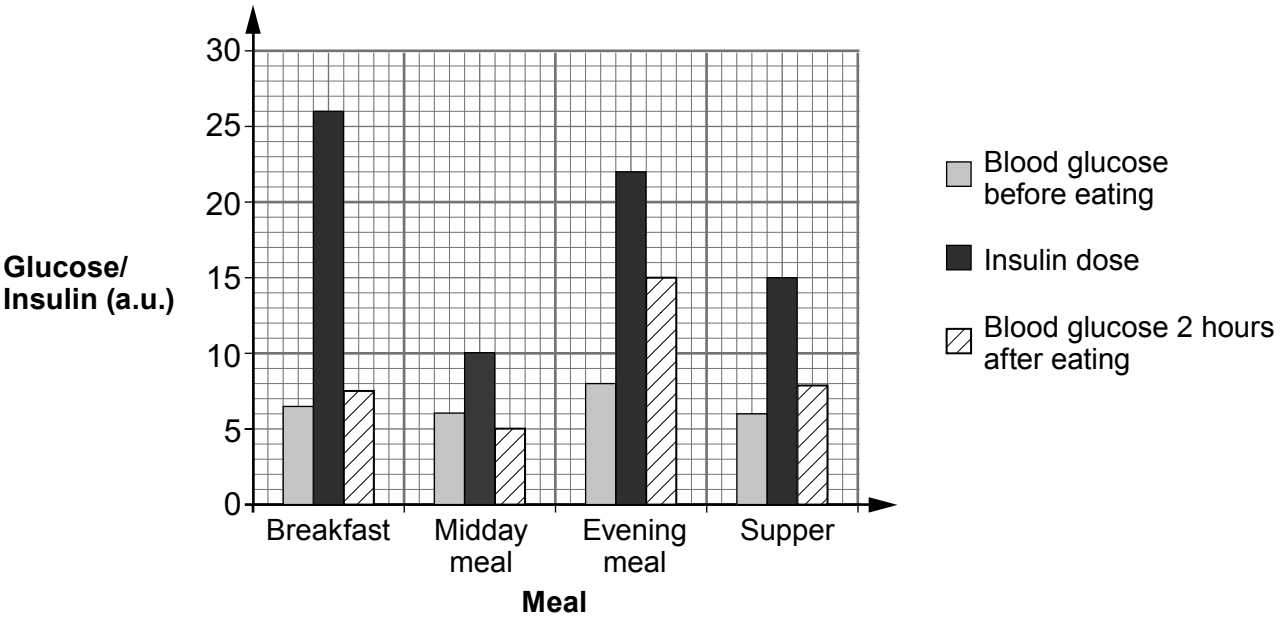
2. Estimates whether the meal she is about to eat has a high, medium or low level of glucose (sugar) in it.

3. Injects insulin, the dose of which depends on the level of glucose in the meal.

Two hours after the meal she measures the concentration of glucose in her blood again.

Anna records all this information on an App, called ***Glucose Buddy***, on her iPhone.

The chart below shows Anna's complete record for one day on ***Glucose Buddy***.



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(a) (i) Which meal of the day did Anna estimate contained the lowest level of glucose? Give a reason for your answer. [2]

Meal .....

Reason .....

.....

(ii) Anna tries to keep her blood glucose level below 8 a.u. Using only the chart and the information opposite, suggest reasons why her blood glucose level was 15 a.u. two hours after she ate her evening meal. [2]

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(b) How does insulin lower the level of glucose in the blood? [2]

.....

.....

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6

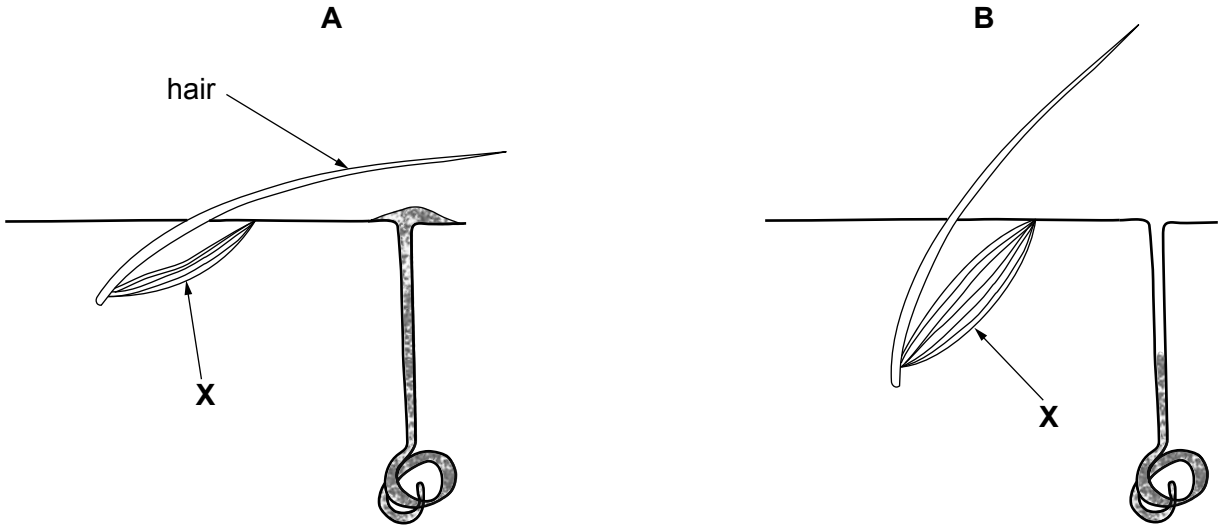
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8. Diagrams **A** and **B** below show the skin under two different environmental conditions.



(a) (i) Which of the diagrams shows the skin in hot conditions? ..... [1]

(ii) Give **two** reasons for your answer. [2]

I .....

.....

.....

II .....

.....

.....

(b) If blood vessels had been drawn on the diagrams, the blood vessels in the skin in diagram **B** would be narrower than in diagram **A**. Explain how this helps to control body temperature. [2]

.....

.....

.....

(c) State how structure **X** on the diagrams above causes the hair to appear as it does in diagram **B**. [1]

.....

.....

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9. In 1960, a survey of a large pond on a farm found that it contained a rich variety of aquatic insects, snails and four different fish species.

In 1965, the farmer started growing cereal crops on his land. Pellets containing nitrate were spread on the crops several times a year. By 1975, the pond had become overgrown with algae and other aquatic plants and a new survey found that there were very few aquatic insects and no fish species.



Pellets containing nitrate

(a) State why the farmer spread nitrate on the cereal crops. [1]

.....

.....

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(b) Use the information opposite and your own knowledge to explain the changes which occurred in the pond. [6 QWC]

.....

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7

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

JANUARY 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2014 examination in GCSE SCIENCE - BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
B1 - 4461	1
B2 - 4471	18

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B1

Question				Marking details	Marks Available
1	*(a)*			Backbone/vertebrae/bones/spine (NOT spinal cord);	1
	(b)	(i)		Genus;	1
		(ii)		Species;	1
	(c)			Eats plants/vegetation; (NOT - does not eat meat/they are vegetarians) neutral – eats {grass/ vegetables/ veg}	1
	(d)	(i)	I	{percentage/ %} dark sheep;	1
			II	correct plotting +/- $^1/_2$ small square;;	2
			III	straight line joining the plots;	1
		(ii)	I	as temperature rises the {%/ proportion} dark sheep falls; (NOT {number/ amount} of sheep/reverse argument)	1
			II	Any two from: (differential) predation/camouflage; disease; food; water; correct genetic reason; NOT different genes (NOT hunting)	max 2
				Question 1 Total	**[11]**

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Question		Marking details	Marks Available
2	*(a)*	{Badgers/ they} {spread/pass on/transmit} {TB/it} (to cattle)/ORA	1
	(b)	Public disquiet/animal rights issues/protests/people might try to stop it;	1
	(c)	Badgers from {outside the area/nearby} move in;	1
	(d)	(if) not all badgers killed/some (infected) badgers would {escape spread TB to other farms};	1
	(e)	Any two from vaccination (reject injection/jab) of cattle; vaccination (reject injection/jab) of badgers; Accept vaccination (cattle/badgers not specified)= 1 mark fencing/ prevention of badgers entering {cattle housing/ troughs} keep badgers away from farm/keep cattle in sheds (idea of separation); control of cattle movement; testing of {cattle/badgers}; kill {infected/diseased} cattle;	max 2
		Question 2 Total	**[6]**

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Question		Marking details	Marks Available
3	*(a)*	Heart disease/circulatory disease/stroke/clogged arteries/mobility issues/diabetes; NOT heart attack/failure	1
	(b)	{Burns/ uses up} {fat/<u>stored</u> energy}; NOT burns {calories/energy}/ lose weight	1
		Question 3 Total	**[2]**

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Question			Marking details	Marks Available
4	*(a)*	(i)	bronchioles;	1
		(ii)	production of thick mucus;	1
		(iii)	an inhaler;	1
	(b)	(i)	C/from his father and his mother;	1
		(ii)	A/heterozygous for cystic fibrosis;	1
		(iii)	C/homozygous recessive for cystic fibrosis;	1
		(iv)	A/25%;	1
		(v)	C/males and females;	1
			Question 4 Total	**[8]**

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Question			Marking details	Marks Available
5	*(a)*		Bacteria/ fungi;	1
	(b)		{The leaves/they} have {decayed/rotted/decomposed}; {More/faster} at {15 ^{o}C / the high temperature/highest temperature}; ORA	2
	(c)	(i)	Any two from: same type of leaves/from same tree; NOT same leaves same size of leaf; equal volumes of soil; NOT amount/ type/moisture content same {length amount} of time/both one month;	max 2
		(ii)	To make a (*qualified)* conclusion (e.g. meaningful/valid)/to make a comparison/to avoid invalid results/to determine that the temperature causes the difference; NOT to make more {reliable/accurate}/ avoid bias	1
	(d)		Carbon dioxide/CO_2; NOT CO^2/Co	1
	(e)		(Nitrates) released/produced by/come from the leaves; during decay;	2
			Question 5 Total	**[9]**

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Question			Marking details	Marks Available
6/1	*(a)*		Rat-tailed maggots; Sludgeworms; NOT maggots/worms	2
	(b)		Water lice ; NOT lice	1
	(c)	(i)	Increases/gets higher/goes up;	1
		(ii)	{Uses atmospheric oxygen/comes to the surface} to breathe/ description of adaptation-they {have a breathing tube/use their tail to breathe}/ takes oxygen out of the air/can breathe out of water ; NOT lift their heads to breathe	1
			Question 6/1 Total	**[5]**

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Question			Marking details	Marks Available
7/2	*(a)*	(i)	Midday meal; smallest/ lowest {dose/ amount} of insulin (injected); NOT lowest level of glucose/ sugar/ carbohydrate in the meal	2
		(ii)	She underestimated the amount of glucose/sugar/carbohydrate in the meal/more glucose than she {thought/estimated/ calculated} there would be; {Injected/dose/gave}too little insulin;	2
	(b)		{Converts/ changes} glucose to glycogen (correct spelling); Stored/in the liver; NOT insulin stores glucose as glycogen 2nd mark only credited if reference to glycogen	2
			Question 7/2 Total	**[6]**

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Question			Marking details	Marks Available
8/3	*(a)*	(i)	**A;**	1
		(ii)	Hairs {lying flat/lying down/hairs not stood up/lower}/ {erector muscle/ X} is relaxed; Sweat on the surface of the skin/A {shows/ is} sweating/more sweat; NOT sweat produced/sweat in the sweat duct/sweat is produced	2
	(b)		Reduced blood flow (in the skin)/less blood in the capillaries; NOT less blood flowing through <u>the body</u> {Reduces/less} heat loss (reject no heat loss); ORA (Must state letter A)	2
	(c)		It <u>contracts;</u> NOT tenses/gets shorter	1
			Question 8/3 Total	**[6]**

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Question		Marking details	Marks Available
9/4	*(a)*	As a fertilizer for growth/to make crops grow/to increase growth (rate)/to increase the {crop/ yield};	1
	(b)	**Indicative content** Nitrate pellets dissolve. Nitrate runs off into pond. Increased growth of aquatic plants/algal bloom. Sunlight blocked. Plants die. Decay. Decay microbes/ bacteria use oxygen in water for respiration. Aquatic animals/insects/fish die. **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.	6
		Question 9/4 Total	**[7]**

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Question			Marking details	Marks Available
5	*(a)*		{the genes/all the alleles} in {an organism/dog/it}/ the {set/pair/two/both} alleles that {determine/control} {a characteristic/colour} of the dog/ the genetic make-up of {an organism/dog};	1
	(b)	(i)	{Cross/mate/breed} {the (black) Labrador/ it} with {a yellow Labrador/bb}/do a test cross; If all the {puppies/litter} are black then {the (black) Labrador/ it} is {homozygous/BB}; If there are yellow puppies in the litter then {the (black) Labrador/ it} is {heterozygous/Bb};	3
		(ii)	1 mark for each correct Punnett square;;	2

Gametes	B	B
b	B b	Bb
b	B b	Bb

Gametes	B	b
b	Bb	b b
b	Bb	b b

Alternative marking option

(b)		(i)	Cross/mate/breed} the black Labrador with another Black Labrador which is known to be {heterozygous/Bb}; If all the puppies are black then the black Labrador is {homozygous/BB}; If there are some yellow puppies in the litter then the black Labrador is {heterozygous/Bb};	3

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Question	Marking details	Marks Available
(ii)	1 mark for each correct Punnett square;	2

Gametes	B	B
B	BB	BB
b	Bb	Bb

Gametes	B	b
B	BB	BB
b	Bb	bb

If bi not completed then first marking option must be used for marking punnett squares

[6]

Question 5 Total

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Question			Marking details	Marks Available
6	*(a)*	(i)	Continuous;	1
		(ii)	{heights/lengths/shells/they} are bigger; NOT population bigger	1
		(iii)	4mm **and** 17mm (units required);	1
		(iv)	(29-17) = 12mm (units required);	1
	(b)	(i)	Any three from: food; temperature NOT climate/weather/heat (can be neutral); pH; NOT PH/Ph oxygen; parasites; disease; predation; pollution; NOT space/size of {pond/habitat} (not neutral)	Max 3
			Question 6 Total	**[7]**

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Question			Marking details	Marks Available
7	*(a)*		They are genetically identical/same {genotypes/DNA/genes};	1
	(b)	(i)	{Genetic composition/DNA/genes} of {gametes/sex cells} is {not identical/varies}; They inherit different {genes/DNA/chromosomes} from {both parents/at fertilisation};	2
		(ii)	Evolution/ natural selection/adaptation to environment/survival value/survival of the fittest/ref to disease resistance;	1
			Question 7 Total	**[4]**

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Question			Marking details	Marks Available
8	*(a)*	(i)	1967;	1
		(ii)	0.27/ 0.3 / 0.266 / 0.267/ 0.26^{r}/; NOT 0.2/ 0.26	1
	(b)	(i)	E;	1
		(ii)	G/A/C;	1
			Question 8 Total	**[4]**

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Question	Marking details	Marks Available
9	Collect the blood from the {gut/digestive system/stomach} of leeches/collect the ingested blood; Compare {genetic/DNA} profiles with the {known/stored} {genetic/DNA} profiles; {A correct match/if they are the same} shows the endangered species exist; 3rd point is linked to 2nd point	3
	Question 9 Total	**[3]**

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Question		Marking details	Marks Available
10	*(a)*	(Radiation) causes mutation/ {damages/changes} the{genes/DNA/ chromosomes}; NOT mutation of cells or organs	1
	(b)	Any three from: insecticides bioaccumulate/increases in concentration through a food chain; NOT passed along food chain can destroy {useful/other/all} insects is not selective; can affect fertility of animals at top of food chains; insects can develop{resistance/ immunity} to insectides;	max 3
	(c)	Any two from: size of population on mainland is larger than island population/ ORA; more insect predators on mainland than on island/ORA; fertile males (from mainland) cannot get to island; fewer sterile flies are needed (because the island is small);	max 2
		Question 10 Total	**[6]**

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Question	Marking details	Marks Available
11	**Indicative content** Soya has increased rate of photosynthesis because of inserted bacterial gene. Therefore increased growth. Yield is increased. Soya withstands/ resistant to herbicide because of inserted bacterial gene. Weeds are killed. Reduces competition for resources (minerals/light/space/water/CO_2). **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit	
	Question 11 Total	**[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4461/01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

P.M. MONDAY, 10 June 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**10**	
3.	**3**	
4.	**4**	
5.	**6**	
6.	**9**	
7.	**6**	
8.	**6**	
9.	**6**	
10.	**6**	
Total	**60**	

4461
010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **10**.

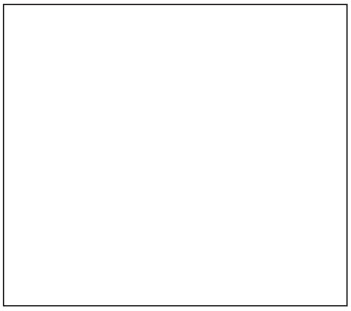
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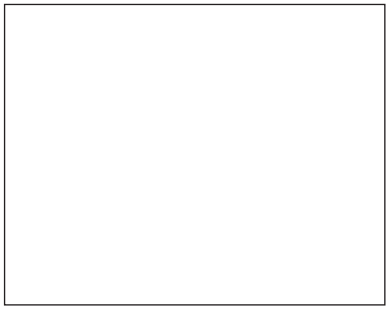
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Answer **all** *questions.*

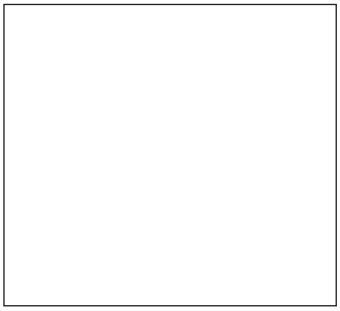
1. The photographs below show three forms of lichen.



crustose

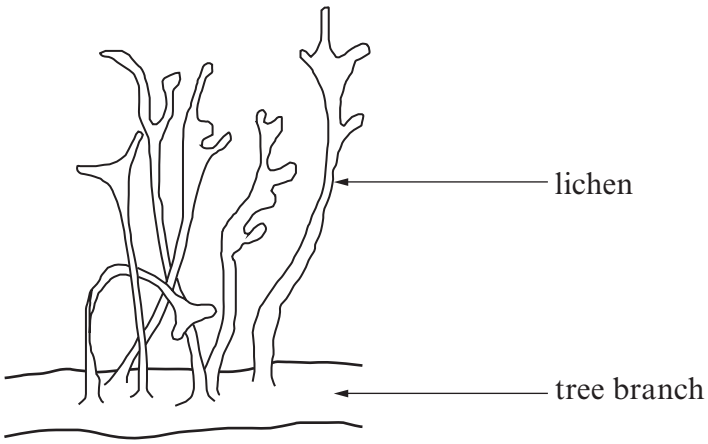


foliose



fruticose

A drawing of one form is shown below.



(a) Use the photographs above to identify the form of lichen shown in the drawing. **Circle** the correct answer. [1]

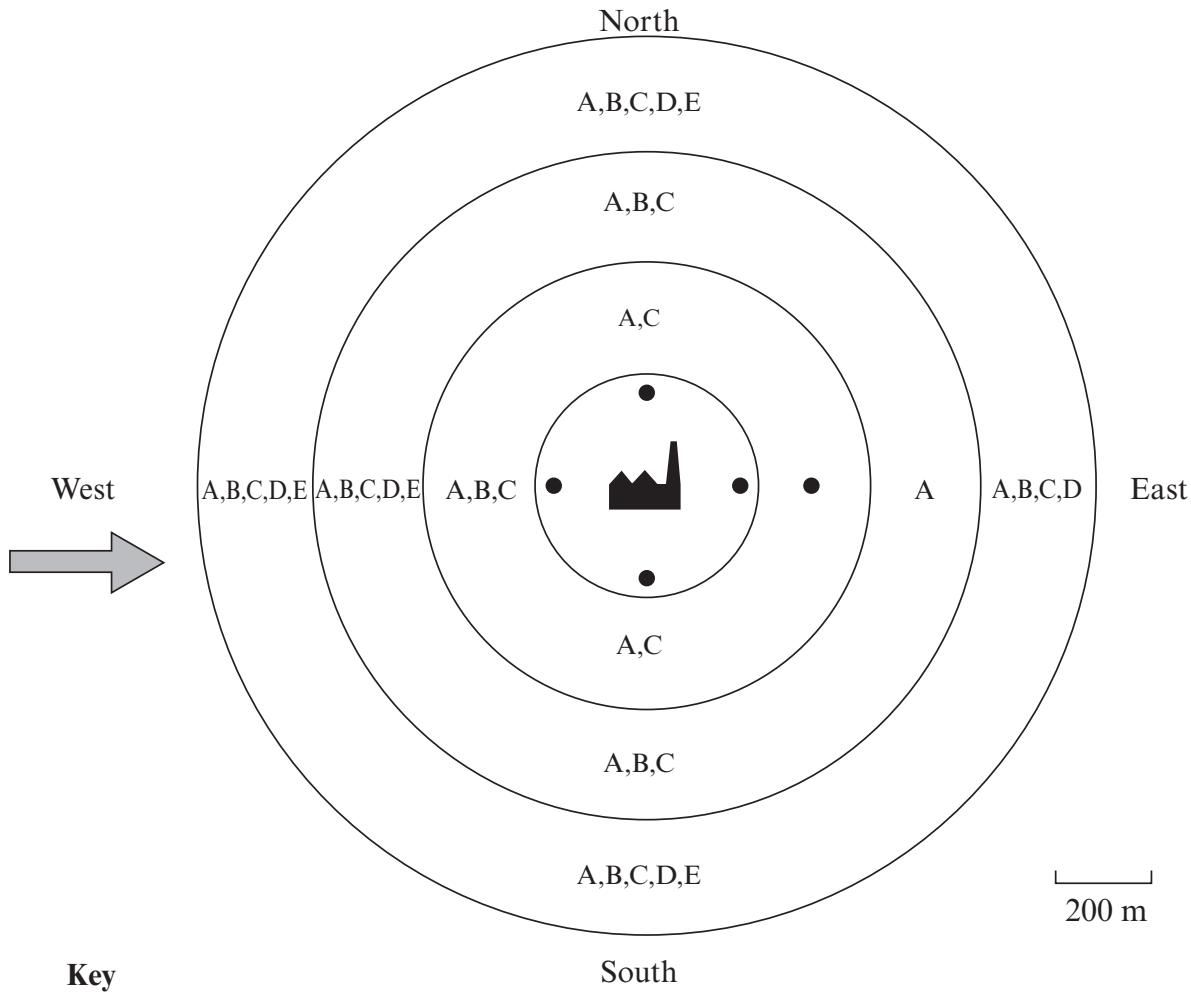
crustose foliose fruticose

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(b) Gareth surveyed the positions of five lichen species (A to E) in woods surrounding a coal-burning factory. He plotted the results on the chart below.



Key

A, B, C, D, E	indicate which lichens are present
	factory
•	no lichens
	usual direction of wind

Use information from the chart above to answer the following:

(i) Complete the following sentence by underlining the correct answer. [1]

The usual wind direction is from the North / South / East / West.

(ii) Give the letter of the lichen (A to E) **most** sensitive to air pollution. [1]

.....

(iii) Give the letter of the lichen (A to E) **least** sensitive to air pollution. [1]

.....

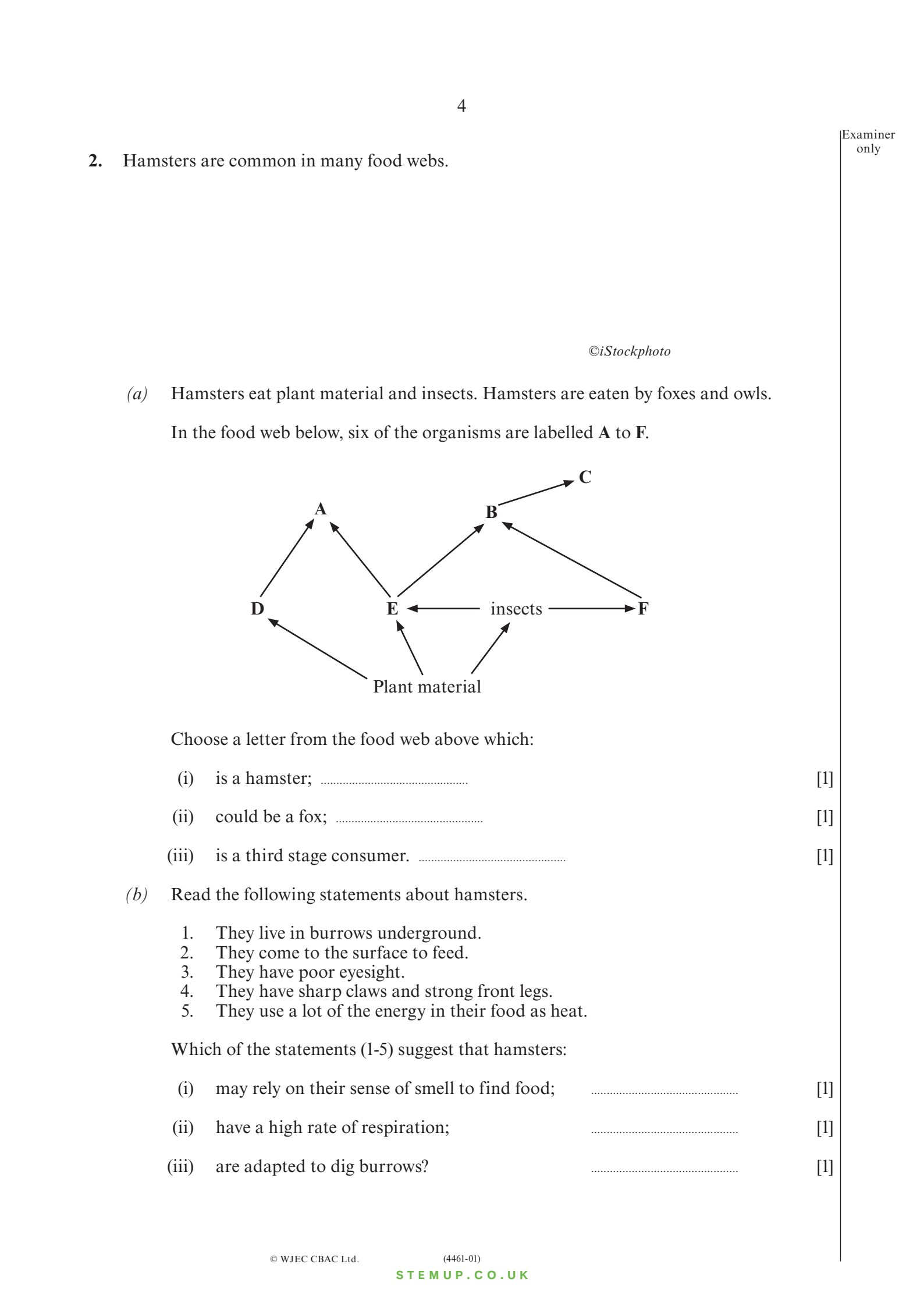
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2. Hamsters are common in many food webs.



©*iStockphoto*

(a) Hamsters eat plant material and insects. Hamsters are eaten by foxes and owls.

In the food web below, six of the organisms are labelled **A** to **F**.

Choose a letter from the food web above which:

(i) is a hamster; ..... [1]

(ii) could be a fox; ..... [1]

(iii) is a third stage consumer. ..... [1]

(b) Read the following statements about hamsters.

1. They live in burrows underground.
2. They come to the surface to feed.
3. They have poor eyesight.
4. They have sharp claws and strong front legs.
5. They use a lot of the energy in their food as heat.

Which of the statements (1-5) suggest that hamsters:

(i) may rely on their sense of smell to find food; ..... [1]

(ii) have a high rate of respiration; ..... [1]

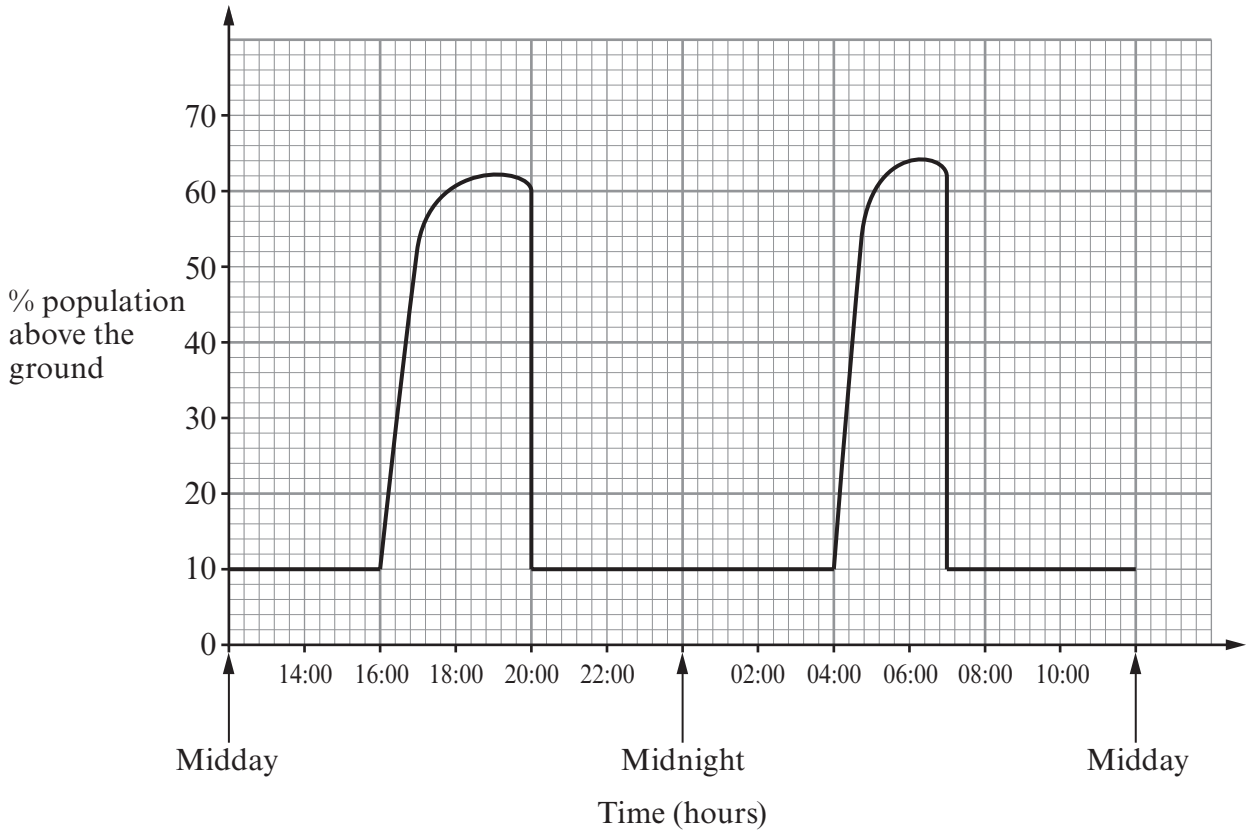
(iii) are adapted to dig burrows? ..... [1]

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Scientists investigated the proportion of a population of hamsters that were above ground during a period of 24 hours.
The results are shown in the graph below.



(c) Use the graph above to answer the following questions

(i) Between which times during the 24 hour period were more than 10% of the population above ground?

I Between ..... hours and ..... hours [1]

II Between ..... hours and ..... hours [1]

(ii) Foxes and owls are active mostly at night.
What is the evidence that hamsters try to avoid being caught by foxes and owls?
[2]

.....

.....

.....

.....

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3. *(a)* A human body cell has 46 chromosomes.
How many chromosomes are present in:

(i) a sperm cell; .....

(ii) a fertilised egg cell? ..... [2]

(b) Gavin and Tracy are expecting their second baby. Their first baby is female.
What is the chance that their second baby will also be female?
Circle the correct answer.

0% 25% 50% 100% [1]

3

4. In May 2008, the Environment Agency reported that tonnes of untreated sewage had spilled into the river Ely in Wales, causing the death of hundreds of fish.

Complete the following sentences to explain why the fish died.

(a) The nutrients in sewage caused the rapid growth of photosynthetic organisms such as

..... . [1]

(b) When the photosynthetic organisms died they were decayed by micro-organisms such as

..... and ..... . [2]

(c) The micro-organisms used up the dissolved ..... so the fish could not breathe and died from suffocation. [1]

4

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5. *(a)* Read the following information about alcohol.

Alcohol slows down our reactions. Regular drinking over the recommended daily limit causes diseases of the circulatory system and liver. Pregnant women are advised not to drink any alcohol.

(i) State the organ named above that is damaged by alcohol. [1]

.....

(ii) State the organ that controls the speed of reactions. [1]

.....

(iii) Suggest why pregnant women are advised not to drink any alcohol. [1]

.....

(b) The alcohol content of drinks may be shown as units of alcohol. The table below gives the units of alcohol in some drinks.

drink	quantity	volume (cm^3)	units of alcohol
cider	can	330	1.3
lager	can	330	2.0
vodka	small measure	25	1.0
wine	large glass	175	2.5
alcopop	bottle	275	1.4

Jane goes to a party. She drinks a can of lager and a large glass of wine.

(i) Calculate the total units of alcohol Jane consumes at the party. [1]

..... units

(ii) The government recommends that females should **not** regularly exceed 3 units of alcohol in one day.
By how much does Jane exceed the recommended limit of 3 units? [1]

..... units

(c) The government wants to reduce the number of patients with alcohol related disease. Why was a plan for a minimum price for alcohol suggested in 2012? [1]

.....

.....

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6. The photograph below shows crops being sprayed with herbicides.



© Buquet Christophe

(a) Explain how herbicides increase crop yield. [2]

.....

.....

.....

.....

(b) Plants can be genetically modified (GM) to make them resistant to herbicides.

(i) The statements below show how this genetic modification takes place, but they are not in the correct order.

1 insert the gene into the seeds of the crop plant

2 grow many different types of plants

3 find and cut out the gene for resistance from the surviving plants

4 spray the plants with herbicide

5 collect the surviving plants

6 trial for many years to test the safety of the method

Complete the sequence below to show the statements (1-6) in the correct order. One has been done for you.

..... → ..... → 5 → ..... → ..... → ..... [4]

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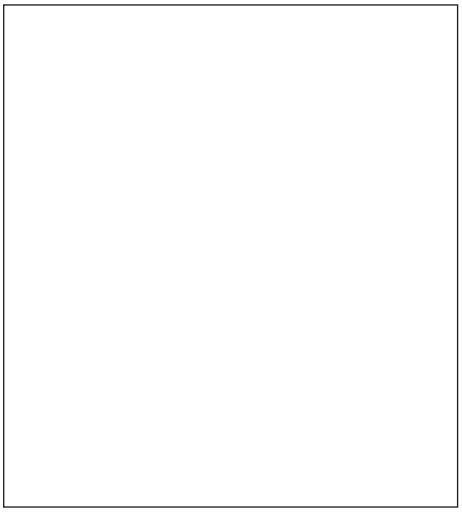
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The table below gives some arguments for and against growing GM plants which are resistant to herbicide.

(ii) Place a tick (✓) next to each argument for **or** a cross (×) next to each argument against growing GM crop plants. Two have been done for you. [1]

argument	✓ or ×
increased crop yield	✓
less herbicide used	✓
reduced biodiversity	
cheaper food	
long term effects unknown	



Soya bean plant

(iii) GM herbicide resistant soya has been grown in Argentina for many years. Seeds from the GM soya have spread widely and the plant is now a serious pest growing in fields of crops such as maize. Farmers now have to use increased concentrations of herbicide to try to kill the pest soya.

From the information above, suggest reasons why the price of maize is likely to rise. [2]

.....

.....

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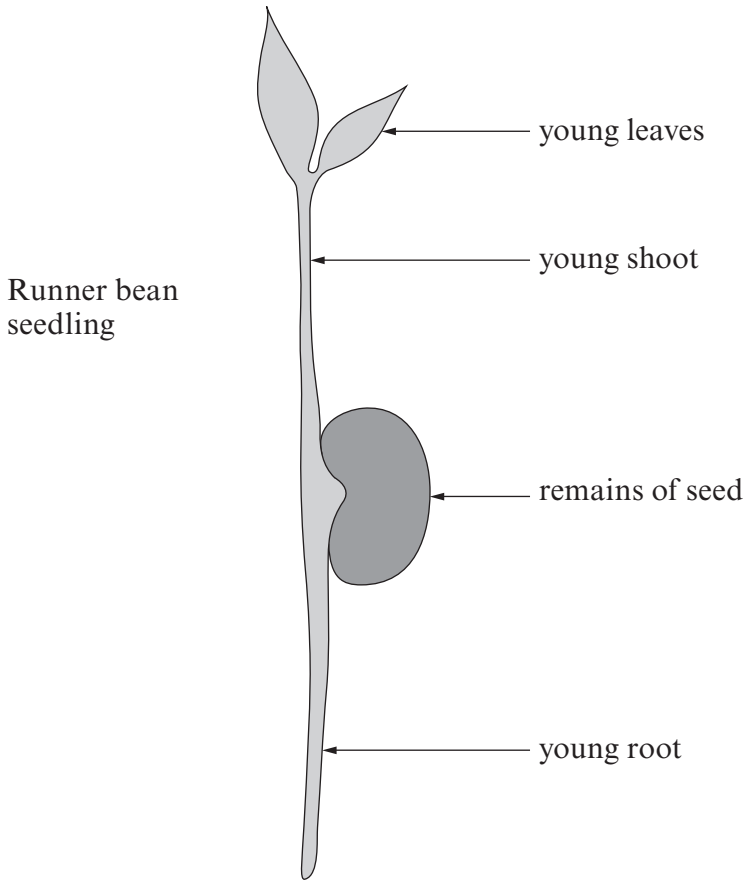
7. *(a)* What is a *tropism*? [2]

.....

.....

.....

(b) A number of runner bean seedlings were grown in soil in a laboratory. After 5 days the seedlings were removed from the soil and their young roots were washed. The straightest of the seedlings was then selected.

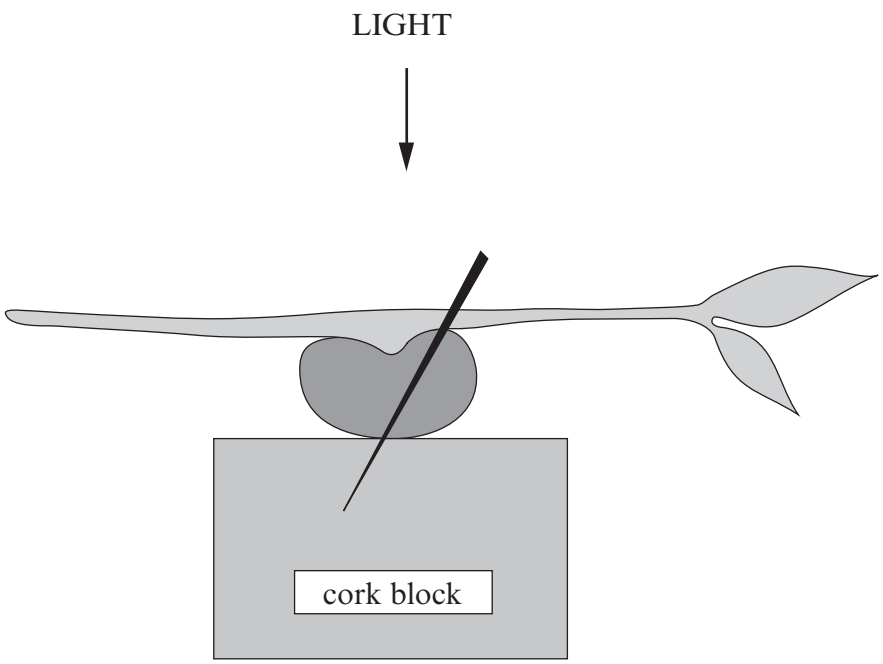


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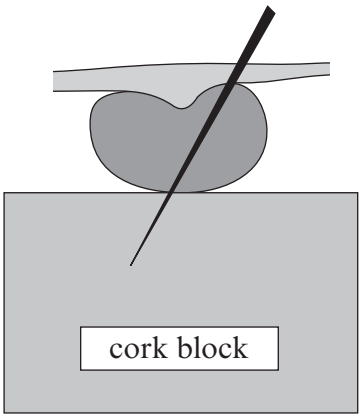
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The runner bean seedling was positioned horizontally and pinned to a cork block as shown below.



(i) After 3 days the seedling was examined.
Complete the diagram below by sketching the expected appearance of the young root **and** shoot. [2]



(ii) Name the response shown by

I the root, ... [1]

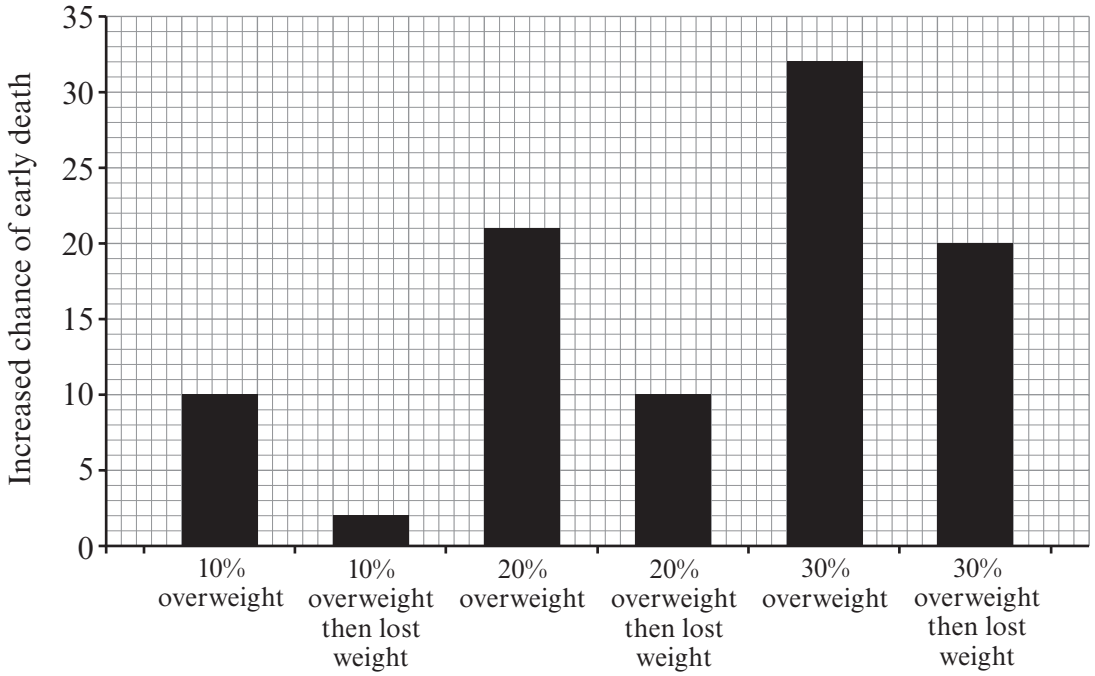
II the shoot. ..... [1]

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8. The chart below shows the relationship between being overweight and increased chance of an early death in the human population in the UK.



(a) From the evidence in the chart state **two** relationships between being overweight and an increased chance of early death. [2]

(i) .....

(ii) .....

(b) The recommended daily energy intake for a man is 10 500 kJ.
The table below shows the energy content of some foods.

food	energy (kJ)
milk 100 g	272
1 egg	15
1 bacon rasher	200
soup 100 g	300
bread & butter 1 slice	520
marmalade 100 g	500
chocolate 100 g	3300

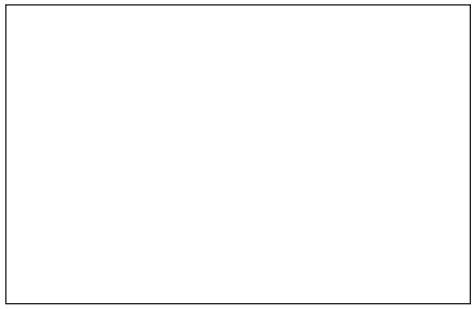
food	energy (kJ)
fried fish 100 g	550
chips 100 g	1065
apple pie 100 g	1200
custard 100 g	500
cheese 100 g	1682
biscuits 100 g	500
sugar /teaspoon	170

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John is a 42 year old man who is severely obese. His typical lunch is shown in the table below:



©iStockphoto

John's lunch	energy content (kJ)
large portion of chips 300 g	3195
4 slices of bread and butter	.....
large fried fish 250 g	1375
2 cups of black coffee with 4 teaspoons of sugar per cup	1360
portion of apple pie 200 g	.....
portion of custard 50 g	.....
Total energy content of John's lunch	.....

(i) Complete the table above by using the table opposite to calculate the energy content of the foods John has eaten and the total energy content of his lunch. Some of the table has been completed for you. [2]

(ii) John has exceeded his recommended daily energy intake in this single meal alone. Calculate how many kJ he has eaten in excess of his recommended daily energy intake. [1]

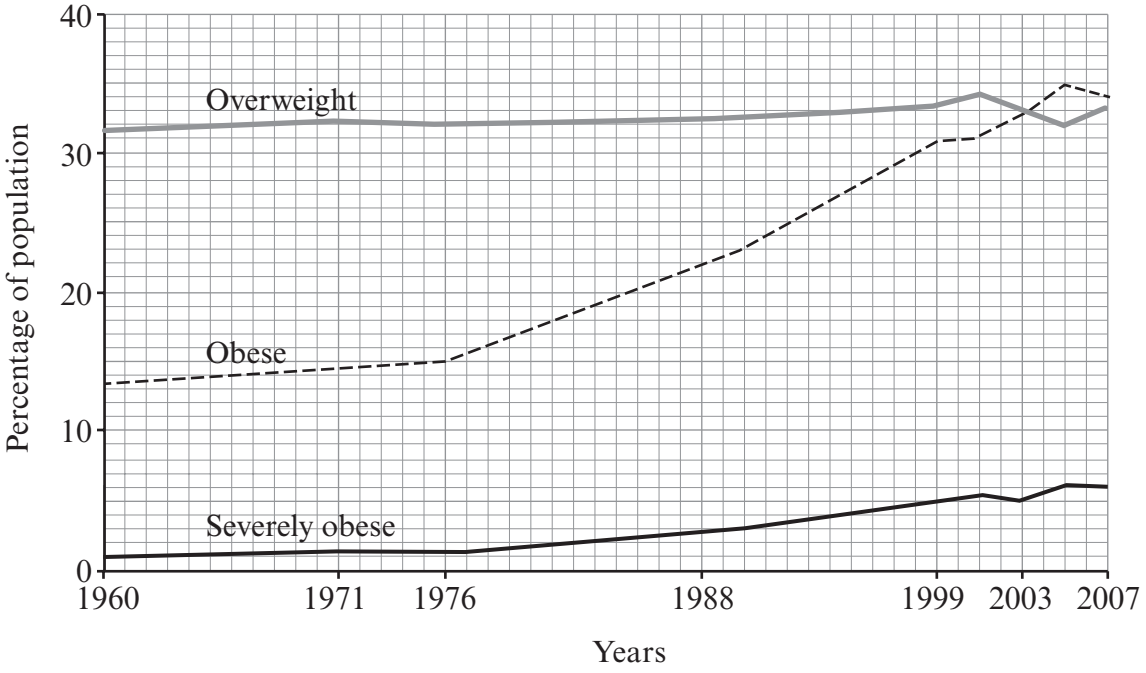
..... kJ

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(iii) John's eating habits are typical of many adults living in developed countries. The graph below shows the trends in being overweight, obese and severely obese among adults aged 20 - 74 in the USA between 1960 and 2007.



Use the graph above to **calculate** the increase in the percentage of obese adults in the USA between 1976 and 2007. [1]

..... %

6

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9. The diagrams below show the skin under two different environmental conditions.

Diagram **P**

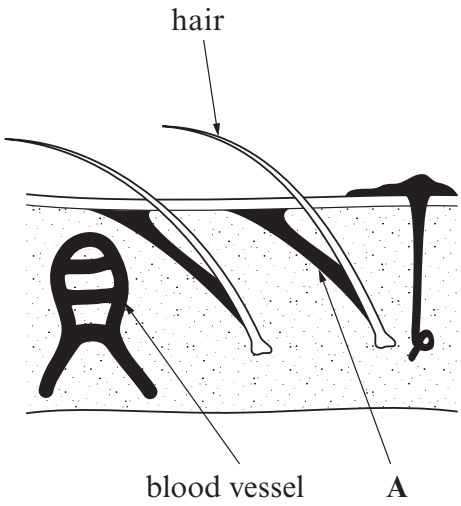
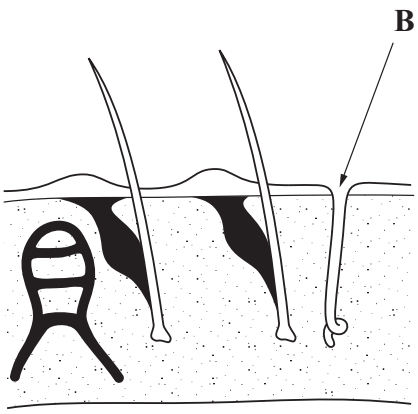


Diagram **Q**



(a) Name the parts **A** and **B** labelled on the diagrams. [2]

A .....

B .....

(b) Diagram **P** shows how the skin responds to cool the body down.
Identify **two** of these responses and explain how each cools the body.

(i) Response ..... [1]

Explanation of cooling effect. ..... [1]

.....

(ii) Response ..... [1]

Explanation of cooling effect. ..... [1]

.....

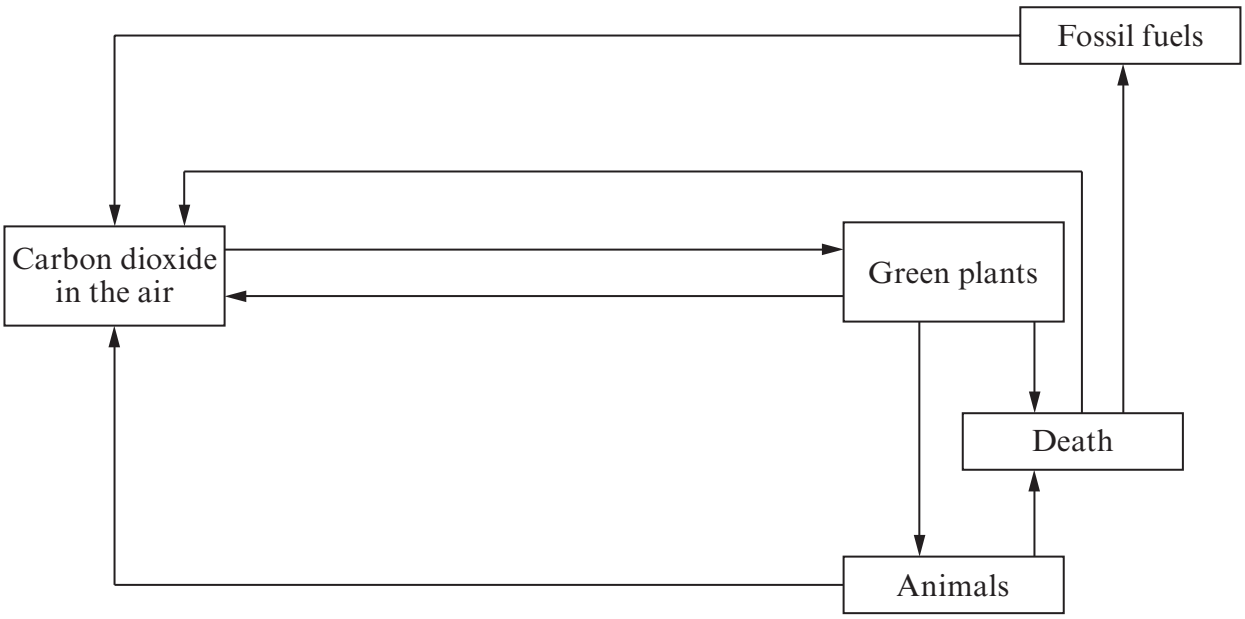
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Turn over.

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10. The diagram shows the basic outline of the carbon cycle.



Use the diagram above **and your own knowledge** to explain **in detail** how carbon is cycled in nature. Start your account with carbon dioxide being taken up by green plants. [6 QWC]

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END OF PAPER

6

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GCSE MARKING SCHEME

BIOLOGY

SUMMER 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in GCSE BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Science - Biology

B1

Question			Marking details	Marks Available
1	*(a)*		fruticose;	1
	(b)	(i)	west;	1
		(ii)	E;	1
		(iii)	A;	1
			Question 1 total	**[4]**

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Question			Marking details	Marks Available
2	*(a)*	(i)	E;	1
		(ii)	A or B;	1
		(iii)	A, B or C;	1
	(b)	(i)	3;	1
		(ii)	5;	1
		(iii)	4;	1
	(c)	(i)	I 16.00-20.00; Accept 16-20	1
			II 04.00-07.00; Accept 4-7	1
			(either order)	
		(ii)	Most/ more of the hamsters; Accept 90%	2
			Reject All	
			Are {below ground/ below surface/ in their burrows/ do not come out} at {night/ when it is dark};	
			reverse argument	
			Less hamsters; Accept only 10%	
			Are {above ground/ active} when it is {dark//at night};	
			Reject All	
			Question 2 total	**[10]**

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Question			Marking details	Marks Available
3	*(a)*	(i)	23;	2
		(ii)	46;	
	(b)		50%;	1
			Question 3 Total	**[3]**

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Question		Marking details	Marks Available
4	*(a)*	algae/ (water) plants/ moss/ named plants; accept weeds/ algal bloom	1
	(b)	bacteria; fungi; Reject germs/ microbes	2
	(c)	oxygen; accept correct symbols	1
		Question 4 Total	**[4]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	liver;	1
		(ii)	brain;	1
		(iii)	harm/ hurt/ damage/ reduce growth of } {baby/ child/ foetus/ embryo};	1
	(b)	(i)	4.5;	2
		(ii)	1.5 (ecf);	
	(c)		Deter people from drinking/ cut down consumption of alcohol/ less people spending money on alcohol/ people buy less alcohol; Reject stop people drinking/ buying alcohol;	1
			Question 5 Total	**[6]**

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Question			Marking details	Marks Available
6	*(a)*		Kills the weeds/ plants (reject animals/ pests); Reject stop weeds growing that compete (with the crop)/ {more room/ nutrients/ light} for crop;;	2
	(b)	(i)	2 4 (5) 3 1 6 ;;;; 5 correct = 4 4 correct = 3 3 correct = 2 2 correct = 1 1 correct = 0	4
		(ii)	<table><tr><th>Argument</th><th>✓ or ×</th></tr><tr><td>Increased crop yield</td><td>given</td></tr><tr><td>Less herbicide used</td><td>given</td></tr><tr><td>Reduced biodiversity</td><td>×</td></tr><tr><td>Cheaper food</td><td>✓</td></tr><tr><td>Long term effects unknown</td><td>×</td></tr></table> All 3 correct for 1 mark;	1
		(iii)	Any two from, <u>Cost</u> of <u>extra</u> herbicide/ farmers have to <u>buy</u> <u>extra</u> herbicide; Competition from (resistant)soya/ description of competition; Herbicide kills maize;	2
			Question 6 Total	**[9]**

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Question			Marking details	Marks Available
7/1	*(a)*		growth (response) shown by plants;	1
			to a {one sided/unilateral} stimulus;	1
			Accept example of growth of plant towards {light source/ pull of gravity/ source of gravity} / sun;	1
	(b)	(i)	shoot drawn growing up from the horizontal;	2
			root shown growing down from the horizontal;	
			Must show at least slight curvature in the correct direction	
			Shoot should have leaves/ root should have an end	
		(ii)	I positive gravitropism/ geotropism;	2
			Accept negative gravitropism/ geotropism if relates to drawing	
			Reject negative phototropism	
			II positive phototropism;	
			(Accept: negative gravitropism/ geotropism)	
			ANSWERS MUST RELATE TO THEIR DRAWING	
			Question 7 Total	**[6]**

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Question			Marking details	Marks Available
8/2	*(a)*		Any 2 from: the more overweight the greater the chance (of early death); the more overweight a person is initially the greater the chance (of early death) after losing weight; losing weight decreases the chance (of early death); Reject greater chance of death (not qualified by 'early')	2
	(b)	(i)		2

John's lunch	kJ
large portion of chips (300g)	3195
4 slices of bread and butter	2080
large fried fish 250g	1375
2 cups of black coffee with 4 teaspoons of sugar per cup	1360
200g portion of apple pie	2400
50 g portion of custard	250
Total energy content of John's lunch	10,660

Foods = 1 mark;

Total = 1 mark; (ecf)

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Question		Marking details	Marks Available
	(ii)	160 (kJ); Allow ECF from (b)(i) as long as candidate's answer is greater than 10 500	1
	(iii)	19%	1
		Question 8/2 Total	**[6]**

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Question		Marking details		Marks Available
9/3	*(a)*	A	erector muscle;	2
		B	sweat pore;	
	(b)	Any two of the following.		4
		1 mark for response 1 mark for explanation(2x2)		
		Response	hairs flattened; NOT hairs relax/ lie down	
		Explanation	{thin layer of / insulating layer of/ less} air trapped so more heat {can escape/ be lost}; NOT no air trapped	
		Response	sweat (present)/ sweating/ sweat produced;	
		Explanation	heat lost by evaporation/ heat {removed from the body/ used} to evaporate sweat;	
		Response	vasodilation/blood vessels wider; NOT larger/ increase in size/ grow/ expand/ bigger	
		Explanation	more blood near skin surface more heat lost; NOT blood gets nearer to skin surface	
		Question 9/3 Total		

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Question	Marking details	Marks Available
10/4	**Indicative content** Carbon dioxide taken up by plants for photosynthesis. Carbon used in manufacture of carbohydrates/ sugar/ starch/ protein/ fat. Plants eaten by animals. Plants and / or animals respire and return carbon (dioxide) to air. Plants and/ or animals die. Decay/ named organisms release carbon (dioxide) to air. Reference to fossilisation due to lack of decay. Combustion/ burning of fossil fuels releases carbon (dioxide). **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the Indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit	6
	Question 10/4 Total	**[6]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	B- 6 black and 2 white;	
		(ii)	Allow ECF from (a) (i)	
			Gametes correct; Must be B	1
			Must link to answer to a(i)	1
			Cross correct;	

Gametes	B	b
B	BB	Bb
b	Bb	bb

	(b)	(i)	I XY both correct 1 mark	1
			II XX;	
			Gametes correct; (ECF)	
			Cross correct;	1
				1

Gametes	X	Y
X	XX	XY
X	XX	XY

Question 5 Total **[6]**

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Question			Marking details	Marks Available
6	*(a)*	(i)	DNA;	1
		(ii)	Genes/ alleles;	1
	(b)	(i)	E;	1
		(ii)	E and/ or D;	1
		(iii)	A;	1
		(iv)	B and C;	1
			Question 6 total	**[6]**

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Question		Marking details	Marks Available
7	*(a)*	Bacteria/ microorganisms/ microbes/ decomposers use oxygen; NOT (de)nitrifying bacteria for respiration;	2
	(b)	Any 4 from Bacteria/ microorganisms/ microbes/ decomposers; Change {protein/urea} to ammonia (compounds); Increase and then a decrease in ammonia; (decrease is) due to dilution; (Some) ammonia is changed to nitrates;	4
		Question 7 total	**[6]**

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Question		Marking details	Marks Available
8	*(a)*	$\frac{44\ 000}{4\ 600\ 000} \times 100$ (working shown);	2
		Answer = 1% ; correct answer = 2 marks	
	(b)	Any two from	2
		Energy used by organisms for	
		cell {repair/ maintenance};	
		growth;	
		movement;	
		reproduction;	
		Energy transferred to environment (lost)	
		during respiration (as heat);	
		excretion; Accept correctly named waste	
		Question 8 total	**[4]**

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Question			Marking details	Marks Available
9	*(a)*		Negative feedback; NOT homeostasis	1
	(b)	(i)	Insulin;	1
		(ii)	Glucagon; correct spelling	1
	(c)		Liver;	1
	(d)	(i)	Use Benedicts; Boil/ heat at 80ºC or above/ heat strongly; NOT heat unqualified/ warm/ hot **OR** Use clinistix/ urinalysis strips/ uristix/ multistix ; Dip (clinistix) into sample;	2
		(ii)		2

Reagent	Present	Absent
Benedicts	brown/ orange/ reddish brown/ brick red/ brownish red/ green; NOT red unqualified/ yellow	blue/ light blue/ clear blue; NOT dark blue/ purple
Clinistix/ multistix	Dark blue/ purple/ dark purple;	pink/ red;
Uristix	Brown;	Green;

Question 9 total **[8]**

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Question	Marking details	Marks Available
10	**Indicative content** A mutation in one or more genes caused variation in the rat population. One variety became resistant to poison. This was an advantage to the resistant individuals and due to natural selection/ survival of the fittest to breed, allowed the resistant gene to be passed on to the offspring of the surviving rats. Success in Henderson Island will depend on the smaller population (small island) and killing all the rats initially. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the Indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit **Question 10 Total**	**[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4461/01

SCIENCE A
FOUNDATION TIER
BIOLOGY 1

A.M. WEDNESDAY, 9 January 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**4**	
2	**8**	
3	**8**	
4	**4**	
5	**5**	
6	**7**	
7	**6**	
8	**6**	
9	**3**	
10	**3**	
11	**6**	
Total	**60**	

4461 010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **11**.

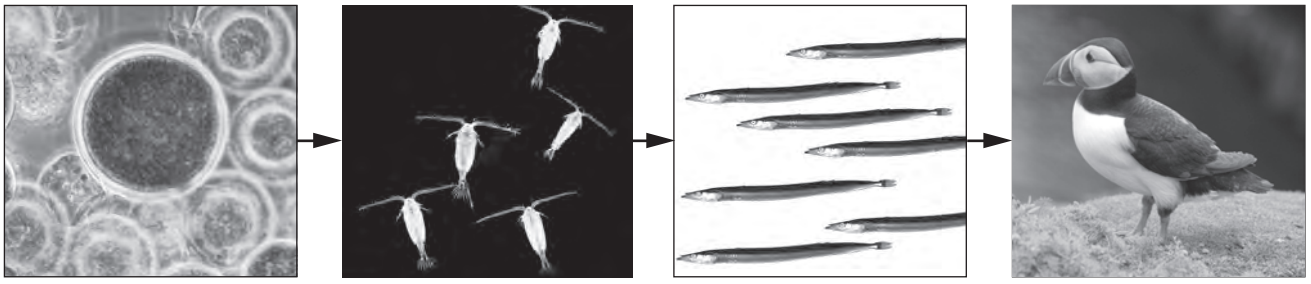
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Answer **all** *questions.*

1. The diagram below shows a food chain from the North Sea.



algae copepods sandeels puffin

From the information in the food chain above:

(a) State the herbivore. ..... [1]

(b) State the second stage consumer. ..... [1]

(c) In recent years, the number of copepods has decreased. There has also been a decrease in the number of puffins.

Suggest an explanation for the decrease in the number of puffins. [2]

.....

.....

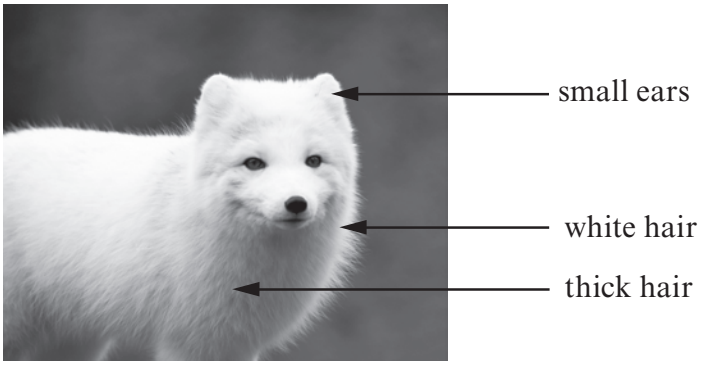
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2. The photograph below shows an arctic fox.



(a) The arctic fox *(Alopex lagopus)* is a mammal belonging to the Phylum Vertebrates.

Use the given information and your own knowledge to complete the classification of this animal. [4]

Kingdom .....

Phylum Vertebrates

Class .....

Order Carnivores

Family Canidae

Genus .....

Species .....

(b) The arctic fox hunts its prey. The fox lives in the Arctic where the land is covered in snow. Explain how each of the labelled adaptations help the arctic fox survive in the cold climate of the Arctic. [3]

white hair .....

.....

thick hair .....

.....

small ears .....

.....

(c) The arctic fox lives in many countries. It is also known as the white fox and polar fox. Why is it important for scientists to use the scientific name of the arctic fox? [1]

.....

.....

4461 010003

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3. The list below describes processes involved in the control of blood glucose but they are in the wrong order.

1. the hormone enters the bloodstream
2. the pancreas detects the rise
3. blood glucose level rises
4. the glycogen is stored
5. the pancreas releases insulin
6. the liver turns excess glucose into glycogen

(a) Write down the numbers of the processes above in the right order to complete the sequence correctly. Two have been done for you. [3]

3 .... 6 .....

(b) State the name of the substance in urine which shows a person may have diabetes. [1]

.....

(c) The table below shows the percentage of people in Wales with diabetes between 2006 and 2010.

Year	Percentage of people in Wales with diabetes (%)
2006	4.1
2007	4.2
2008	4.4
2009	4.6
2010	4.9

(i) Calculate the increase in diabetes between 2006 and 2010. [1]

.....%

(ii) Most of the increase in diabetes is due to a rise in Type 2 diabetes. One doctor working with diabetics in South Wales has called for a tax on chocolate.

How could a person's lifestyle possibly lead to Type 2 diabetes? [3]

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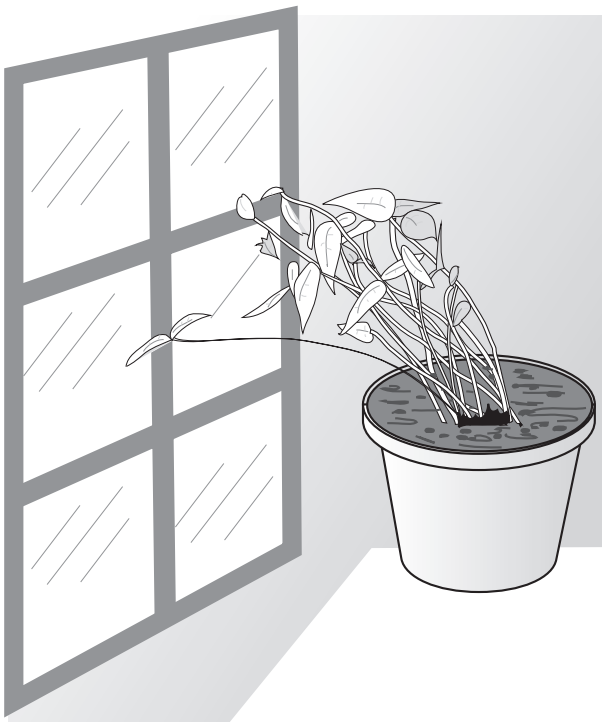
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4. The plant in the diagram below shows positive phototropism.



(a) In a phototropic response, state what is:

(i) the stimulus; ..... [1]

(ii) the response. ..... [1]

(b) **Circle** the correct answer below to complete the following sentence. [1]

The response is due to **gravity** / **a hormone** / **an impulse**.

(c) State the advantage of phototropism to the plant. [1]

.....

.....

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5. Scientists investigated how crop yields (mass of crops produced per m^2) vary when plants are grown at different densities in a field. The results are shown in the table below.

Density (number of plants per m^2)	Crop yield (kg per m^2)
1	20
5	85
10	92
15	90
20	90
25	80

(a) Which density gives the greatest crop yield? ..... plants per m^2 [1]

(b) Complete the table below by calculating the yield per plant. The first four have been done for you. [2]

Density (number of plants per m^2)	Crop yield (kg per m^2)	Yield per plant (kg)
1	20	20.0
5	85	17.0
10	92	9.2
15	90	6.0
20	90	
25	80	

(c) Suggest **two** reasons why the yield per plant decreases as the number of plants per m^2 increases. [2]

1. .....

2. .....

5

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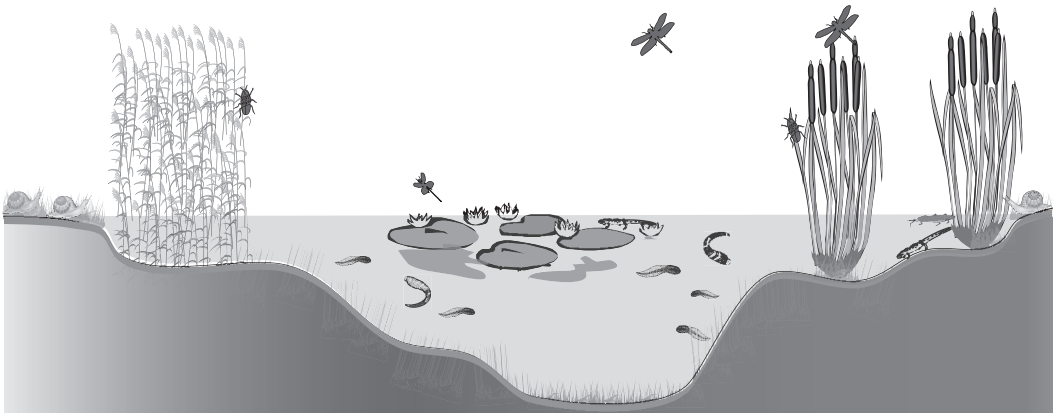
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6. The diagram below shows a section through a pond on a farm in April 2010.



Students carried out an investigation to see if the types of organism in the pond changed over time. They also measured the pH of the pond water.

Their results are shown in the table below.

Observations		April 2010	July 2012
Plants:	algae	✓	✓
	pondweed	✓	✓
	waterlily	✓	✓
	reed	✓	✓
Animals:	snail	✓	×
	leech	✓	✓
	tadpole	✓	×
	newt	✓	×
pH of pond water		7	4

Key:

present	✓
absent	×

(a) One student said the water was too acidic for most of the pond animals in 2012. Explain how information in the table supports the student's idea. [2]

.....

.....

.....

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(b) The list below describes some of the features of the investigation. Suggest **one** improvement for each feature. [3]

(i) The students studied the pond in April 2010 and in July 2012.

Improvement .....

.....

(ii) The students noted their results using a key: ✓ = present × = absent

Improvement .....

.....

(iii) The students noted their results after a ten minute search of the pond.

Improvement .....

.....

(c) In March 2012, nitrates from fertiliser used on the farm spilled into the pond. By July, many animals in the pond had suffocated.

(i) Complete the sentences below to show how the nitrates resulted in the death of the animals. **Circle** the **three** correct answers. [1]

I The numbers of algae in the pond **increased** / **decreased**.

II The number of decay causing microorganisms **increased** / **decreased**.

III Oxygen levels in the water **increased** / **decreased**.

(ii) Name **one** type of microorganism that causes decay. [1]

.....

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7. A grey-bodied fruit fly was mated with a black-bodied fruit fly. All the F1 offspring were grey-bodied.



Grey-bodied fly

×



Black-bodied fly



All the F1 offspring are grey-bodied

(a) Using the letters **A** and **a** to represent the alleles for the two different body colours, complete the Punnett square below to show the offspring produced from the mating between the grey-bodied and black-bodied fruit flies. [2]

	Gametes		
F1			

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(b) (i) Complete the Punnett square below to show the offspring produced when two of the F1 offspring are selfed (bred together). [2]

	Gametes		
F2			

(ii) What is the ratio of the different phenotypes in the F2 offspring? [1]

..... : .....

(c) Name the 19th Century scientist whose work on garden pea plants led to the understanding of the mechanism of inheritance. [1]

.....

6

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8. A scientist investigated the range of heights of a flowering plant species at two different locations; in the middle of a woodland and in a hedgerow. He measured the heights of 20 plants in each location.

Heights of plants from **woodland** (mm)			
125	134	139	126
135	149	144	135
130	137	128	136
136	141	143	133
131	129	133	138

Heights of plants from **hedgerow** (mm)			
115	134	127	117
127	123	131	122
132	126	118	123
121	125	124	128
134	137	129	138

(a) (i) Complete the tally chart below by scoring the height ranges of the **hedgerow** plants. Some have been done for you. [1]

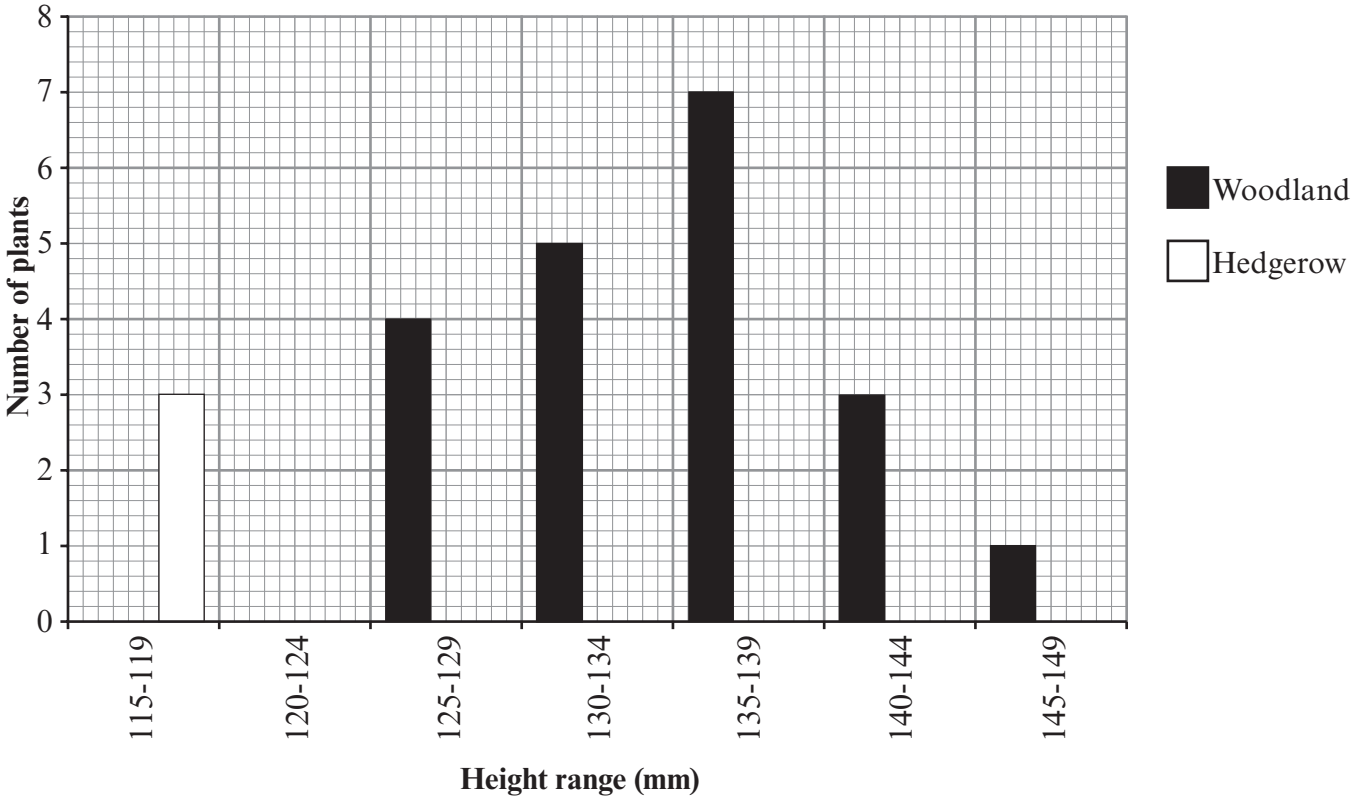
	Tally of plants at each location	
Range (mm)	Woodland	Hedgerow
115-119	0	|||
120-124	0	
125-129	||||	
130-134	𝍸	
135-139	𝍸 ||	
140-144	|||	
145-149	|	

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(ii) The woodland data have been plotted below. Complete the bar chart by plotting the data for hedgerow plants. One bar has been done for you. Use a ruler to carefully draw the bars. [2]



(iii) Using the data and graph only what conclusion can you make about the plants growing in the hedgerow? [1]

.....

(b) Suggest a way in which the scientist could find out whether the difference in height of the flowering plant species found at the two locations is due to environmental or genetic causes. [2]

.....

.....

.....

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9. *(a)* Explain what is meant by the term *genetic profiling.* [1]

.....

.....

(b) State **two** uses of genetic profiling. [2]

(i) .....

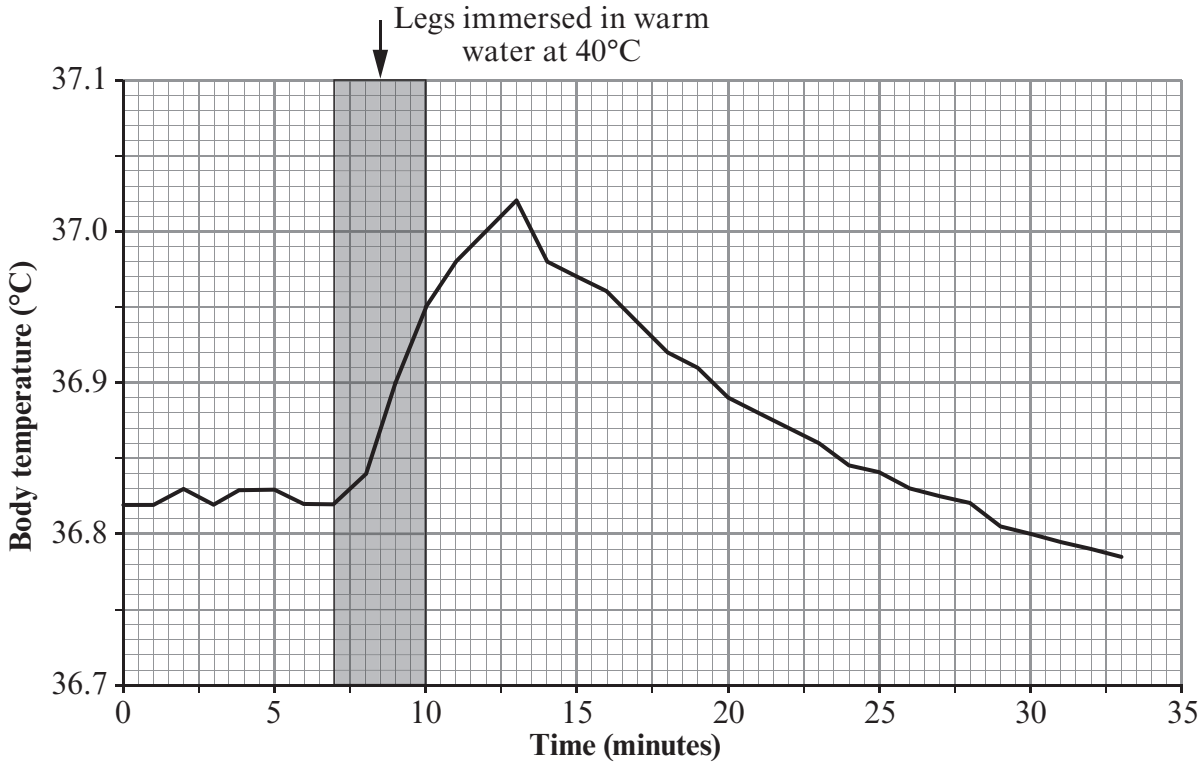
.....

(ii) .....

.....

3

10. A scientist carried out an investigation into the body temperature of a man. The changes in the man's body temperature were measured by a clinical thermometer in his mouth. The graph below shows his body temperature over a 35 minute period. Between 7 and 10 minutes he immersed his legs, from the knees downwards, in a bath of warm water at 40°C. He then stepped out of the bath and dried his legs.



(a) Explain why the body temperature increased even though it was only the legs which were immersed in the warm water. [1]

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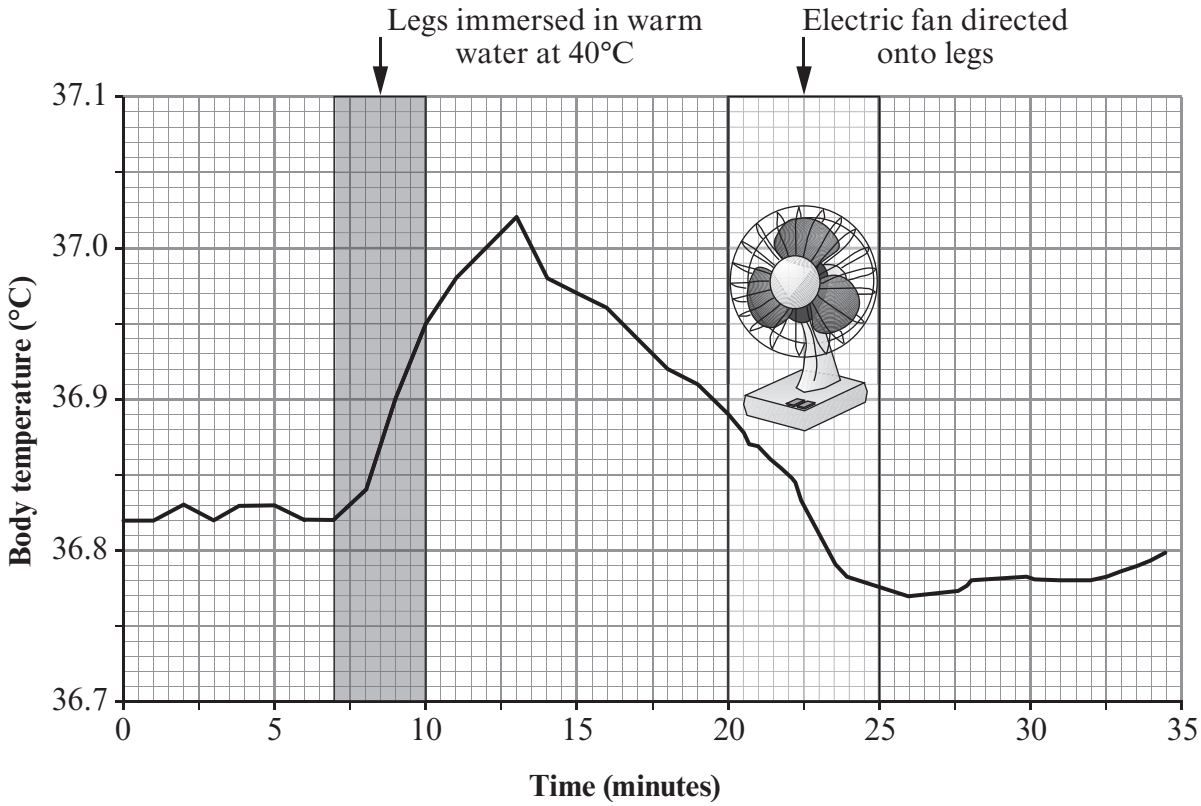
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(b) The experiment was repeated. After 20 minutes an electric fan was directed onto the man's legs. The results are shown in the graph below.



Explain why the body temperature of the man dropped more quickly between 20 and 25 minutes when the fan was used. [2]

.....

.....

.....

.....

3

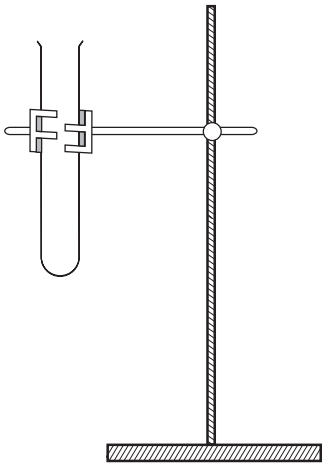
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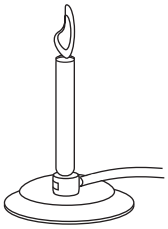
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11. Describe how the apparatus and materials shown below could be used to compare the energy content of two different food samples A and B. [6 QWC]

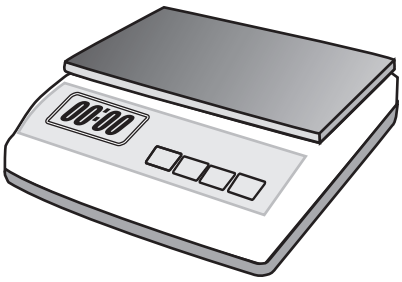
stand and boiling tube



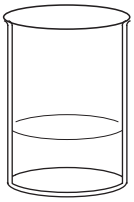
lit Bunsen burner



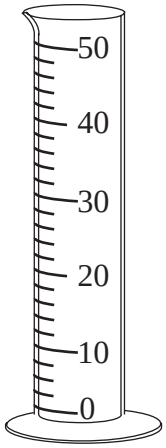
digital balance



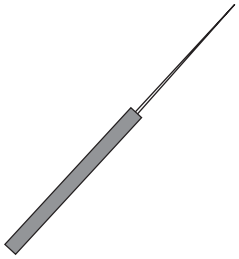
beaker of water



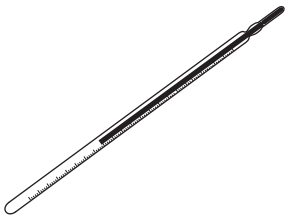
50 cm^3 measuring cylinder



mounted needle with wooden handle



thermometer



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END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY (NEW)

JANUARY 2013

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE SCIENCE - BIOLOGY (NEW). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

Unit	Page
BIOLOGY 1 (NEW) FOUNDATION TIER	1
BIOLOGY 1 (NEW) FOUNDATION & HIGHER TIER	7
BIOLOGY I (NEW) HIGHER TIER	13
BIOLOGY 2 (NEW) FOUNDATION TIER	19
BIOLOGY 2 (NEW) FOUNDATION & HIGHER TIER	25
BIOLOGY 3 (NEW) HIGHER TIER	31

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BIOLOGY 1 (NEW) MARK SCHEME - JANUARY 2013

FOUNDATION TIER

Question		Marking details	Marks Available
Q.1	(a)	copepods;	[1]
	(b)	sandeels;	[1]
	(c)	less food for sandeels/ fewer sandeels/ no food for sandeels;	[2]
		so less food for puffins/puffins starve/ puffin has nothing to feed off;	
		must make link to food and fall in numbers at least once	
		Question Total	**[4]**

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Question		Marking details	Marks Available
Q.2	(a)	Animal; Mammal; Alopex; lagopus;	[4]
	(b)	*White hair:* Idea of camouflage/ blending in/ match environment; NOT hide/ disguise *Thick hair:* Insulation/ traps (warm) layer of air/ keeps heat in/ let out less body heat; NOT keep it warm/ so it doesn't get cold *Small ears:* Idea of reduced surface area/ {reduces/ less} heat loss; NOT stop heat escaping/ no heat loss/ keeps heat in (can be neutral if used with reduced surface area)	[3]
	(c)	Universal/ unique/ unchanging/ they all use the same name/ same in all languages/ international/ common name is different in different languages;	[1]
		Question Total	**[8]**

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Question			Marking details	Marks Available
Q.3	(a)		(3) 2 5 1 (6) 4;;; All 4 correct = 3marks 2/3 correct = 2 marks 1 correct = 1 mark	[3]
	(b)		glucose; NOT sugar	[1]
	(c)	(i)	0.8;	[1]
		(ii)	Reference {eating/ take in / ingest/ consume} too much fat/ too much fat in diet; Reference {eating/ take in / ingest/ consume} too much sugar/ carbohydrates; NOT carbs (Alternative if first two not awarded) eat too much/ too many calories/ energy; NOT too much chocolate Sedentary/ lack of exercise/ not enough sport;	[3]
			Question Total	**[8]**

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Question			Marking details	Marks Available
Q.4	(a)	(i)	Light;	[1]
		(ii)	Growth/ grows towards the light/ positive phototropism; NOT bends/ moves/ leans	[1]
	(b)		hormone	[1]
	(c)		To get more light/ for more photosynthesis;	[1]
			Question Total	**[4]**

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Question		Marking details	Marks Available
Q.5	(a)	10;	[1]
	(b)	4.5; 3.2;	[2]
	(c)	Any two from: Competition for/ shortage of/ less/ running out of: light; water; nutrients/ minerals; space/ room; carbon dioxide;	[2]
		Question Total	**[5]**

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Question			Marking details	Marks Available
Q.6	(a)	(i)	fewer {species/ animals} recorded (2012)/ ref to a correctly named animal (snail/ tadpole/ newt)/ biodiversity reduced/ lots of animals are no longer present; Reference to a {fall in / lowered} pH/ pH has gone from 7 to 4/ {became/ now} acidic; Must have some ref to change NOT more acidic	[2]
	(b)	(i)	annual or several years/same month/more frequent in each year;	[1]
		(ii)	quantitative data/ / count them/ tally/ find out how many;	[1]
		(iii)	longer observation period/ observe several times in the day;	[1]
	(c)	(i)	increased increased decreased; all **three** required for one mark	[1]
		(ii)	Bacteria/ fungi/ mould; NOT decomposers/ microbes/ algae	[1]
			Question Total	**[7]**

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Question		Marking details	Marks Available

Q.7/1 (a)

Gametes	A	A
a	Aa	Aa
a	Aa	Aa

[2]

Award 1 mark for all 4 gametes being correct (Must use **A** and **a**);
Award 1 mark for the mechanics of the cross; Award this mark even if the gametes are incorrect or the wrong letters are used.

(b) (i)

Gametes	A	a
A	AA	Aa
a	Aa	aa

[2]

Award 1 mark for all 4 gametes being correct;
Award 1 mark for the mechanics of the cross; Award this mark even if the gametes are incorrect
ECF- both these marks can be awarded if letters used in (a) are carried forward into (b). Also award the marks if **any** two F1 individuals are selfed.

(ii) 3 grey bodied: 1 black bodied (or correct ratio from given answer); [1]

(c) (Gregor) Mendel; [1]

Question Total **[6]**

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Question			Marking details	Marks Available
Q.8/2	(a)	(i)	5 6 4 2 0 (not required for mark) 0 (not required for mark)	[1]
		(ii)	All bars correct height – according to candidate's tally;;	[2]
		(iii)	They are shorter than the woodland plants;	[1]
	(b)		Collect seeds from the plant growing in each locality and sow (plant) in opposite locality (Accept reference to the transplanting of seedlings)	[1]
			If plant height changes then caused by environment/ if plant height doesn't change then due to genetics;	[1]
			Question Total	**[6]**

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Question		Marking details	Marks Available
Q.9/3	(a)	The analysis of the DNA of an organism/ looking at the {patterns/ bands} in DNA;	[1]
	(b)	Any 2 from : {Identifying/ finding out who is} the {culprit/ suspect} from evidence at a crime scene/ or example; NOT solving crimes/ catching criminals {Paternity/ maternity} testing/ finding out who the {father/ mother} is/ identify relatives; Comparison between species for classification purposes; Identification of genes associated with an {inherited disease/ named inherited disease}/ to find out if parents may have children with cystic fibrotic disease/ determine risk of developing breast cancer; Identification of dead bodies;	[2]
		Question Total	**[3]**

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Question		Marking details	Marks Available
Q.10/4	(a)	Heat being transported around the body via the blood;	[1]
	(b)	Fan increasing the rate of <u>evaporation</u> of sweat; Therefore increased rate of cooling/ more heat removed from the {blood/ body};	[2]
		Question Total	**[3]**

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Question	Marking details	Marks Available
Q.11/5	Indicative content Use the measuring cylinder to measure 20cm^3 of water into the boiling tube. (Accept any reasonable volume of water) Measure the initial temperature of the water with the thermometer and record the temperature (in a suitable results table) Choose a piece of food and find it's mass using the balance. Record the mass (in the results table). Accept measure 1g of the food sample. (Accept any reasonable mass of food sample) Impale/ attach/ stick the piece of food carefully on the mounted needle. Hold the food in the Bunsen burner flame until it catches alight/ Light the food in the Bunsen flame Hold burning food sample under the boiling tube until all the food has burnt. Measure the final temperature of the water with the thermometer and record the temperature (in a suitable results table) Calculate the rise in temperature of the water Repeat with other food sample If an equal mass of the two foods has not been used accept reference to : Energy released from food/g (J) = $\frac{\text{mass of water(g) x temperature rise (°C) x 4.2}}{\text{Mass of food sample(g)}}$	

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5-6 marks
The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar

3-4 marks
The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1-2 marks
The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks
The candidate does not make any attempt or give a relevant answer worthy of credit

Question Total [6]

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Question			Marking details	Marks Available
Q.6	(a)	(i)	Prey;	[1]
		(ii)	Predator;	[1]
		(iii)	Reproduction/ accept immigration;	[1]
	(b)		Extinction/ natural selection;	[1]
	(c)		Camouflage/ blend in/ green beads are less easily seen/ ORA;	[1]
	(d)		Prey is static/ prey is only identified on the basis of colour;	[1]
			Question Total	**[6]**

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Question		Marking details	Marks Available
Q.7	(a)	Blood; Urine;	[2]
	(b)	Any three from Insulin injections/ jabs; {Metformin/ novonorm/ actose/ named correct} tablets/ take tablets for type 2 diabetes/ take tablets to control blood {glucose/ sugar} level; NOT take tablets unqualified Controlled intake of carbohydrate/ fat/ named foods rich in carbohydrate or fat; Pancreatic tissue transplant; Regular exercise;	[3]
	(c)	Not able to produce insulin; Not able to produce glucagon;	[2]
		Question Total	**[7]**

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Question			Marking details	Marks Available
Q.8	(a)	(i)	(Reduced because of) lack of food/ water voles;	[1]
		(ii)	*Any two from*	[3]
			Increase Lack of/ less marbled cats;	
			high rate of reproduction/ more squirrels survive;	
			Less competition from voles and deer;	
			One from	
			Decrease they outgrow food supply/ competition for food/ not enough food for them;	
	(b)		At first, a decrease in insects leads to decrease in shrews;	[3]
			Then an increase due to lack of predators;	
			And an increase in food because insects increase due to food from decaying remains of trees;	
			Question Total	**[7]**

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Question			Marking details	Marks Available
Q.9.	(a)	(i)	The {higher temperature/ increased light} in May causes greater rate of {growth/ root formation};	[1]
		(ii)	Low temperature in January slows down {<u>bacterial growth/ enzyme action</u>};	[1]
	(b)		urease;	[1]
	(c)	(i)	Urea is broken down by the enzyme/ urease; to {ammonia/ ammonium compounds};	[2]
		(ii)	Moist indicator paper pH7; 20cm^{3}urea at 1mol/dm^3; 5cm^3 {boiled/ denatured} (and cooled) 1% {enzyme/ urease}; NOT no enzyme	[3]
		(iii)	Leave for 1 hour/ time; at 20°C/ temperature;	[2]
			Question Total	**[10]**

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Question	Marking details	Marks Available
Q.10	Indicative content Correct reference to data shows that the pesticide has been a selective pressure on a mutated gene for resistance. This results in variation and natural selection/ survival of the fittest TO BREED and the resistant genes are passed on. 5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. 3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. 1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. 0 marks The candidate does not make any attempt or give a relevant answer worthy of credit	
	Question Total	**[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4461/01

SCIENCE A
FOUNDATION TIER
BIOLOGY 1

P.M. WEDNESDAY, 30 May 2012

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**7**	
2	**6**	
3	**8**	
4	**8**	
5	**7**	
6	**6**	
7	**4**	
8	**7**	
9	**7**	
Total	**60**	

4461
010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **8**.

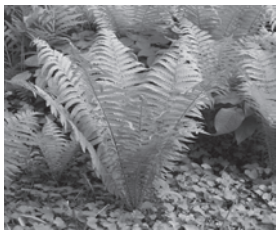
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Answer **all** *questions.*

1. *(a)* Using a ruler draw lines to join each organism to its correct group. [4]

Organism		Group
7 cm	 Earthworm	Flowering plant
45 cm	 Fern	Micro-organism
85 cm	 Fox	Invertebrate animal
10 cm	 Dandelion	Vertebrate animal
0·001 mm	 Algae	Non-flowering plant

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(b) Give **one** difference between vertebrates and invertebrates. [1]

.....

(c) Name **one** type of micro-organism *not* shown on the diagram. [1]

.....

(d) Why do scientists need to give scientific names to organisms rather than using common names? [1]

.....

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Examiner only

2. Read the following information about hens.

- Many farmers keep hens for egg production.
- Large numbers of hens can be kept indoors. Some are kept in battery cages.



Caged hen



Non-caged hen

	Caged hens	Non-caged hens
Eggs produced per year by each hen	310	250
Food provided	less	more
Labour costs	less	more
Broken bones	often	rare
Movement	very restricted	not restricted
Space available per hen	560 cm^2	840 cm^2

From this information:

(a) (i) Over two years, how many more eggs are produced by a **caged hen**? Show your working. [2]

Answer .....

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(ii) Other than producing more eggs, give **one** advantage to a farmer of using cages for hens. [1]

.....

(b) Suggest **one** reason for the difference in broken bones found in caged and non-caged hens. [1]

.....

(c) State **one** way, shown in the photographs, in which the health of **caged hens** is poorer. [1]

.....

(d) From 2012 a new European law will require battery cages to have 750 cm^2 for each hen.

How will this make life better for the hens? [1]

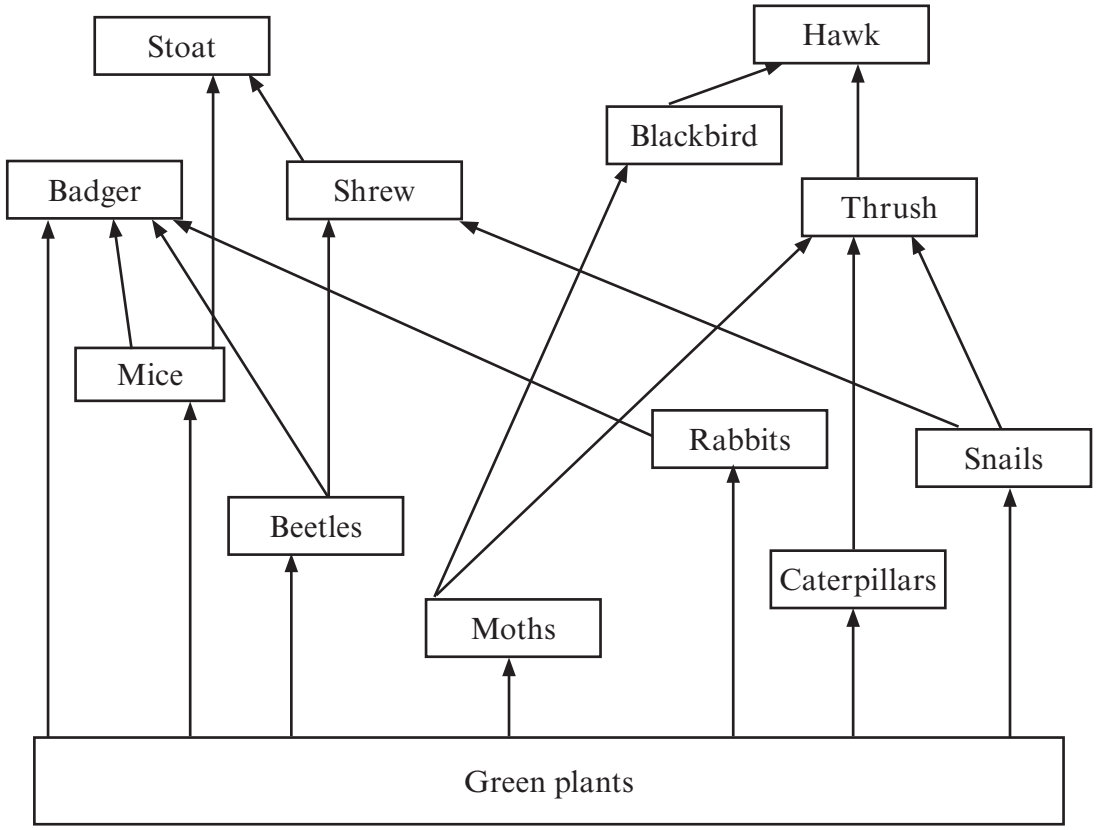
.....

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3. *(a)* Use the information in the food web below to answer the questions.



From the diagram:

(i) Name

I. one third stage consumer; ..... [1]

II. two herbivores; .... [1]

III. the producer. ..... [1]

(ii) Name **one** animal which is *both* a first stage and a second stage consumer. State what it eats. [1]

Animal .....

Food eaten .....

(iii) What is the source of energy for the producer? [1]

.....

(iv) How is the flow of energy shown in the food web? [1]

.....

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(b) The table below shows some trees and the number of herbivore species which feed on them.

Tree type	Number of herbivore species
oak	284
birch	229
ash	42
beech	64

From the table:

(i) What would happen to the number of herbivore species in a park if birch trees were replaced by ash trees? [1]

.....

(ii) Suggest **one** reason why an oak woodland has more carnivore species than a beech woodland. [1]

.....

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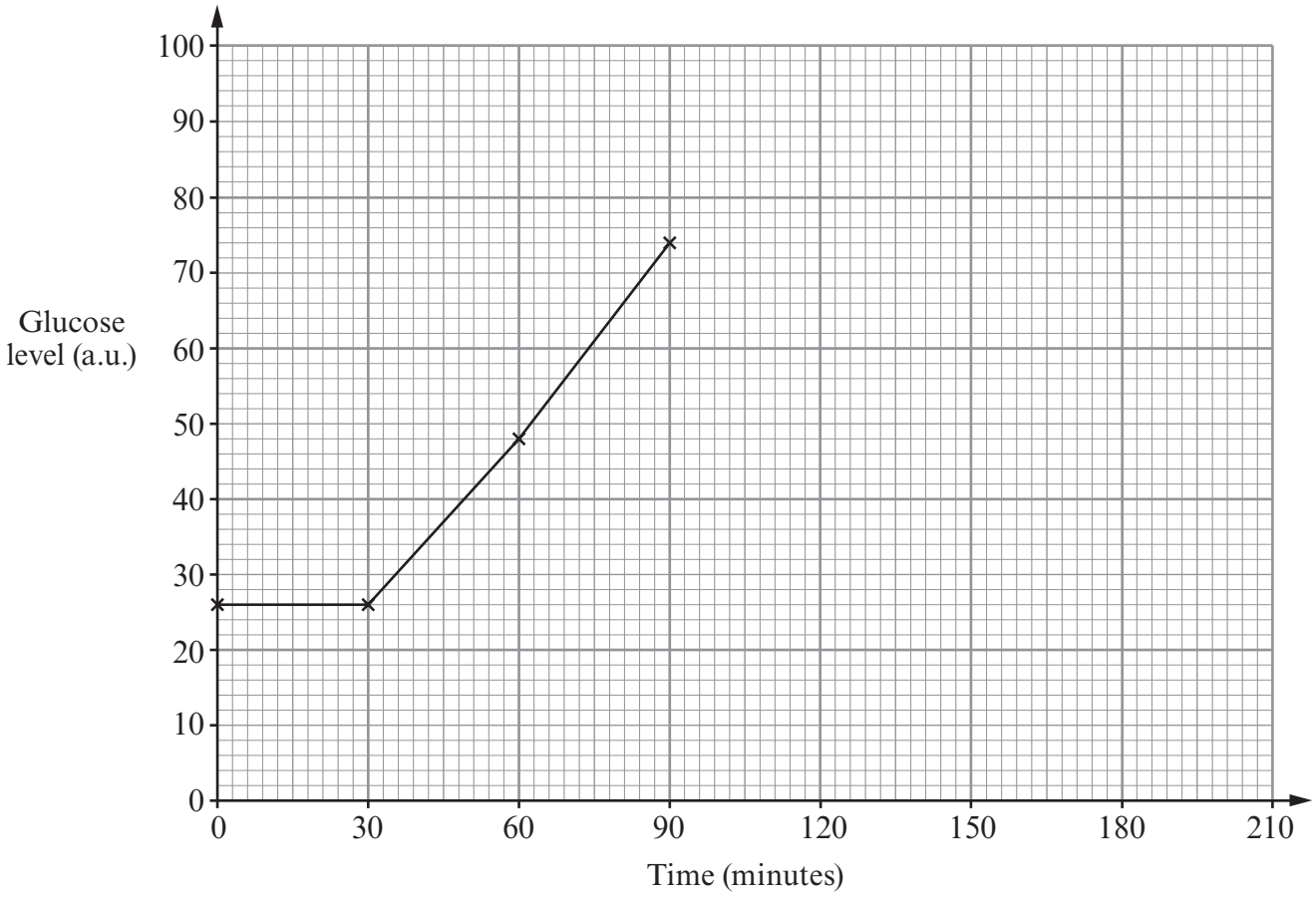
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4. *(a)* The level of glucose in a person's blood was measured every 30 minutes for three and a half hours. During this time the person was given a drink containing glucose. The results are shown below.

Time (minutes)	Glucose level (a.u.)
0	26
30	.....
60	.....
90	74
120	90
150	65
180	43
210	28



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(i) Use the graph opposite to complete the table of results above it. [1]

(ii) Complete the graph by plotting the results from 90 to 210 minutes. Join the plots with a ruler. [3]

(b) From the graph:

(i) At what time did the person take the glucose drink? [1]

.....

(ii) How does the level of glucose change between 60 and 150 minutes? [1]

.....

(c) The level of glucose in the blood is controlled by a hormone.

(i) Name the hormone. [1]

.....

(ii) Some people have a medical condition where they do not produce enough of this hormone. Name the condition. [1]

.....

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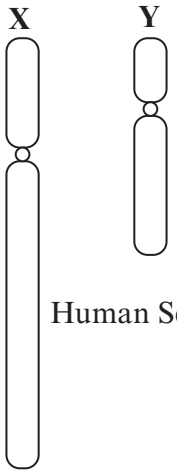
Examiner only

5. *(a)* Complete the sentences using some of the terms below. [4]

pairs proteins inherited DNA genes

Chromosomes in body cells are found in ..... . They are long strands of molecules of ..... . Chromosomes have ..... which determine ..... characteristics.

(b) Each human body cell has 46 chromosomes including a pair of sex chromosomes. There are two types of sex chromosomes **X** and **Y**.



Human Sex Chromosomes

(i) Complete the table below. [1]

Sex	Chromosomes
Female	..... and .....
Male	..... and .....

(ii) How many chromosomes are present in a human sperm cell? [1]

.....

(iii) What name is given to cells such as sperm and egg cells? [1]

.....

7

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6. In cats, the allele for short hair **(D)** is dominant to the allele for long hair **(d)**.

A cat with short hair was mated with a cat with long hair. All the offspring (**F1**) had short hair.





(a) (i) Complete the following to show the genotypes of the parents. [1]

I. The cat with short hair. .....

II. The cat with long hair. .....

(ii) Complete the Punnett square to show the cross between the cat with short hair and the cat with long hair. [2]

	Gametes		
F1			

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(b) (i) Complete the Punnett square to show the offspring produced on selfing (breeding together) two of the **F1** generation. [2]

F2

Gametes		

(ii) Complete the following to show the ratio of the different types of offspring appearing in the **F2** generation. [1]

..... homozygous dominant: ..... heterozygous: ..... recessive

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7. In 1982 the same species of pine tree was planted on both sides of a river valley in Wales. In 2011 the trees were surveyed at points **A**, **B** and **C** and the average heights of the trees were recorded.

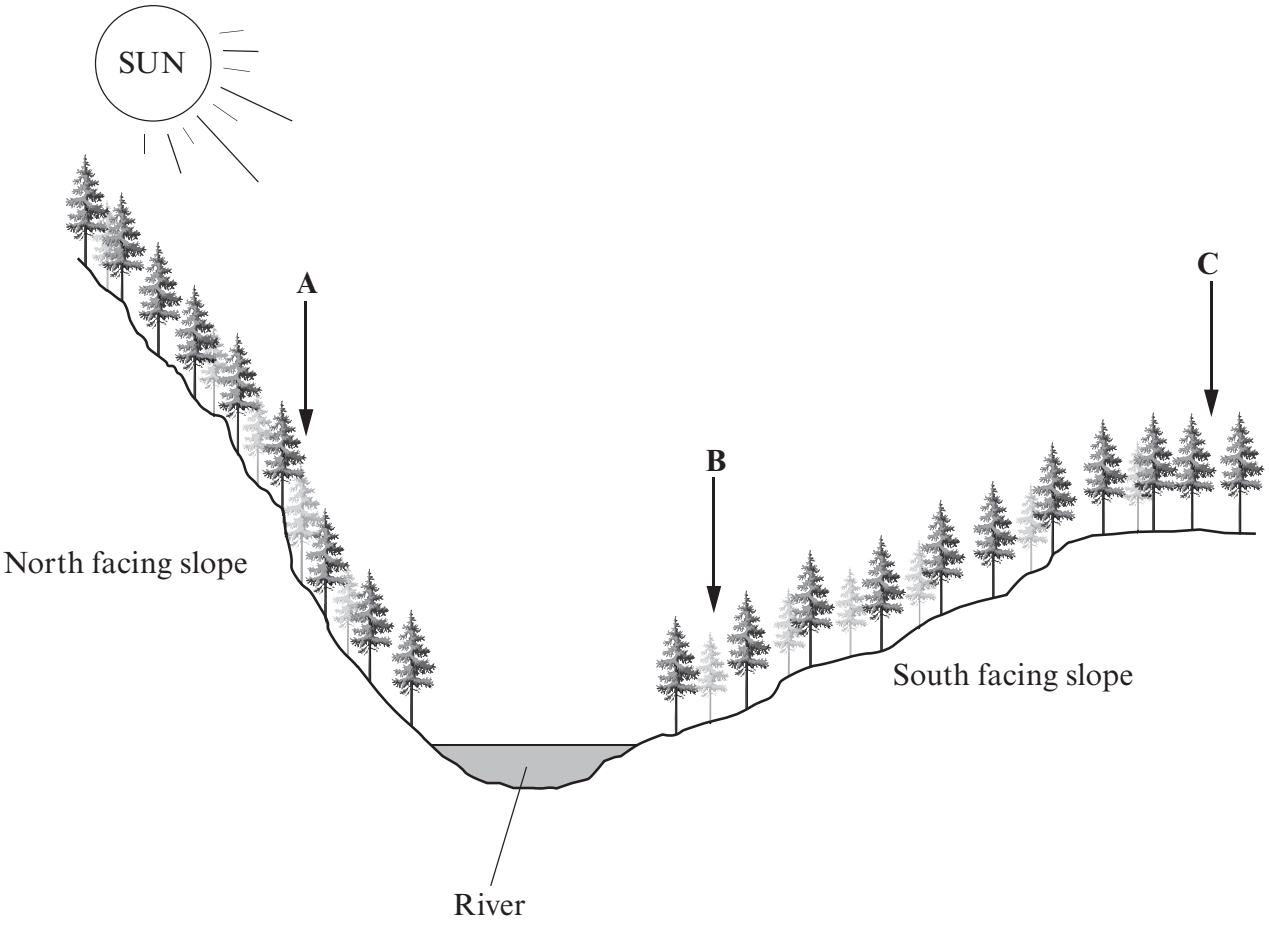


Table showing the average heights of the trees at survey points **A**, **B** and **C**.

Survey point	Average height of trees (m)
A	8.6
B	11.4
C	10.7

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(a) What term is used to describe the differences found between members of the same species? [1]

.....

(b) Suggest **two** environmental reasons for the differences in the average height of the trees growing at survey points **A** and **B**. [2]

(i) .....

.....

(ii) .....

.....

(c) All the trees growing at survey point **C** were growing under exactly the same environmental conditions, but the difference in height between the individual trees was as much as 0.5 m. Suggest a reason for this difference. [1]

.....

4

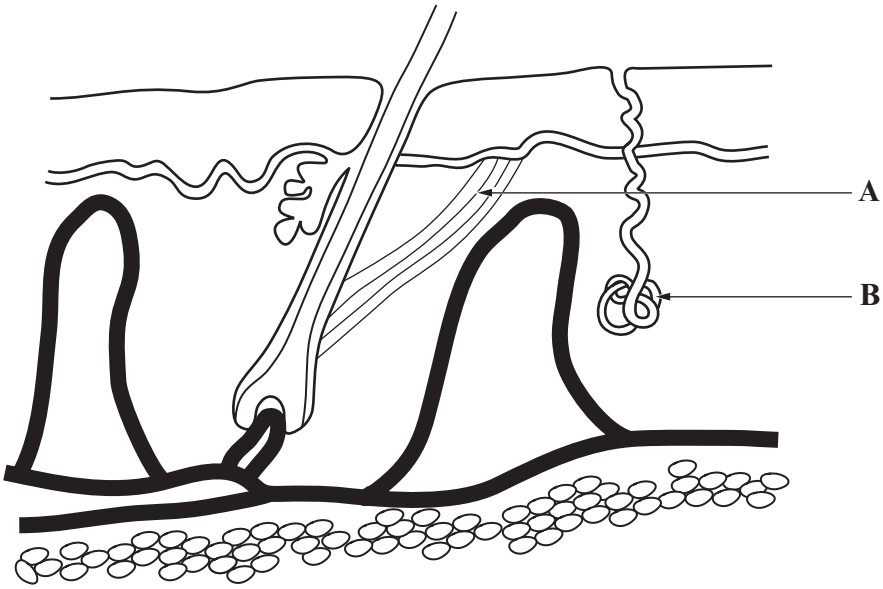
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Turn over.

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8. The diagram shows a section through the skin.



(a) Label part **A** on the diagram. [1]

(b) Explain, in detail, the role part **B** plays in lowering the body temperature in warm conditions.

[6 QWC]

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9. The table below shows the information on the packaging of two different breads, *Multi-Seeded* and *White sliced*.

	Multi-Seeded (100g)	White Sliced (100g)	Guideline Daily Amount (GDA) for an adult
Energy (kJ)	1110	992	8400
Protein (g)	10.5	9.5	45
Total carbohydrates (g)	33.5	15.7	230
Sugars (g)	4.1	4.2	90
Total fat (g)	9.9	1.3	70
Saturated fat (g)	1.5	0.1	20
Salt (g)	0.85	0.4	6

(a) Use the information in the table to calculate the mass of a *White Sliced* loaf which an adult would have to eat to reach their GDA of energy. [2]

Answer .....

(b) Which of the breads would you recommend to:

(i) a person suffering from coronary heart disease; [1]

Bread .....

Reason .....

(ii) a person suffering from high blood pressure? [1]

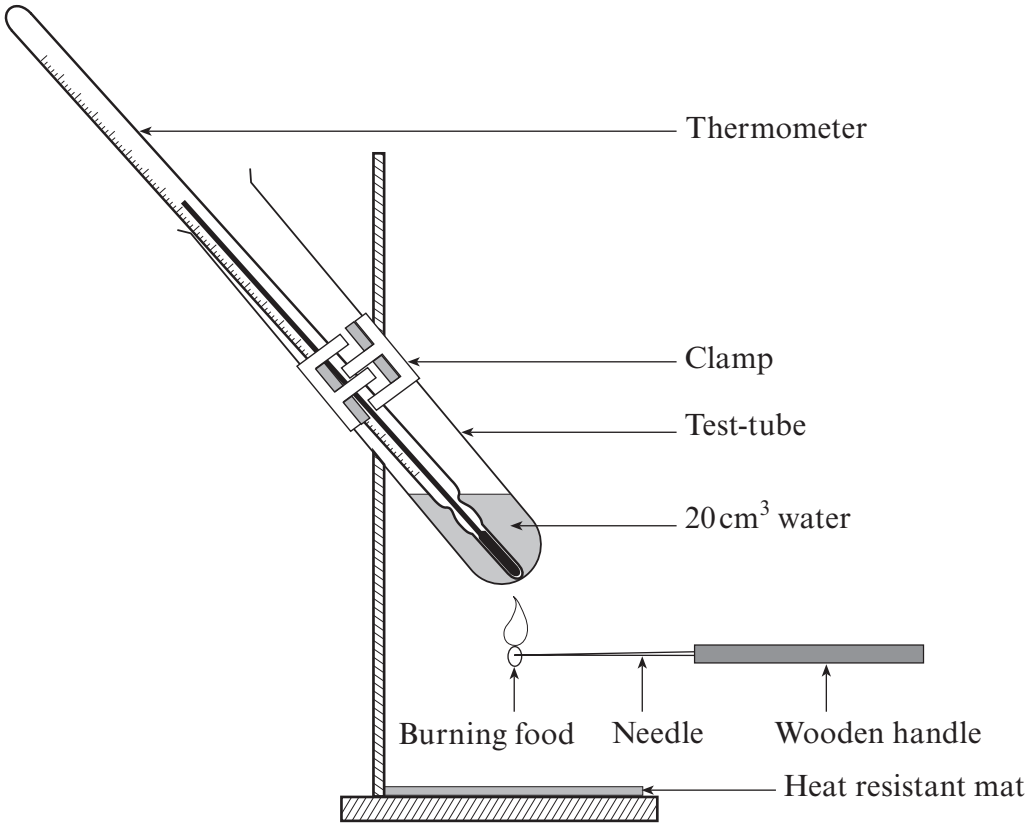
Bread .....

Reason .....

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(c) Bethan wanted to check the energy content of the *Multi-Seeded* bread. She set up the apparatus shown below.



(i) Apart from the volume of water used, state **two** *other* measurements that Bethan must take in order to find the energy content of the bread. [2]

I. .....

II. .....

(ii) Why will the apparatus which Bethan uses not give an accurate reading of the energy content of the bread? [1]

.....

.....

THERE ARE NO MORE QUESTIONS IN THIS EXAMINATION.

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT B1

FOUNDATION TIER

Question		Marking details	Marks Available
1.	(a)	Earthworm – invertebrate Fern – non-flowering plant Fox – vertebrate Dandelion – flowering plant Algae – microorganism 4 or 5 = 4 marks;;;; 3 = 3 marks 2 = 2 marks 1 = 1 mark	4
	(b)	Presence of {backbone/ spine} in vertebrates (or converse); Must be clear reference to vertebrates/ invertebrates	1
	(c)	Bacteria / virus / fungi/ yeast; NOT named species/ plant plankton/ mould	1
	(d)	Scientific name is always the same / common names different/ scientific name is the {same all over the world/ universal}/ scientific names are the same in <u>all</u> languages;	1
		Question total	**[7]**

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Question			Marking details	Marks Available
2.	(a)	(i)	Answer 120;; Suitable part calculation (eg 620 – 500) allow 1 mark	2
		(ii)	Less food has to be bought/ lower labour costs/ can keep more chickens in the same space; NOT lower heating costs/ security costs/ cheaper – unqualified/ less food – unqualified	1
	(b)		Have less food/ {crushing/ cramped/ squashed/ squeezed together/ crammed} (against cage wall)/ less room so less exercise; Must be clear reference to caged/ uncaged NOT restricted movement/ less space/ cooped up/ squished up/ standing on top of each other/ fighting	1
	(c)		Poor feather growth/ less feathers; NOT no feathers	1
	(d)		More room to move / stretch legs or wings more /more movement/ more exercise/ movement is less restricted. NOT more ethical/ cruel/ less broken bones	
			Question total	**[6]**

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Question			Marking details	Marks Available
3.	(a)	(i)	I hawk or stoat;	1
			II Any two from:	
			Mice / beetles / moths / rabbits / caterpillars / snails;	1
			III green plants;	1
		(ii)	Badger: eats {beetles/ mice/ rabbits} and plants;	1
			No mark if any wrong animal named	
		(iii)	Sun (light);	1
			NOT light/ sunshine	
		(iv)	Arrows/ ⟶;	1
	(b)	(i)	Decrease;	1
		(ii)	More {variety of herbivores/ herbivore species} to feed on;	1
			NOT more food/ more herbivores	
			Question total	**[8]**

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Question			Marking details	Marks Available
4.	(a)	(i)	26, 48;	1
		(ii)	Plots 4 plots all correct (-1 per error) (+/- ½ small square);;	2
			Line quality;	1
	(b)	(i)	30 min (from graph) (units must be present);	1
		(ii)	Rise <u>and</u> then fall;	1
	(c)	(i)	Insulin;	1
		(ii)	Diabetes/ diabetic;	1
			Question total	**[8]**
5.	(a)		Pairs;	1
			DNA;	1
			Genes;	1
			Inherited;	1
	(b)	(i)	X X **and** X Y;	1
		(ii)	23;	1
		(iii)	Gametes/ sex cells;	1
			Question total	**[7]**

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Question			Marking details	Marks Available
6/1	(a)	(i)	I DD II dd; Allow e.c.f from (a)(i)	1
		(ii)	Gametes correct;	1
			Cross correct;	1

FI

Gametes	D	D
d	Dd	Dd
d	Dd	Dd

(b) (i) Allow e.c.f from (a)(ii)
Gametes correct; 1
Cross correct (mark independently of gametes); 1

Gametes	D	d
D	DD	Dd
d	Dd	dd

(ii) Answer from candidate's Punnett square

1 homozygous dominant : **2** heterozygous : **1** recessive; 1
NOT 25:50:25/ 2:4:2/ ¼: ½: ¼

Question total **[6]**

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Question		Marking details	Marks Available
7/2	(a)	Variation; NOT {environmental/ genetic} variation/ mutation	1
	(b)	Any **two** from: (Trees in region) A have <u>less</u> water/ furth<u>er</u> away from {water/ river} ORA; (Trees in region) A have <u>less</u> (sun)light /ORA; Accept south facing slope has <u>more</u> sunlight (Trees in region) A are growing on thinn<u>er</u> soils/ ORA; (Trees in region) A are growing higher up the hillside therefore at a low<u>er</u> temp/ ORA; NOT REFERENCES TO DIFFERENCES IN O_2 OR CO_2 CONCENTRATIONS <u>Candidates must make it clear which survey points they are referring to in their answer</u>	2
	(c)	They are <u>genetically</u> different / <u>genetic</u> differences / <u>genes</u> are different / DNA is different/ genetic variation/ variation in inherited genes; NOT: Chromosomes are different/ They come from seeds from different parents/ mutations/ genetics	1
		Question total	**[4]**

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Question		Marking details	Marks Available
8/3	(a)	Erector muscle;	1
	(b)	Indicative content: Sweat gland Removes {sweat / water and salts} from blood/ produces sweat Sweat travels up sweat duct Through sweat pore onto surface of skin Water in sweat evaporates / accept sweat evaporates Removing heat The order of these two statements can be reversed as shown below: Heat is removed from the body to Evaporate the water in sweat / accept to evaporate the sweat	

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5 – 6 marks 6

The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3 -4 marks

The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1 – 2 marks

The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks

The candidate does not make any attempt or give a relevant answer worthy of credit

Question total [7]

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Question			Marking details	Marks Available
9/4	(a)		8400 ÷ 992 x 100 = 846.8g (accept 846.77g);; Award 2 marks for correct answer – unit required Award 1 mark for correct answer if no unit indicated. If answer is incorrect award 1 mark for 8400 ÷ 992 x 100 NOT 847	2
	(b)	(i)	White sliced because it has the {lowest/ lower/ less} {fat / saturated fat} content (salt is neutral) NOT low fat	1
		(ii)	White sliced because it has the {lowest/ lower/ less} salt content NOT low salt	1
	(c)	(i)	Any 2 from: Initial temperature (of water**);** Final temperature (of water); {Rise/ Change} in temperature of water = 2 marks NOT temperature alone Mass (accept weight) of {bread/ food (being burned)} NOT amount	2
		(ii)	Much of the heat from the burning {food sample / bread} is {not transferred to the water / lost to the surroundings}/ incomplete burning / apparatus is not insulated.	1
			Question total	**[7]**
			PAPER TOTAL	**[60]**

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HIGHER TIER

Question			Marking details	Marks Available
5.	(a)	(i)	{Grown / bent/ curved/ leaning/ turned} towards the {light/ lamp} NOT moves towards light	1
		(ii)	Positive phototropism	1
		(iii)	Hormones / plant hormones / phytohormones / auxins	
	(b)	(i)	C (straight up)	1
		(ii)	All {sides/ parts} of the {shoot/ seedlings} receive an equal amount of light/ correct reference to distribution of auxin; In each revolution / every 20 minutes/ as plant {revolves/ rotates/ turns}; All shoots receive an equal amount of light as it is rotating = 1 mark Accept an answer which states: The effect of one sided illumination has been cancelled out by the fact that the shoots are revolving (OWTTE) for 2 marks	2
			Question total	**[6]**

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Question		Marking details	Marks Available
6.	(a)	'Eat' marked between 'normal conc of glucose' and bottom of 'glucose conc increases' box;	1
	(b)	To keep glucose constant/ too much glucose in the blood/ control glucose level in blood/ lower level (in blood)/ help level return to normal; It = glucose level	1
	(c)	'X' on "insulin released" box; Accept 'X' on "glucose changed to glycogen" box.	1
	(d)	Negative feedback;	1
		Question total	**[4]**
7.	(a)	D C B A ;;; 3/ 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark	3
	(b)	To understand the possible effects on environment / health (safe to eat)/ health problems/ to check there is no transfer of genes to other species; NOT to see if genetic modification is successful	1
		Question total	**[4]**

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Question			Marking details	Marks Available
8.	(a)		On pair 7;	1
			Opposite (defective allele)/ at the same locus/ at the same position;	1
	(b)	(i)	Could cause disease (leukaemia / cancer); NOT makes you ill/ gives you health problems/ side effects	1
		(ii)	New cells / replaced cells / copies would have {cystic fibrosis/ defective} allele/ copy would not have the virus/ gene therapy would have to be repeated;	1
	(c)		Profile would show {cystic fibrosis/ defective} gene/ show if parents were carriers (of the disease); would show chances/ risk of having a child with cystic fibrosis / (counsellor could) predict/ determine risk;	2
			Question total	**[6]**

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Question		Marking details	Marks Available
9.	(a)	Any 2: Depth of soil; constant flow of spray/ Ref to rain e.g. rain is not constant; allowance for wind; evaporation; capacity of soil to soak up solution/ soil composition; ref to slope;	Max 2
	(b)	Any 2 for 1 mark; Nitrate/ NO_3^- Phosphate/ PO_4^- Potassium/ K Named trace element e.g. Magnesium Allow correct formulae NOT NPK	Max 1

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(c) **Indicative content** 6

The fertiliser {runs off / leaches into} the water. The fertiliser causes {overgrowth of plants/ algal bloom} in the water. Top layers of plants {stop light reaching the lower layers/ stops photosynthesis underneath} so the lower layers of plants die. They decay by the action of bacteria which use up oxygen for respiration. This causes the fish to die because of lack of oxygen.

5 – 6 marks

The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.

3 – 4 marks

The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.

1 – 2 marks

The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.

0 marks

The candidate does not make any attempt or give a relevant answer worthy of credit

Question total [9]

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Question		Marking details	Marks Available
10.	(a)	Any 2 Same <u>volume</u> of water; same soil/ pH/ mineral (content); same temperature; NOT heat NOT light	Max 2
	(b)	<u>Keep all factors the same</u> but use {pure water / tap water/ distilled water/ unpolluted water/ water without copper} NOT clean/ normal water	1
	(c)	Mutation; Variation; Survival value – {some were tolerant to/ not poisoned by/ resistant to copper}; NOT immune to copper Gene passed on.	4
		Question total	**[7]**
		PAPER TOTAL	**60**

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Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4461/01

SCIENCE A
FOUNDATION TIER
BIOLOGY 1

A.M. THURSDAY, 12 January 2012

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**5**	
3	**3**	
4	**13**	
5	**4**	
6	**5**	
7	**8**	
8	**6**	
9	**4**	
10	**6**	
Total	**60**	

4461 010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

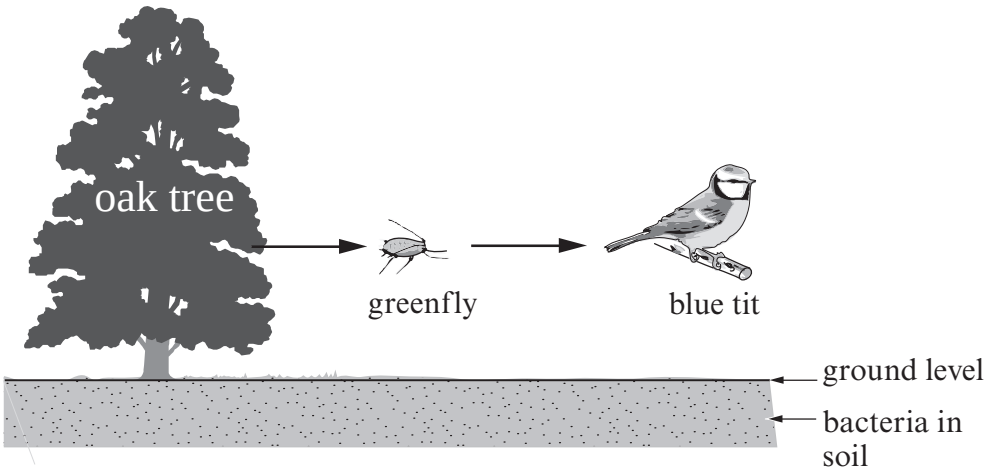
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question 8.

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Answer **all** *questions.*

1. The diagram shows a woodland food chain (not drawn to scale). Bacteria, that bring about decay, are found in the soil.



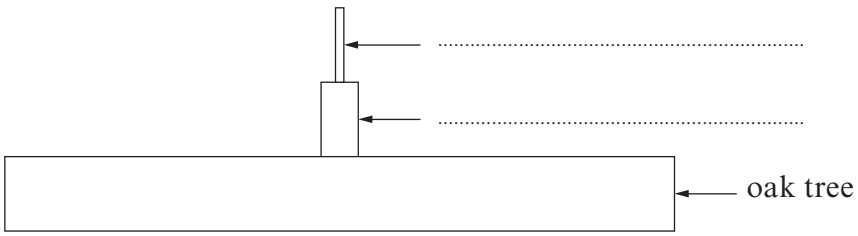
(a) (i) What is the source of energy for the food chain? [1]

.....

(ii) Name the herbivore in this food chain. [1]

.....

(b) Using this food chain, complete the labels on the pyramid of biomass below. [1]



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(c) The organisms in the food chain belong to different groups. Each group has an identifying feature.
Use information in the table to place each organism into it's correct group.

Place a tick (✓) in the correct group. One has been done for you. [3]

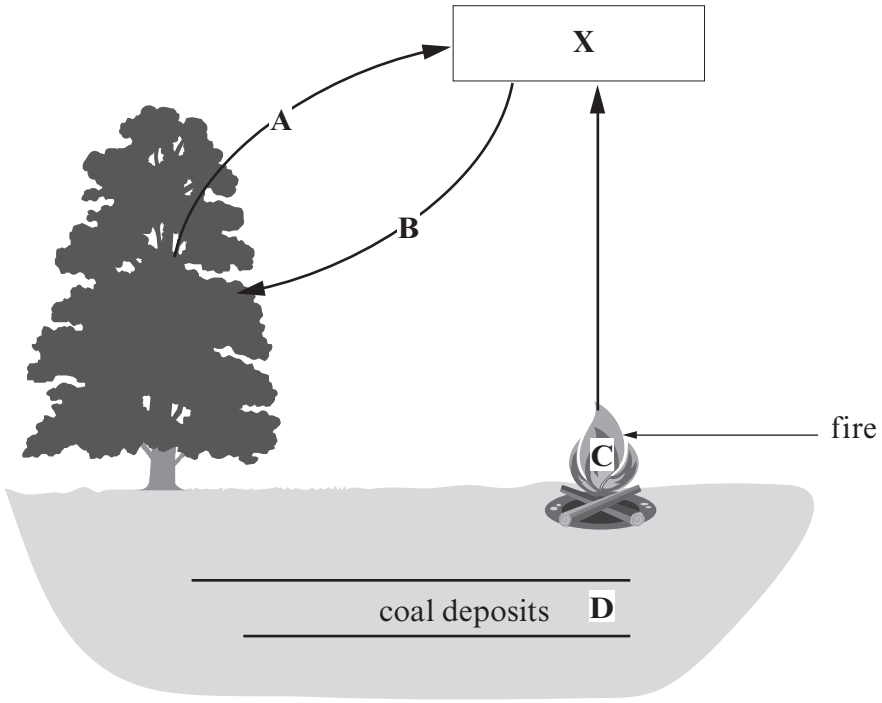
Organism	Feature	Group			
		plant	vertebrate	invertebrate	microorganism
Oak tree	has flowers	✓			
Greenfly	has no backbone				
Blue tit	has backbone				
Bacteria	bring about decay				

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2. The diagram shows some features of the Carbon Cycle. The features are labelled **A** to **D**.



(a) The list shows some of the features in the diagram.
Write the correct letter from the diagram in the space by each feature. [3]

Feature	**Letter**
combustion	.....
respiration	.....
a store of carbon	.....

(b) State the name of the gas at **X**. [1]

.....

(c) State the name of the process at **B**. [1]

.....

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3. The chart below lists four sense organs and four stimuli.
Draw a straight line from each sense organ to the stimulus it detects. [3]

Sense organ	stimulus
eye	chemicals
ear	sound
skin	touch
tongue	light

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4. In an experiment, Sue measured her skin temperature while sitting outside on a hot day.

The results are shown in the table.

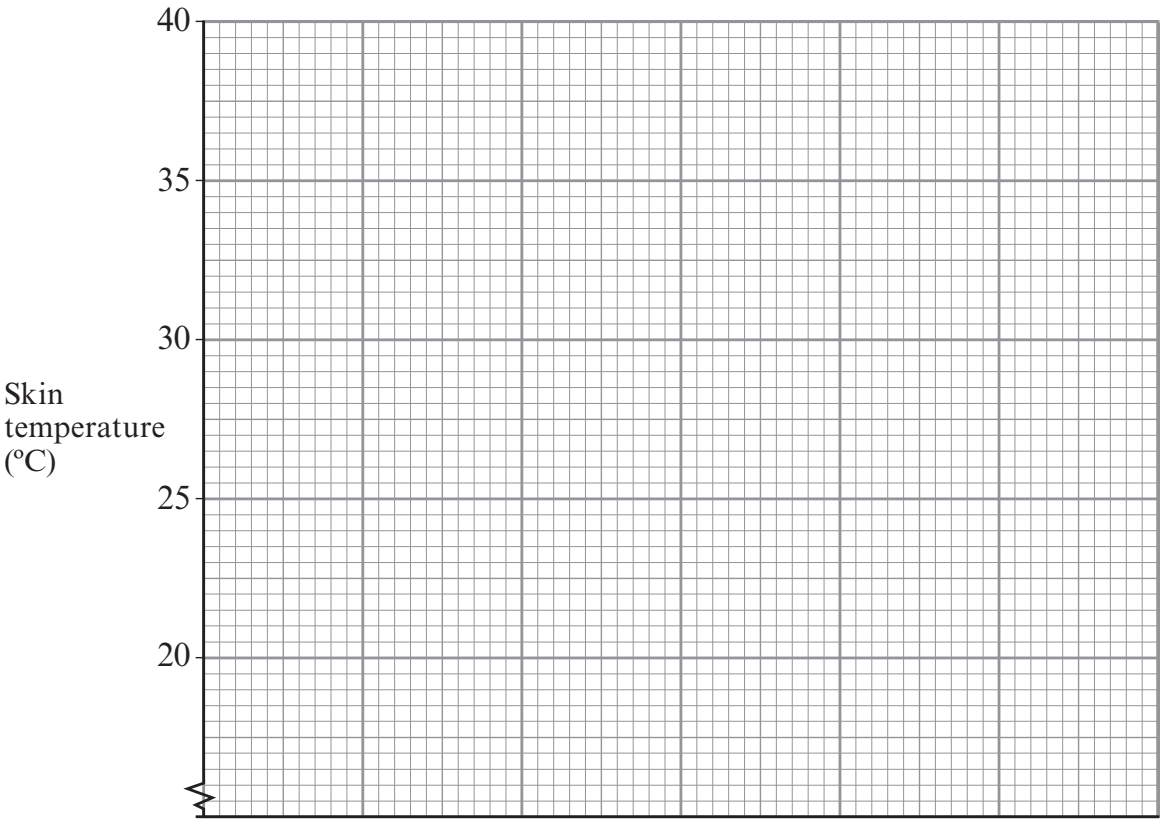
	Time sitting outside (minutes)					
	0	2	4	6	8	10
Skin temperature (°C)	24	34	35	38	38	38

(a) (i) Complete a line graph of these results on the grid by:

I choosing the scale on the time axis, [1]

II plotting the points, [2]

III joining the plots with a ruler. [1]



(ii) From the graph, describe how the skin temperature changed during the experiment. [1]

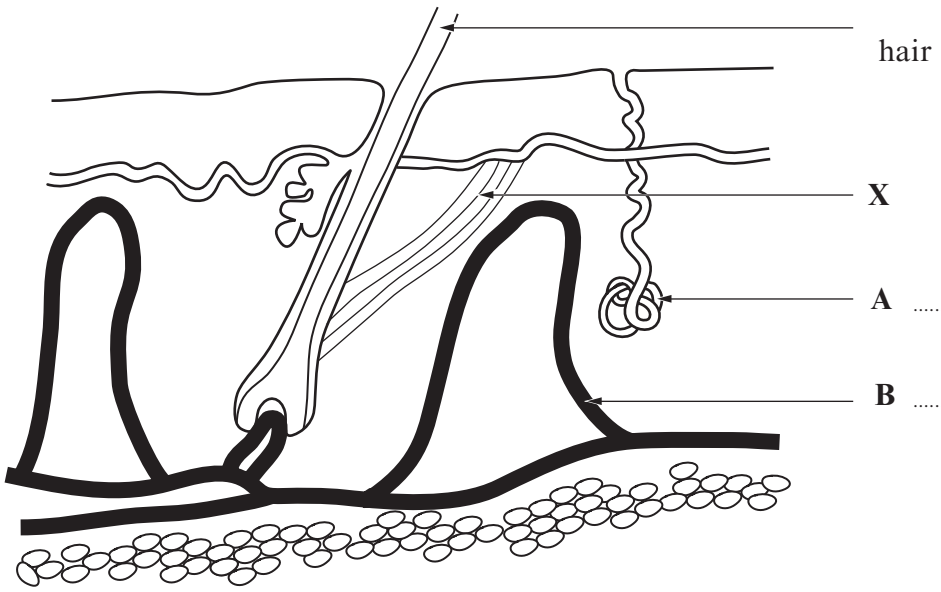
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(b) The diagram shows a section through the skin.



(i) Using the list below, label **A** and **B** on the diagram. [2]

blood vessel nerve sweat gland sweat pore

(ii) Complete the following sentence using the correct word from the list. [1]

absorption evaporation insulation

When we sweat, heat is lost from the skin by .....

(iii) Complete the table below to show how the skin responds in **cold** conditions.

Circle the correct answer for each feature.

Feature of skin	Response
sweat from sweat gland	more / less / stays the same
blood flow in vessels near surface	more / less / stays the same

[2]

(iv) Structure **X** on the diagram can contract and relax.

I Name **X** ..... [1]

II Describe how **X** and the hair work together to keep us warm. [2]

.....

.....

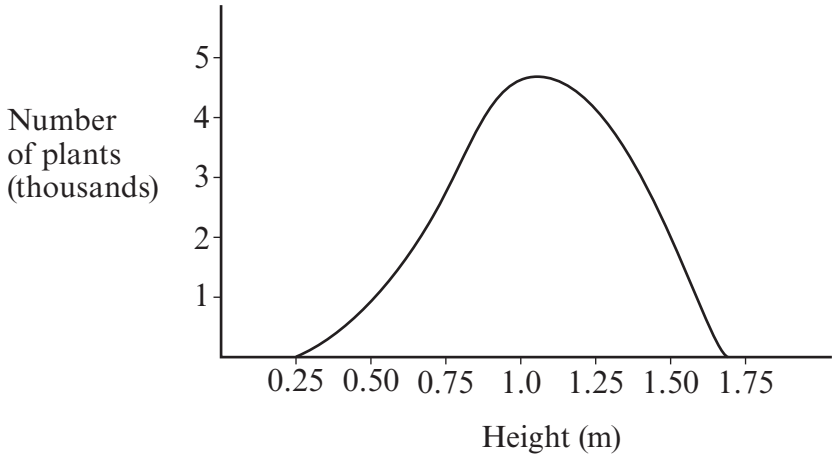
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5. The graph shows variation in the height of wheat plants.



(a) Complete the sentences below using some words from the list. [2]

asexual environmental genetic sexual

The plants were grown in the same conditions, so the differences in height are due mostly to ..... causes. Differences in appearance between individuals are common because of ..... reproduction.

(b) Some variations may be inherited from parents.

Which of the following can be inherited in humans?

Place a tick (✓) in the box against the **two** correct answers. [2]

mutation in a gamete ☐

broken bone ☐

eye colour ☐

mutation in a skin cell ☐

4

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6. *(a)* Complete the following sentences about genes.

(i) Genes are made of a chemical called [1]

..... .

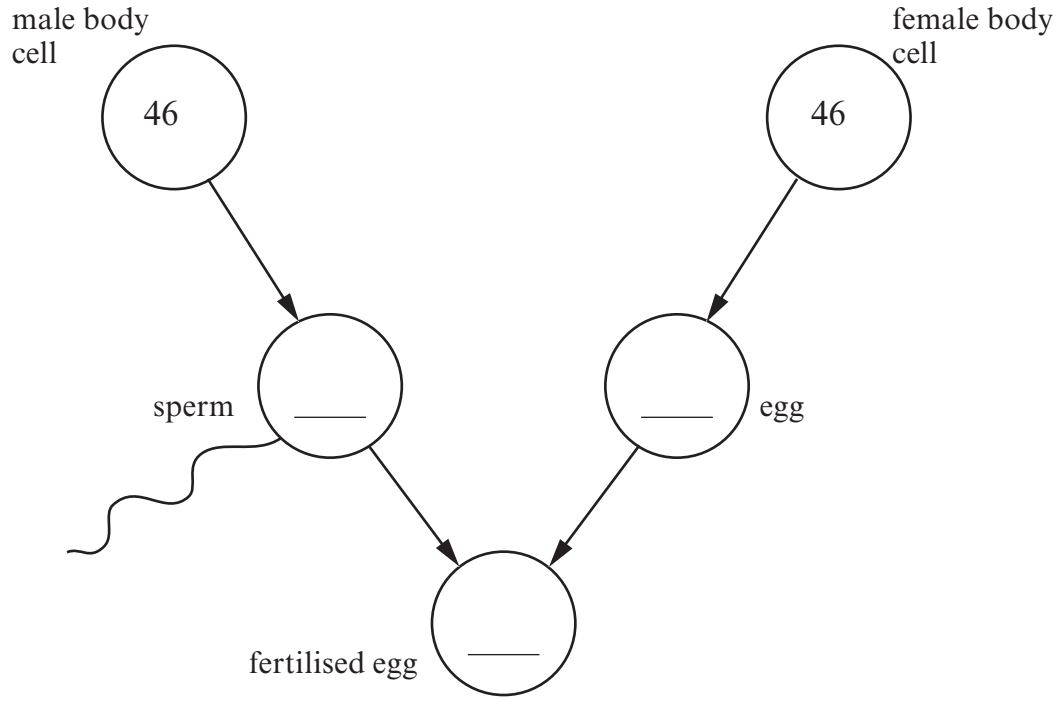
(ii) Genes are linked together to form structures called [1]

..... .

(iii) Each gene is a code for the production of a different [1]

..... .

(b) The diagram shows the number of chromosomes present in a male and female body cell. The production of gametes and fertilisation are also shown.



Complete the diagram to show the number of chromosomes in the sperm, egg and fertilised egg. [2]

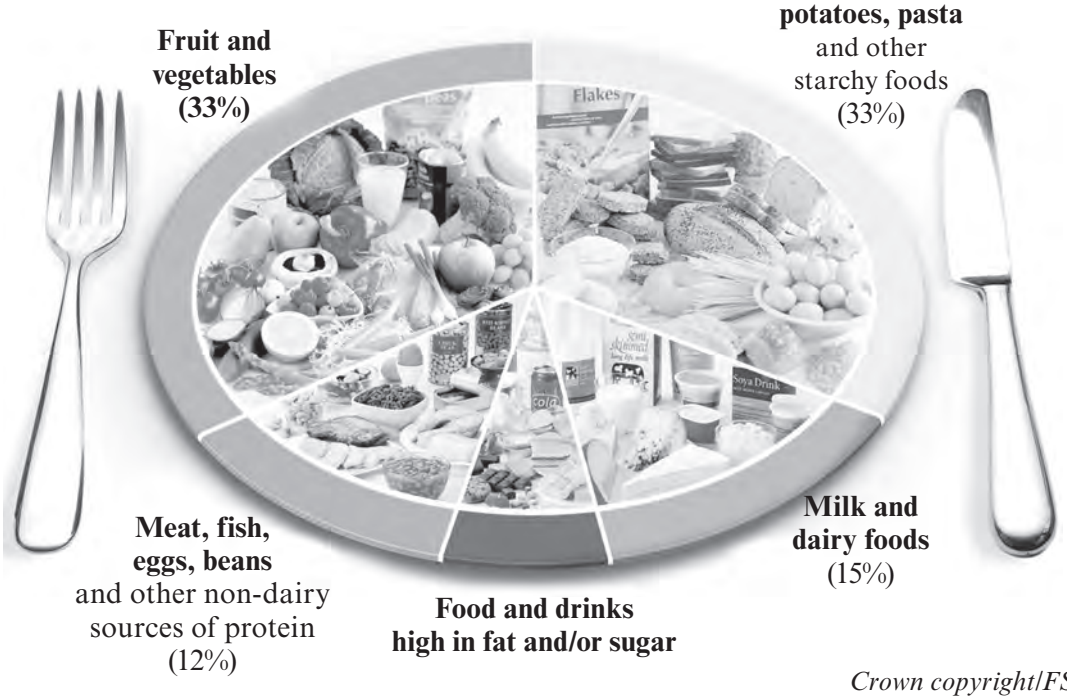
Turn over.

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7. *(a)* The eatwell plate shows the types and percentages of foods that we should eat for a healthy diet.

The eatwell plate



Crown copyright/FSA

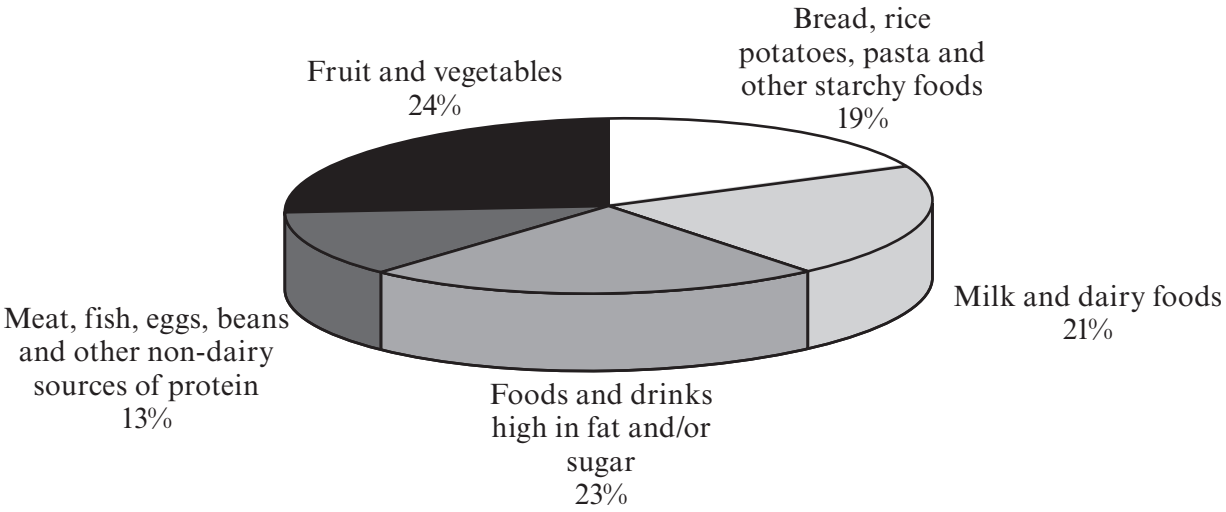
Calculate the percentage of the eatwell plate that should come from **Foods and drinks high in fat and/or sugar**. Show your working. [2]

Answer ..... %

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(b) The chart below shows the percentages of different types of food bought at the shops.



Crown copyright/FSA

Which **three** types of food are bought in greater percentages than shown in the eatwell plate? Tick (✓) the three boxes. [1]

Meat, fish, eggs ☐

Fruit and vegetables ☐

Bread, rice, potatoes, pasta ☐

Milk and dairy foods ☐

Foods and drinks high in fat and/or sugar ☐

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(c) The table below shows the fat content of a meal.

Food	Fat content (g)
Doner kebab	50.2
Mayonnaise	11.5
Packet of crisps	11.5
Doughnut	13.3
Total	86.5

The Guideline Daily Amount of fat for an average female is 70g.
Calculate the excess fat content of this meal. [1]

Answer ..... g

(d) Why do food labels often give information on fat content **per 100g of food**? [1]

.....

(e) Explain why it is unhealthy to eat too much fat. [2]

.....

.....

.....

.....

(f) Give **one** use for fat in the human body. [1]

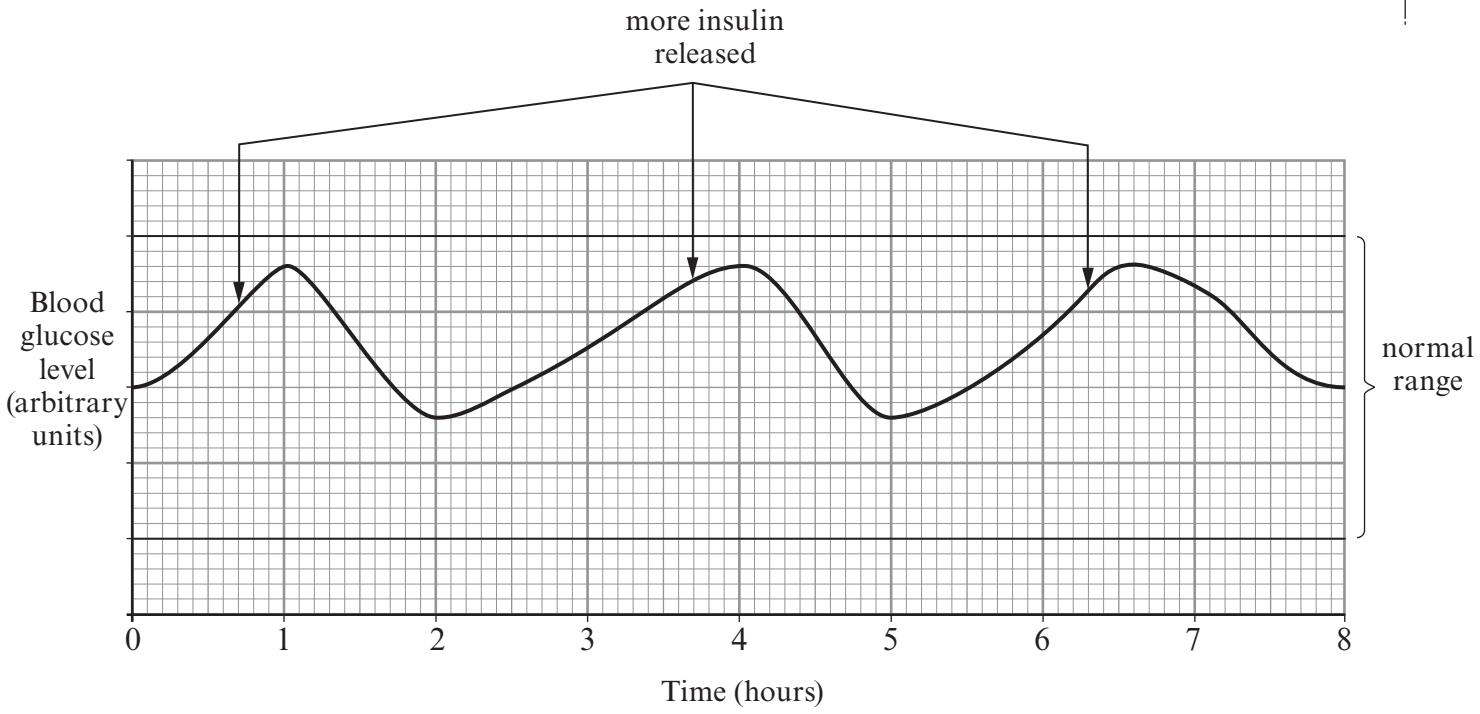
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8. The hormone insulin helps to keep blood glucose levels within a narrow, normal range.

The graph shows changes in blood glucose levels during a period of eight hours and the points when more insulin was released into the blood.



Use the above information, **and your own knowledge**, to explain how blood glucose levels are controlled in the human body. [6 QWC]

.....

.....

.....

.....

.....

.....

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.....

6

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Examiner only

9. The legal blood alcohol limit for driving in the UK is 80 mg of alcohol per 100 ml of blood. In some countries, it is illegal to drive with **any** alcohol in the blood. This is the zero limit.

(a) (i) Why is it dangerous to drive after exceeding the legal limit of blood alcohol? [1]

.....

.....

(ii) Give **one** reason why some people think that there should be a **zero** limit in the UK. [1]

.....

.....

(*b*) Alcohol is an addictive drug.
Explain what is meant by 'an addictive drug'. [2]

.....

.....

.....

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10. Red squirrels and grey squirrels live in woodland. The two squirrel species compete for similar resources. Where the two species share the same habitat, the greys usually outcompete the reds.



Red squirrel



Grey squirrel

The island of Anglesey used to have a large population of red squirrels. In the early 1970s, grey squirrels started to arrive across the road bridges. The number of grey squirrels on the island grew rapidly. By the mid 1980s, red squirrels had disappeared from many parts of the island. In 1998, conservation groups started to control the numbers of grey squirrels and the red squirrel was re-introduced into several woodlands.

(a) Anglesey is 710 km^2 in area. Only 3% of the area is mature woodland suitable for red squirrels.

Calculate the area of woodland suitable for red squirrels. Show your working. [2]

..... km^2

(b) Give **two** resources for which both squirrel species compete. [2]

1. .....

2. .....

(c) Apart from competition between the squirrels for resources, give **two** *other* factors that might limit the size of the squirrel populations. [2]

1. .....

2. .....

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WJEC
CBAC

GCSE MARKING SCHEME

SCIENCE - BIOLOGY
SPEC A (NEW)

JANUARY 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCSE BIOLOGY – SPEC A (NEW). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

UNIT B1

FOUNDATION TIER

Question	Answer	Mark
1. (a) (i)	Sun/ sunlight/sunshine NOT sun alone	1
(ii)	greenfly(ies); NOT fly	1
(b)	pyramid correct; Blue tit Greenfly	1
(c)	One mark for each correct tick;	3

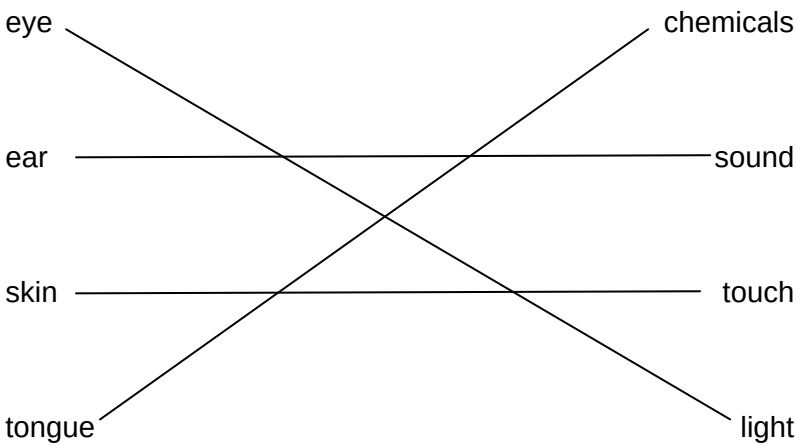
Organism	Feature	Group			
		Plant	Vertebrate	Invertebrate	Microorganisms
Oak tree	has flowers	given			
Greenfly	has no backbone			✓	
Blue tit	has backbone		✓		
Bacteria	Brings about decay				✓

Total for the Question 6

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Question	Answer	Mark
2. (a)	C;	3
	A;	
	D;	
(b)	carbon dioxide; (accept CO_2, if written correctly)	1
	NOT CO^2	
(c)	photosynthesis; accept phonetic spelling	1
	Total for the question	**5**

3.



3 or 4 correct;;;	3
2 correct;;	2
1 correct;	1
Total for the Question	**3**

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Question	Answer	Mark
4. (a) (i)	I suitable scale on the time axis; If no scale cannot access mark points I or II/ Scale must start at origin and use at least half of grid	1
	II correct plotting ± ½ small square;	2
	III straight line joining the plots;	1
(ii)	rises and plateaus/levels; ecf from graph Accept : goes up and then stays the same	1
(b) (i)	A - sweat gland;	
	B - blood vessel;	2
(ii)	evaporation;	1
(iii)	<table><tr><th>Feature of skin</th><th>Response</th></tr><tr><td>Sweat from sweat gland</td><td>more / **less** / stays the same</td></tr><tr><td>Blood flow in vessels near surface</td><td>more / **less** / says the same</td></tr></table>	
	One for each correct answer;;	2
(iv)	I muscle/erector muscle NOT erector alone	1
	II muscle/X contracts/pulls hair vertical up/hair is pulled up;	2
	Traps air/insulates;	
	Total for the Question	**13**

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Question	Answer		Mark
5. (a)	genetic;		1
	sexual;		1
(b)	mutation in a gamete;	✓	1
	broken bone		
	eye colour;	✓	1
	mutation in a skin cell		
	Total for the Question		**4**

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Question		Answer		Mark
6.	(a)	i DNA/ dna	accept deoxyribonucleic acid (phonetic)	1
		ii chromosomes		1
		iii protein		1
	(b)	23 and 23		1
		46		1
			Total for the Question	5

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FOUNDATION AND HIGHER TIER

Question	Answer	Mark
7/1.(a)	7 Two marks for correct answer; One mark for working if incorrect answer (100 – 93)	2
(b)	Meat, fish, eggs ✓ Fruit and vegetables Bread, rice, potatoes, pasta Milk and dairy foods ✓ Foods and drinks high in fat and/or sugar ✓	
	All three boxes required;	1
(c)	16.5;	1
(d)	reference to comparison; NOT fair testing	1
(e)	Any two from: Overweight/fat/obese/ put on too much weight NOT put on weight mobility problem; joint damage; heart disease/ heart attack NOT heart problems/ damage cholesterol/circulatory disease/stroke/ clogging diabetes; infertility;	2
(f)	energy (store)/membranes/nerves/ insulation NOT keeping warm	1
	Total for the Question	**8**

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Question	Answer	Mark
8/2	Indicative content as blood glucose rises (more) insulin released; ref to pancreas; to the liver; in the blood; glucose changed to glycogen; insoluble/stored; ignore references to glucagon	

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Question	Answer		Mark
8.	**QWC Marking**		
	Indicative content:		
	5 - 6 marks	The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.	
	3 - 4 marks	The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.	
	1-2 marks	The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.	
	0 marks	The candidate does not make any attempt or give a relevant answer worthy of credit.	

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Question		Answer	Mark
9/3 (a)	(i)	increased (allow slower) reaction time/impaired judgement/	1
		lose concentration/ adverse effect on nervous system	
		NOT car crash/ reduces reaction time/ slows nerve impulses	
	(ii)	effect starts even at low alcohol level	1
		NOT stops any chance of alcohol affecting the driver/ some	
		People are more affected than others	
	(b)	dependency idea/ craves/ hard to give up/ can't live without	
		it/ keep wanting more NOT hooked	
		withdrawal symptoms idea/ cold turkey	2
		Total for the Question	**4**
10/4	(a)	21.3; one mark for working (710 x0.03) or two marks for correct answer if no working	2
	(b)	Any two from	2
		food; NOT named food e.g. nuts	
		water;	
		space/ area NOT land	
		habitat/ places to live NOT homes/ shelter	
	(c)	Any two from	2
		disease;	
		predation;	
		adverse weather, cold, drought/ global warming	
		NOT weather/ climate	
		pollution;	
		'management'/hunting/ culling/ poisoning/ shooting	
		Not able to find a mate	
		Total for the Question	**6**

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HIGHER TIER

Question	Answer	Mark
5. (a) (i)	7.5	1
(ii)	4.5 / 4 ½ ;	1
(b) (i)	either: any two from receptor/sensory cells; impulses/ electrical signals NOT message/ electric signal along sensory neurones/nerves; or: in the blood; in the form of heat;	2
(ii)	Any two from Vasodilation/ dilate/increase in width/ diameter/ get wider NOT bigger/ expand/ thicker/ nearer to surface more blood; radiation/conduction;	2
	Total for the Question	**6**

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Question	Answer	Mark
6. (a)	(Genetic) profile/genetic code/ profiling NOT fingerprinting	1
(b)	Captive tortoises would have all the same patterns	1
	NOT similar	
	(Ref to 'It' = wild population of tortoise)	
	Wild populations would all be different to captive tortoises	1
	Total for the question	**3**
7. (a) (i)	Photosynthesis	1
(ii)	0.5 no unit needed	1
(b)	5120kJ Unit must be unambiguous	1
(c)	Herbivores are more active/ move more or converse/ higher	1
	metabolic rate NOT herbivores excrete	
(d)	Decay/decomposition/ bacteria break down	1
	NOT it breaks down	
	urea to ammonia	1
	ammonia to nitrates	1
	which are taken up by plants and used to make <u>protein</u>	1
	Total for the Question	**8**

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Question	Answer	Mark
8.	Indicative content: Few predators/no virus/other answers relating to availability of food/space/suitable climate. Mutation caused resistance/ immunity caused variation which was an advantage/had survival value allowed survival of the fittest TO BREED (Mutated) GENE passed on	
	Total for the Question	**6**

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QWC Marking

Question	Answer	Mark
8.	Indicative content:	
	5 - 6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.	
	3 - 4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.	
	1 - 2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.	
	0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.	

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Question	Answer	Mark
9. (a) (i)	Continuous: bell-shaped bar profile NOT continuous line	1
	Discontinuous: Two bars or more – different heights	1
(ii)	Continuous	
(b) (i)	B b B BB Bb b bB bb	
	Gametes	1
	Cross	1
(ii)	Shows discontinuous variation	1
	Plain is dominant/banded recessive	1
	NOT plain is more/ most dominant	
	Total for the Question	**7**

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Question	Answer	Mark
10. (a) (i)	By microorganisms / bacteria/ microbes/ fungi	1
	as a result of respiration NOT respirate/ breathe	1
(b) (i)	Lead killed bacteria/fungi/decomposers OR denatured enzymes/ lead stops bacteria respiring/ working	1
	No carbon dioxide produced	1
(ii)	To show lead was responsible (and not nitrate)/to show nitrate was not responsible (but lead was) (not: as a control)	1
(iii)	sterilised soil/ disinfected soil/ use boiled soil/ use soil with dead microbes NOT soil with no micro-organisms(same volume of reagents as tube A or C)	
	Total for the Question	**6**

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