CCEA GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT 1 HIGHER TIER GBY12 PAPERS

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016

Biology

Unit 1
Higher Tier

[GBY12]

GBY12

FRIDAY 10 JUNE, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the box, around each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **12(b)(ii)**.

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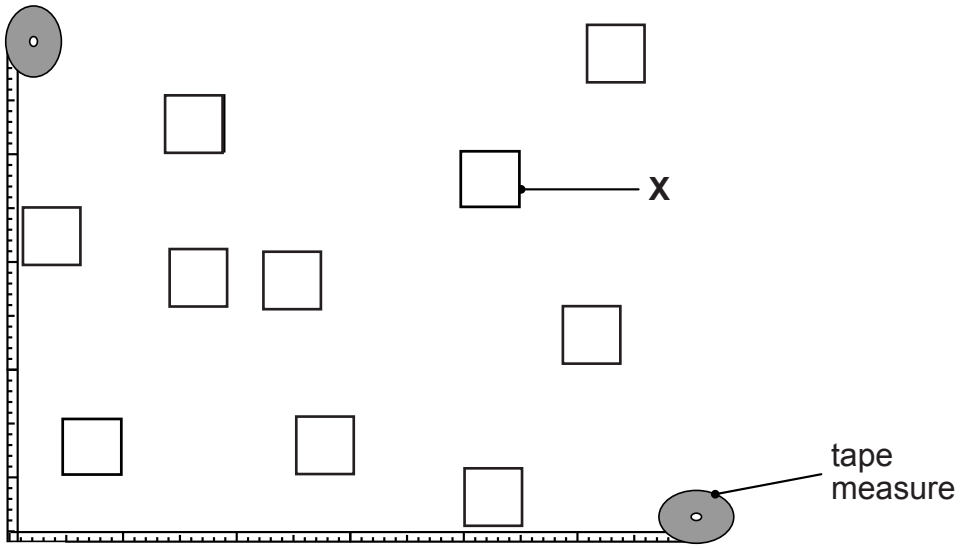
32GBY1201

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1 Pupils carried out an investigation to estimate the size of a population of daisies on a playing field.

They placed two tape measures at right angles on the playing field.

They then placed apparatus **X** at 10 random coordinates inside the area enclosed by the two tape measures.



© Chief Examiner

(a) Name apparatus **X**.

_____ [1]

(b) Explain why random coordinates were used to decide where to place apparatus **X**.

_____

_____ [1]

The area of apparatus **X** is 0.25m^2.

(c) Describe how the pupils would have used apparatus **X** to calculate the number of daisies per square metre on the playing field.

_____

_____

_____ [2]

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2 Sulfur dioxide is one cause of acid rain.

(a) Explain how sulfur dioxide forms acid rain.

_____

_____

_____ [2]

(b) Describe **one** harmful effect acid rain has on living organisms.

_____

_____ [1]

The table shows changes in sulfur dioxide emissions in Ireland from 1999 to 2007.

Year	Sulfur dioxide emissions /1000 tonnes
1999	159.5
2000	140.5
2001	135.5
2002	102.2
2003	79.4
2004	71.7
2005	70.4
2006	60.3
2007	54.7

Greenhouse Gas and Acid Rain Precursor Accounts for Ireland 1998-200
© Government of Ireland 2009, Material complied by the Central Statistics Office. ISBN: 978 1-4064-2098-2.
Licensed under: https://creativecommons.org/licenses/by/4.0/legalcode

(c) Describe the change in sulfur dioxide emissions from 1999 to 2007.

Suggest **one** reason for this change.

_____

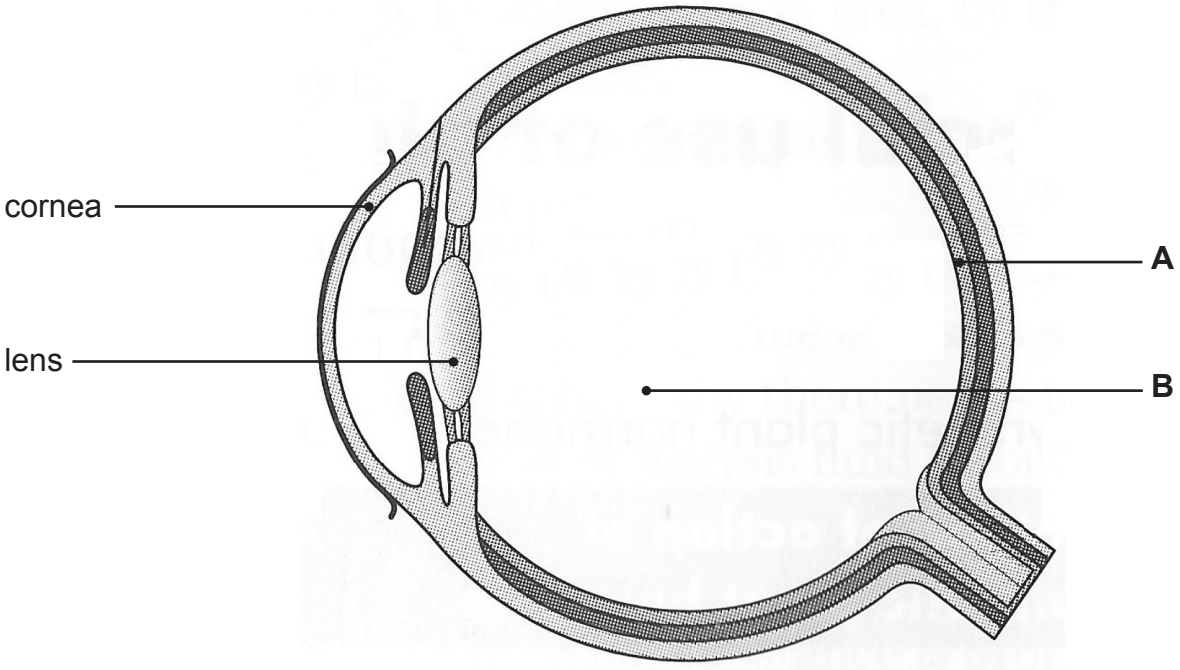
_____

_____

_____ [2]

[Turn over

3 The photograph shows a section through an eye.



© GCSE Biology for CCEA, Revision Book by James Napier. Publisher Hodder Education, 2007. ISBN: 9780340940556. "Reproduced by permission of Hodder Education".

(a) Name and give the function of parts **A** and **B**.

A _____ [1]

Function _____

_____ [1]

B _____ [1]

Function _____

_____ [1]

(b) The lens and the cornea work together to carry out one function.

Describe this function.

_____

_____ [1]

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(Questions continue overleaf)

[Turn over

4 The photograph shows a farmer in a rainforest area clearing land by cutting down and burning trees.



© Vaughan Fleming / Science Photo Library

Use your knowledge and understanding of the carbon cycle to explain how

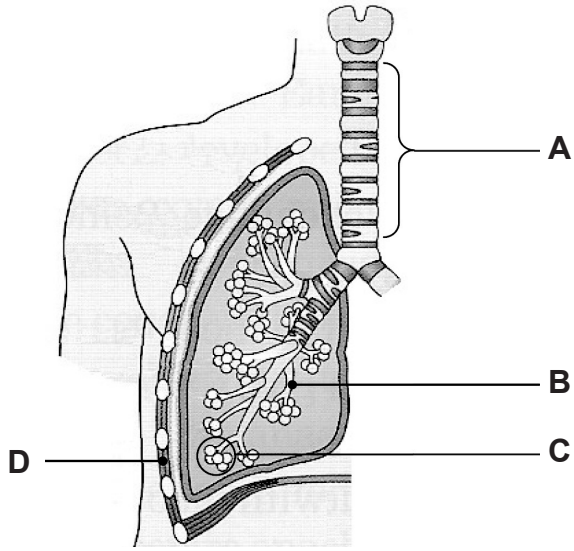
- cutting down and burning trees affects the concentration of the carbon dioxide in the atmosphere.
- the change in the atmospheric carbon dioxide concentration harms the environment.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

[Turn over

5 The diagram shows part of the respiratory system.



Adapted figure ('The main parts of the human respiratory system') from OCR Gateway GCSE Biology by S Broadley, S Hocking and M Matthews (OUP, 2011), copyright © Oxford University Press 2011, reproduced by permission of Oxford University Press.

(a) Name parts **A**, **B**, **C** and **D**.

A _____ [1]

B _____ [1]

C _____ [1]

D _____ [1]

(b) Describe the process of breathing in.

_____

_____

_____

_____

_____

_____

_____ [4]

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6 A class set up an experiment to investigate the movement of molecules.

Starch agar is a jelly with starch added.

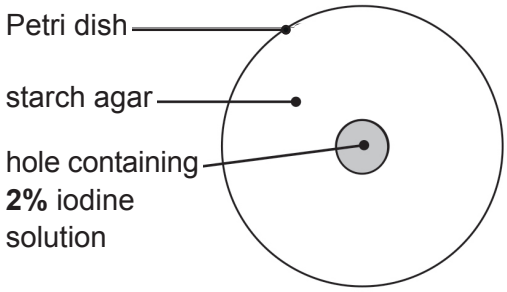
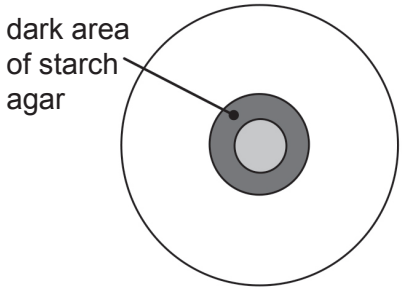
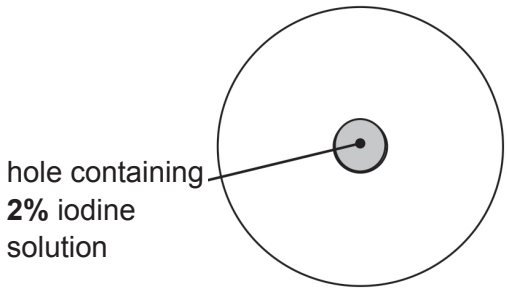
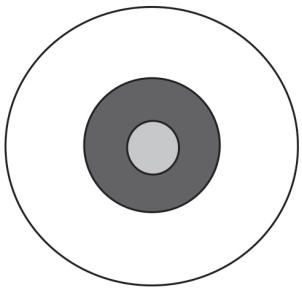
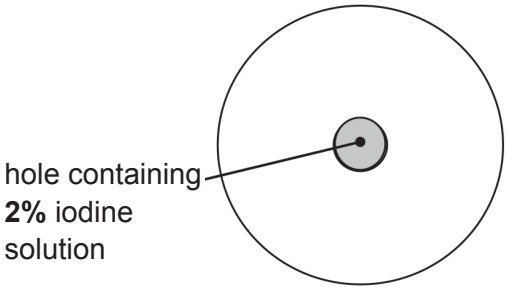
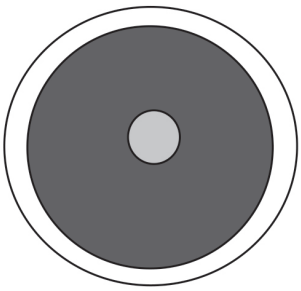
Starch agar was placed in three Petri dishes.

A hole was cut out of the starch agar in the centre of each Petri dish.

Each hole was filled with a 2% concentration of iodine solution.

The Petri dishes were left for 30 minutes at different temperatures.

The table shows the results.

Temperature /°C	Start of experiment	After 30 minutes
10		
15		
20		

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(a) Describe and explain the colour change of the starch agar after 30 minutes in the Petri dish left at 10°C.

Colour change _____

_____ [2]

Explanation _____

_____

_____

_____

_____ [3]

(b) What conclusion can be made about the effect of temperature on the movement of molecules?

Use evidence from the diagrams to help explain your conclusion.

Conclusion _____

_____

_____ [1]

Explanation _____

_____

_____

_____

_____ [2]

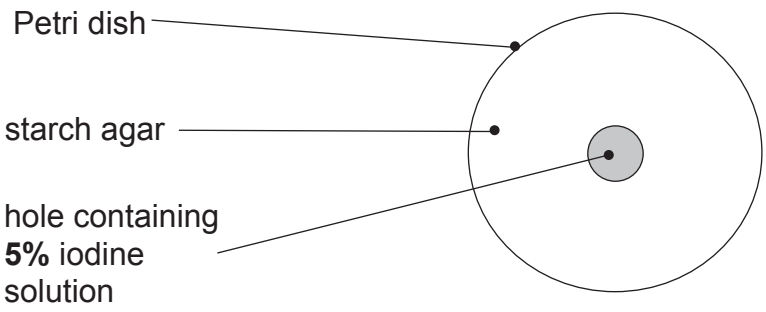
[Turn over

A fourth Petri dish was set up in the same way.

The hole in the centre of the starch agar was filled with **5%** iodine solution.

It was kept at a temperature of **15°C** for 30 minutes.

(c) **Complete the diagram** by shading in the **dark area** of starch agar that would form in the Petri dish after 30 minutes. [1]



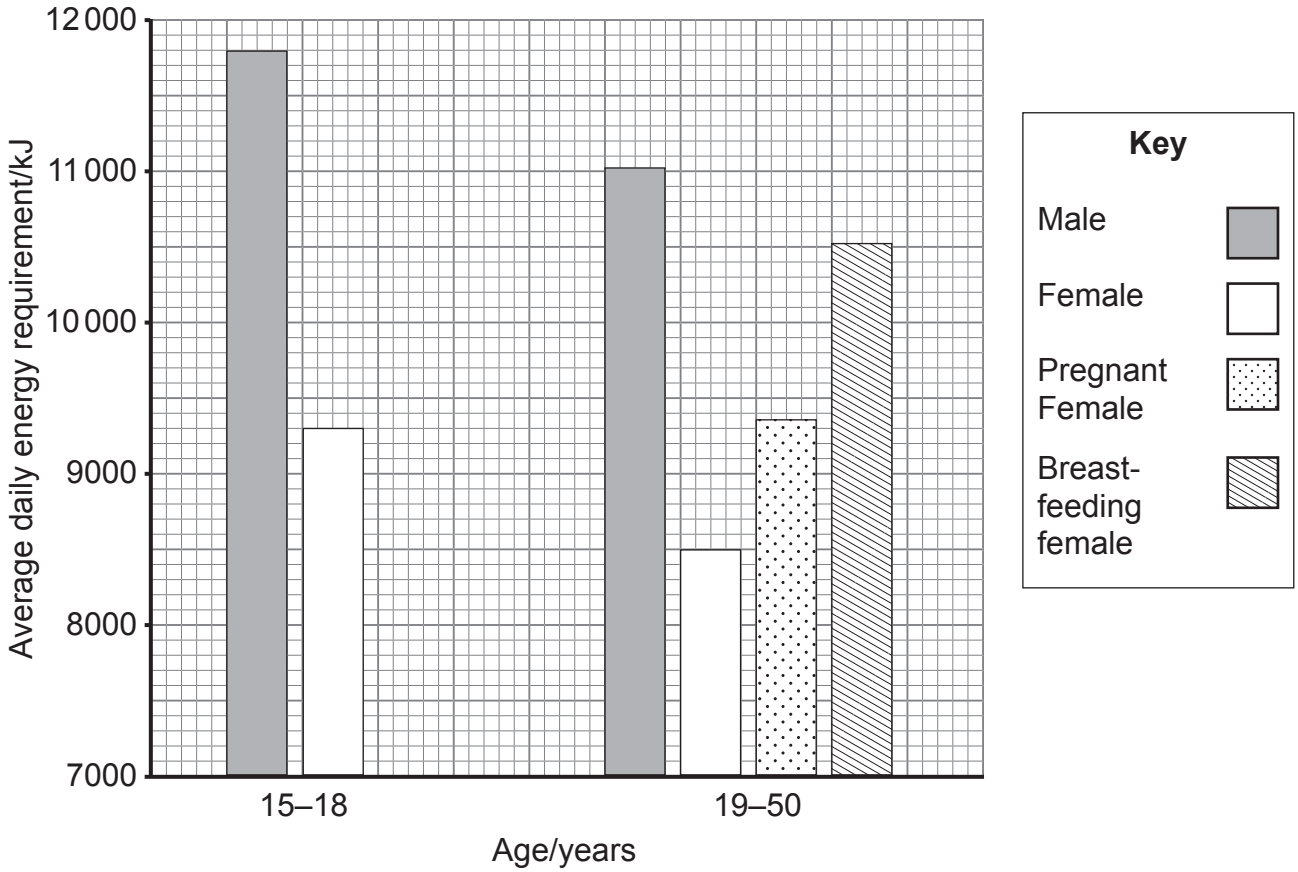
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(Questions continue overleaf)

7 **(a)** The graph shows how the average daily energy requirement, of 15 to 50 year old males and females, varies with age.



(i) Describe and explain the difference in the average daily energy requirement of 15–18 year old males and females.

_____

_____

_____

_____ [2]

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(ii) Pregnancy increases a woman's average daily energy requirement.

Calculate the **percentage increase** in the average daily energy requirement due to pregnancy.
Show your working.

_____ % [3]

(iii) Explain why pregnancy increases a woman's average daily energy requirement.

_____

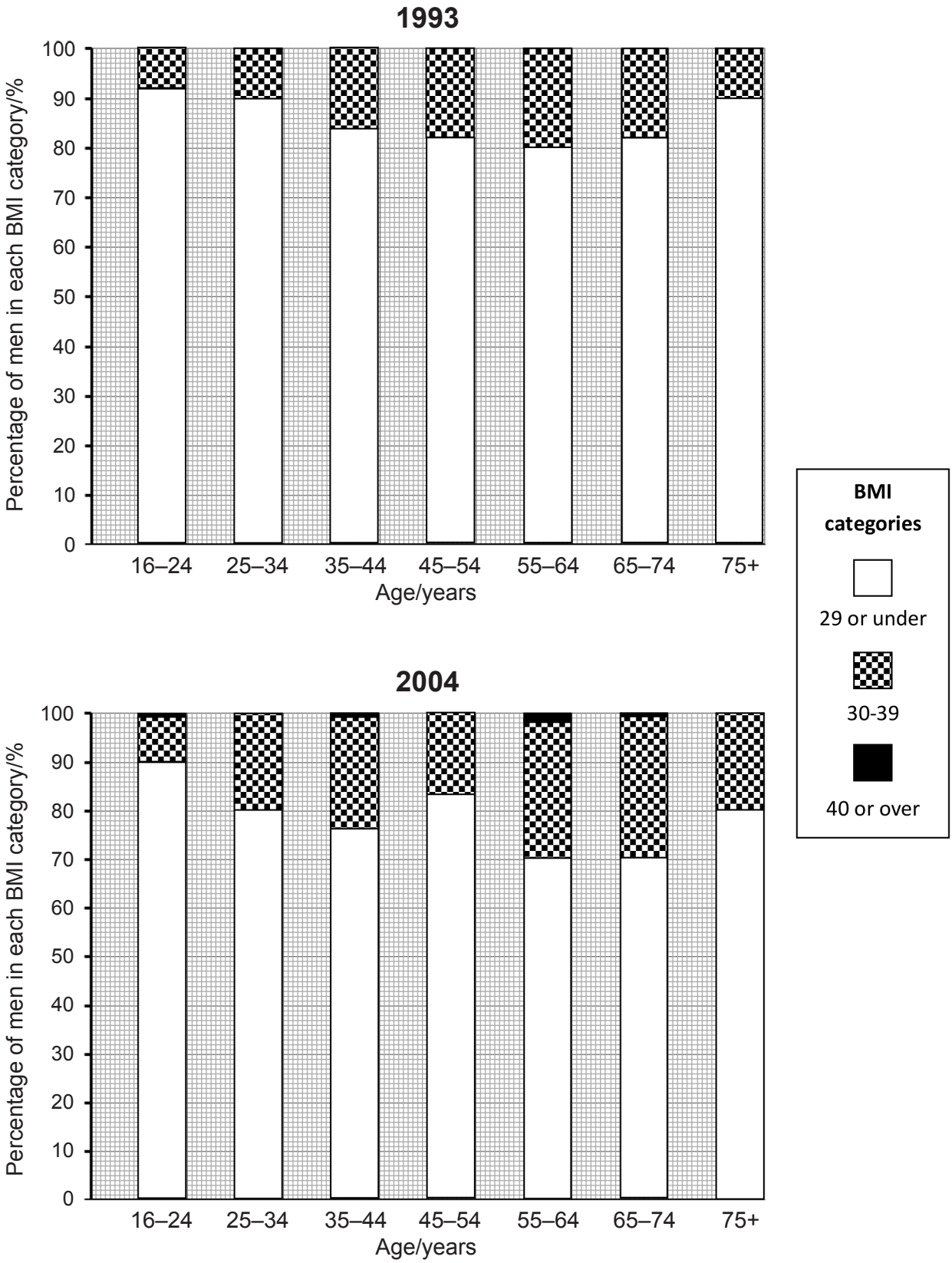
_____ [1]

(iv) Give **one** factor, not shown in the graph, which affects a person's average daily energy requirement.

_____ [1]

[Turn over

(b) The graphs show the percentage of men of different ages in each BMI category in 1993 and 2004.



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A person with a BMI of 30 and above is described as obese.

(i) Describe the relationship between age and obesity levels in **1993**.

_____

_____

_____ [2]

(ii) Calculate the change in the percentage of men aged 55–64 who were obese in the eleven years between 1993 and 2004.

_____ % [1]

(iii) Use this trend to predict what percentage of men aged 55–64 will be obese eleven years later, in 2015.

_____ % [1]

(iv) Predictions of future obesity levels in men can be unreliable.

Use the data for 45–54 year old men in 2004 to suggest why.

_____

_____

_____ [1]

(c) Obesity is estimated to cost the Northern Ireland economy £500 million per year.

Give **two** ways obesity costs the local economy.

_____

_____

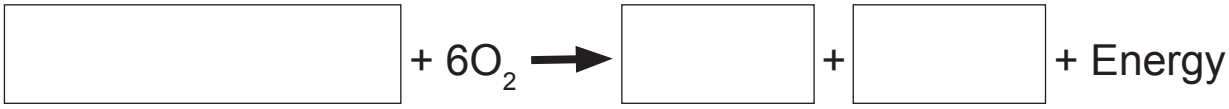
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_____ [2]

[Turn over

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8 **(a)** Complete the **balanced chemical equation** for aerobic respiration.



[3]

(b) Aerobic respiration uses oxygen, anaerobic does not.

Describe **other** ways aerobic respiration differs from anaerobic respiration in yeast.

_____

_____

_____

_____

_____ [3]

(c) **(i)** Give the **word equation** for anaerobic respiration in human muscles.

_____ [2]

(ii) Describe **one** difference in the products of anaerobic respiration in human muscles and yeast.

_____

_____ [1]

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9 Rivers are often polluted with nitrates.

(a) Give **one** source of the nitrates in polluted river water.

_____ [1]

(b) Increased nitrate concentration can lead to a decrease in the concentration of oxygen dissolved in river water.

Explain how.

_____

_____

_____

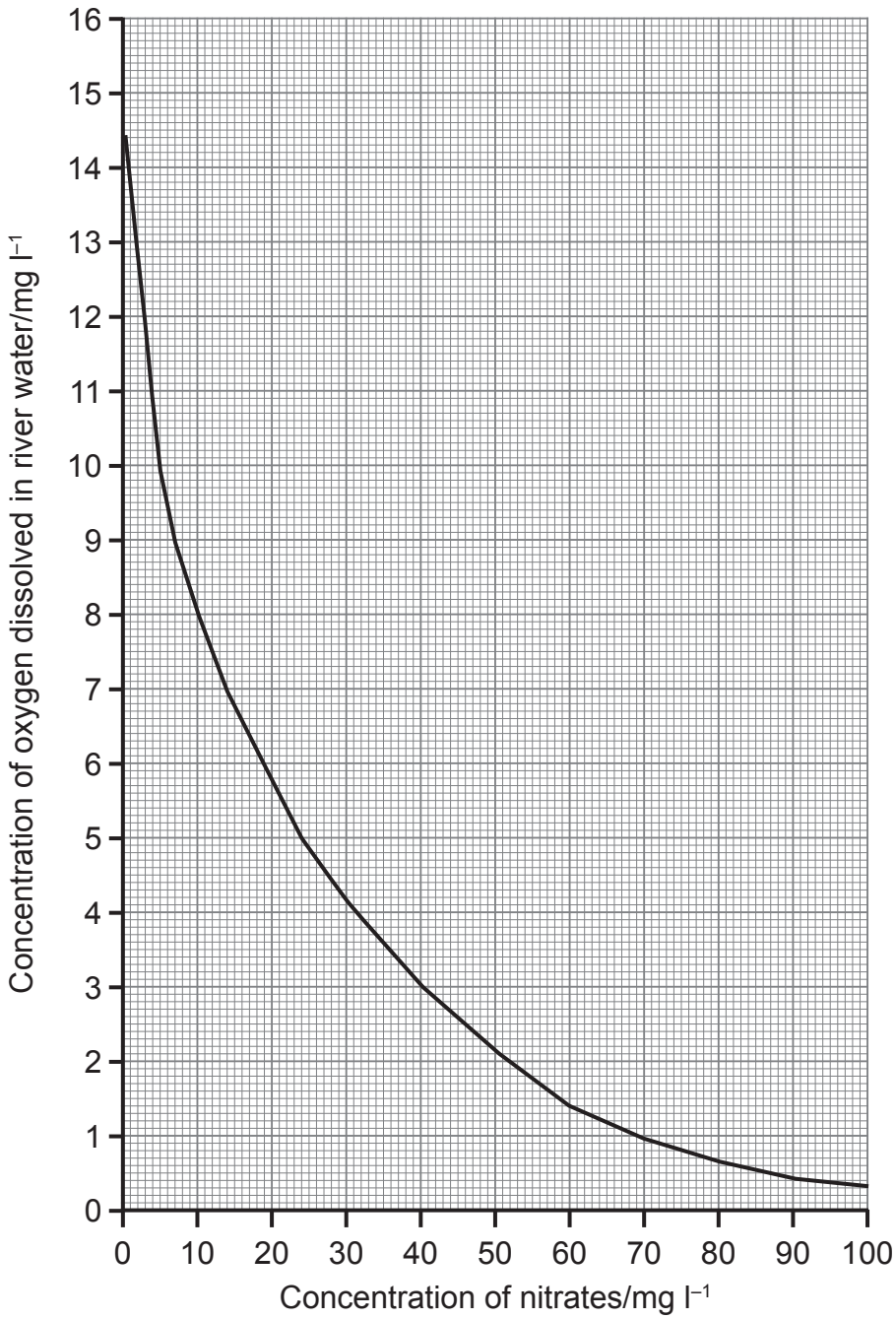
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_____

_____ [3]

[Turn over

The graph shows how the concentration of oxygen dissolved in river water varies with the concentration of nitrates.



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The concentration of nitrates was sampled in three rivers, **A**, **B** and **C**.

The table shows the results.

River	Concentration of nitrates /mg l^{-1}
A	18.5
B	5.0
C	43.0

River water with less than 3 mg l^{-1} of oxygen dissolved in it is lethal to many aquatic animals.

The number of bloodworms in the river may be used as a measure of the water quality.

(c) Suggest which river may have the largest number of bloodworms.

Explain your answer using data from the graph.

River _____

Explanation _____

_____

_____

_____

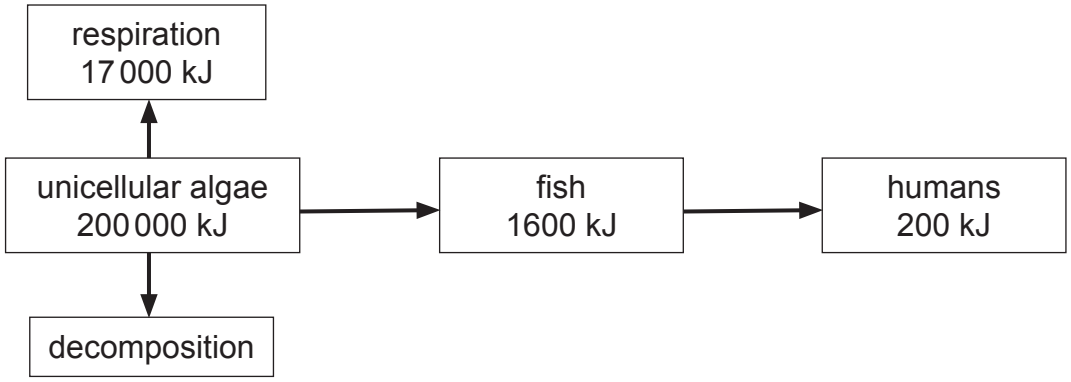
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_____

_____ [3]

[Turn over

10 The diagram shows the flow of energy through a marine food chain.



(a) Less than 1% of the light energy hitting the sea is used by the unicellular algae in photosynthesis.

Suggest what happens to the other 99% of the light energy.

_____

_____ [1]

(b) How much of the energy trapped by the unicellular algae passes to the decomposers?

Show your working.

_____ [3]

(c) Calculate what percentage of the energy trapped by the unicellular algae passes to the secondary consumers.

Show your working.

_____ [2]

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Unicellular algae grow quickly and have a high protein content.

They can be grown in large quantities and used to make single cell protein for humans to eat.

(d) Rather than eating fish it would be better to use unicellular algae to provide food for the growing human population.

Use data from the food chain to explain why.

_____

_____

_____

_____

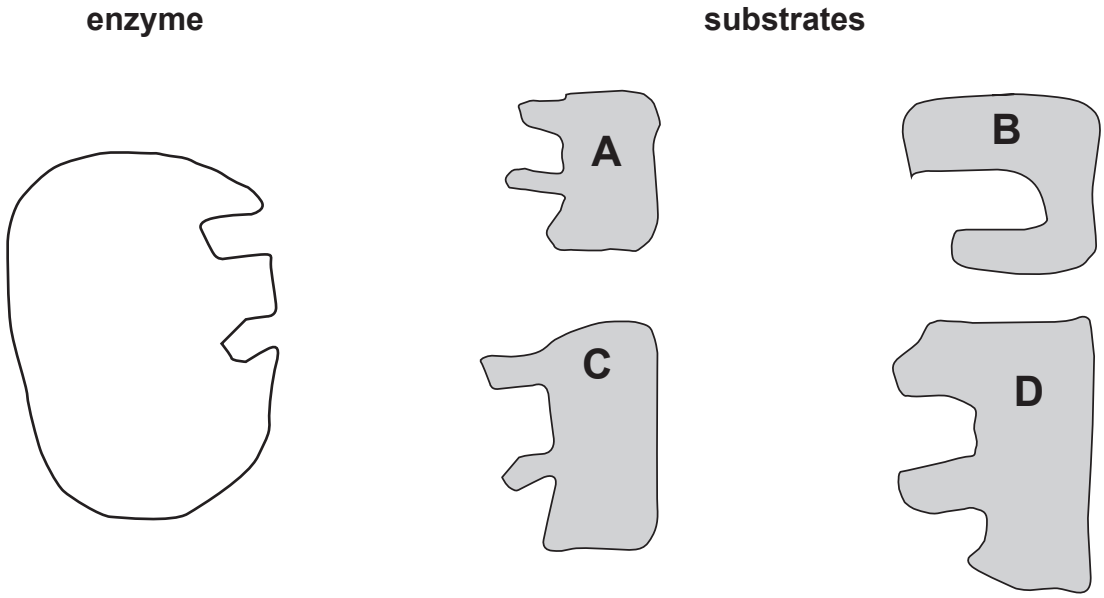
_____

_____

_____ [3]

[Turn over

11 The diagram shows an enzyme and four substrate molecules.



(a) (i) Which substrate molecule will react with this enzyme?

_____ [1]

(ii) Explain why this is the only substrate which will react with enzyme.

_____

_____

_____

_____

_____

_____

_____ [3]

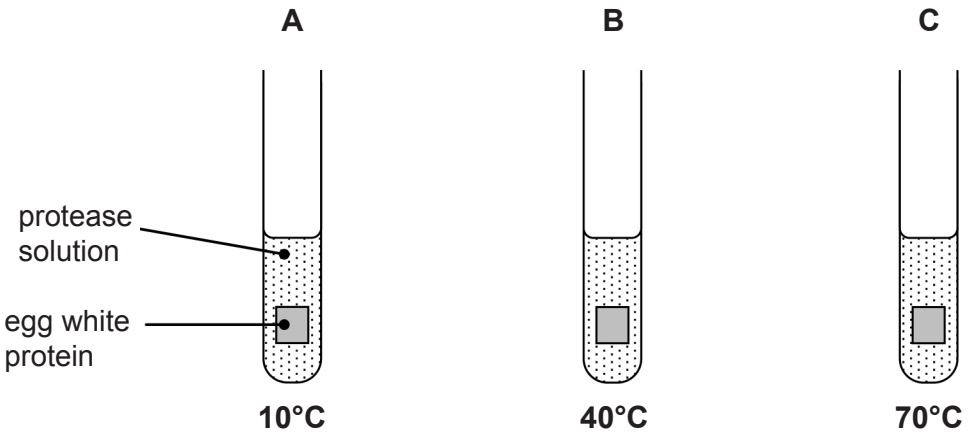
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(b) A student set up three test tubes to investigate the effect of temperature on the action of a human protease enzyme on egg white protein.

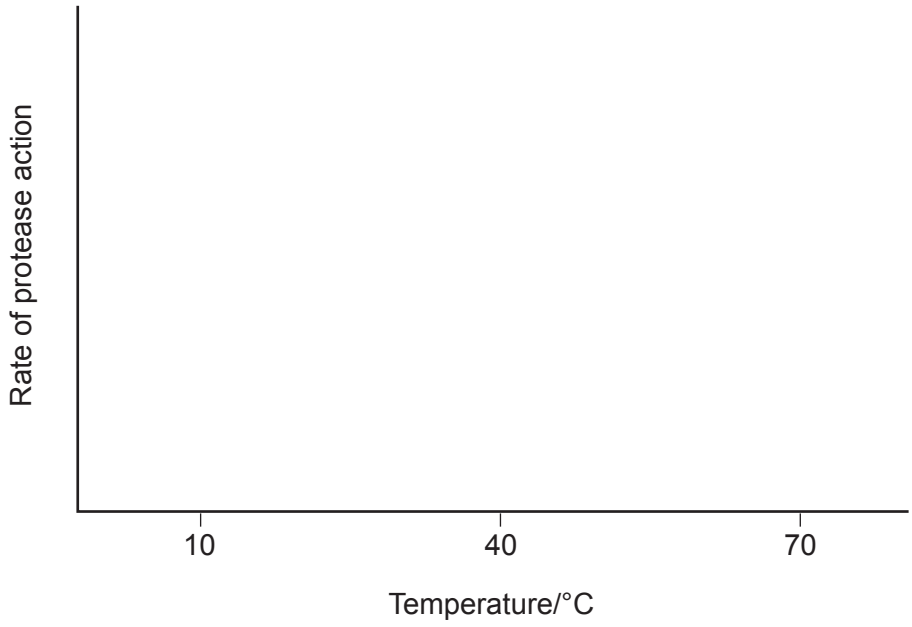
The optimum temperature of human enzymes is 37°C.

He added a 1 cm^3 cube of egg white protein and 20 ml of protease solution to each test tube.

He then placed the test tubes in water baths at 10°C, 40°C and 70°C.



(i) **Sketch** a graph, on the axes provided, to show how temperature affects the rate of this protease action.



[1]

[Turn over

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(ii) Explain the rate of reaction at 10°C and 70°C.

_____

_____

_____

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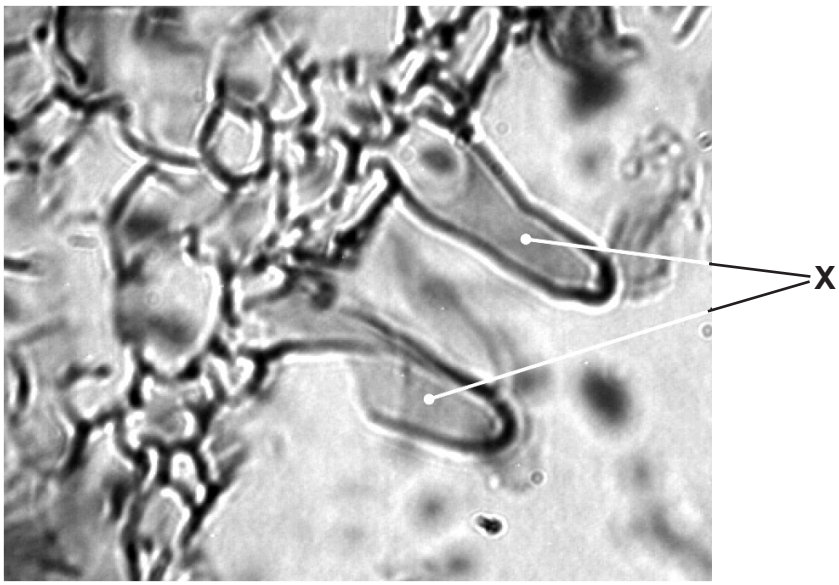
_____

_____ [4]

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12 (a) Nitrates in the soil are absorbed by plant roots.

The photograph shows a section of a root viewed through a microscope.



Source: Principal Examiner

(i) Identify the cells labelled **X**.

_____ [1]

(ii) Give one way, visible in the photograph, cells **X** adapt plants to absorb nitrates.

_____

_____ [1]

(iii) Explain why farmers need to add fertiliser to their fields each year.

_____

_____

_____ [2]

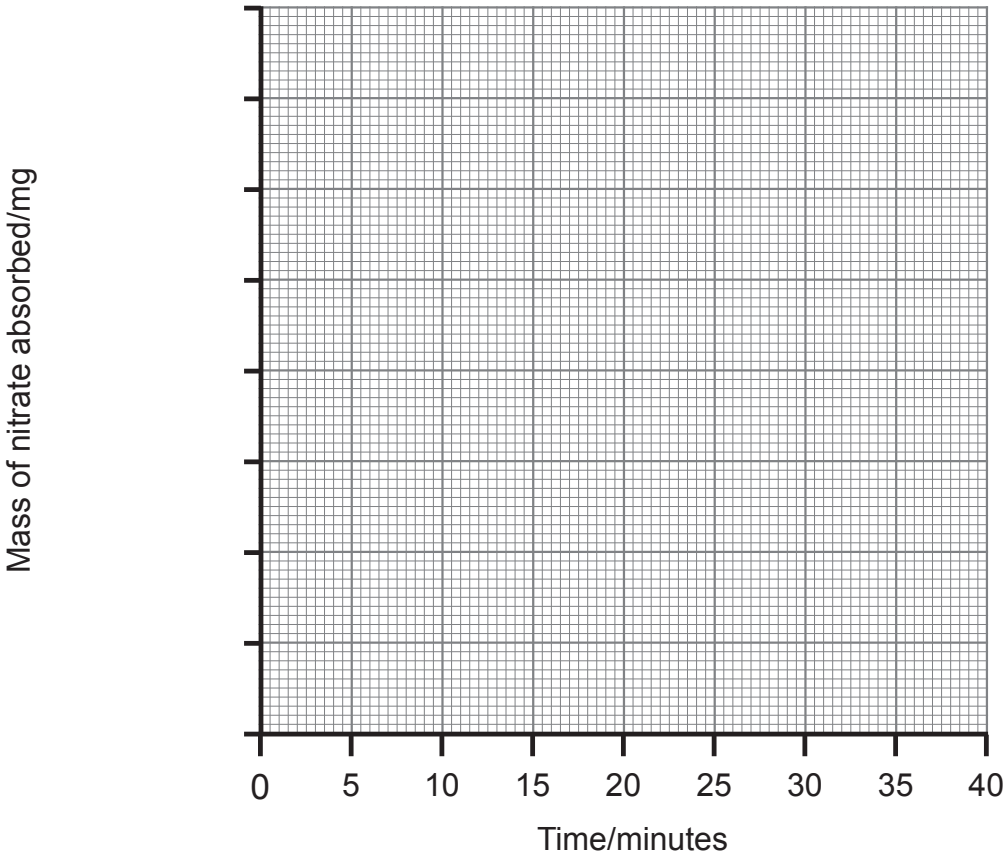
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(b) The table shows the mass of nitrate absorbed by a root over forty minutes at 5°C and 25°C.

Time /minutes	Mass of nitrate absorbed /mg	
	5°C	**25°C**
0	0.00	0.00
10	0.08	0.08
20	0.09	0.10
30	0.09	0.12
40	0.09	0.14

(i) Complete the graph of these results.



[5]

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(ii) Compare the mass of nitrate absorbed at 5°C and 25°C over the forty minute period.

Explain the differences.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
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11	
12	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2016

GCSE Biology

Unit 1

Higher Tier

[GBY12]

FRIDAY 10 JUNE, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

		AVAILABLE MARKS
1	**(a)** Quadrat; [1]	
	(b) Ensure sample unbiased/make it a fair test/representative; [1]	
	(c) Count/average the number of daisies **per** quadrat/apparatus X/0.25 m^2; [1] Multiply the number per quadrat by 4/sum or add 4 quadrats; [1] [2]	4
2	**(a)** Dissolves in/combines/reacts; with water (in clouds)/water vapour; [2]	
	(b) Defoliates trees (which then die)/(acidifies lakes so) animals die; [1]	
	(c) Sulfur dioxide emissions decrease; Burning less coal/smokeless zones/laws inforced to reduce emissions/ catalytic converters in cars/low sulfur fuels/burn less fossil fuels/increased use of renewable energy; [2]	5
3	**(a)** **A** – retina; [1] Contains light sensitive cells/rods/cones; [1] **B** – vitreous humour; [1] Maintains shape of eye; [1] [4]	
	(b) Focus/bend/refract light on to retina; [1]	5

4 **Indicative Content**

1 (Less trees/less plants so) less photosynthesis;
2 Less CO_2 used by plants/less CO_2 absorbed from atmosphere;
3 Combustion/burning produces/releases CO_2 into atmosphere;
4 Overall CO_2 in atmosphere increases;
5 (Increased atmospheric CO_2 linked to) global warming/increased temperature;
6 Irregular weather pattern;
7 Ice caps melt/flooding/sea levels rise;
8 loss of habitat/species

Accept: bullet points which start with capital letter, contain a verb and end in full stop as sentences.

Band	Response	Mark
A	Candidates **must use appropriate, specialist terms** throughout **using <u>at least 5</u> of the points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
B	Candidates use **some appropriate, specialist terms** throughout **using <u>at least 3</u> of the points**. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
C	Candidates make **little use of specialist terms** throughout **using <u>at least 1</u> of the points**. The spelling, punctuation and grammar, form and style are of a **limited** standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6] 6

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				AVAILABLE MARKS
5	**(a)**	A – Trachea; [1] B – Bronchiole; [1] C – Alveolus/alveoli; [1] D – Intercostal muscle; [1]	[4]	
	(b)	Any **four** from: Intercostal muscles contract; Ribs move up and out; Diaphragm contracts/flattens; Increased volume; Decreased pressure/pressure becomes lower than atmospheric;	[4]	8
6	**(a)**	Yellow/brown; [1] to blue/black; [1]	[2]	
		Iodine diffuses/moves/spreads out; [1] Through starch agar; [1] From a high [iodine] concentration to a low [iodine] concentration/down concentration gradient; [1]	[3]	
	(b)	**Conclusion** – Increasing temperature increases diffusion [rate]; [1] **Petri dish 3** – Larger/largest dark area, when temperature is highest/ 20 °C; [1] Iodine molecules move further/faster/have more [kinetic] energy; [1]	[3]	
	(c)	Dark area drawn greater than in Petri dish at 15 °C;	[1]	9
7	**(a)**	**(i)** Males have higher energy requirement than females; [1] Males have greater proportion of/more muscle; [1] accept converse	[2]	
		(ii) 9350 – 8500/850; ÷ 8500; 10%;	[3]	
		(iii) Energy needed for growth of baby;	[1]	
		(iv) Activity/manual (physical) work vs desk work;	[1]	
	(b)	**(i)** Obesity increases then decreases; [1] up to/from 55–64 years; [1]	[2]	
		(ii) (30 – 20)/10;	[1]	
		(iii) From 2004 to 2015: 30 + 10 = 40;	[1]	
		(iv) % obese men aged 45–54 decreased/didn't follow trend;	[1]	
	(c)	Sick days/loss of work force/sick pay/sick benefits [1] Cost of medical treatment/to NHS; [1]	[2]	14

				AVAILABLE MARKS
8	**(a)**	$C_6H_{12}O_6$; [1] $6H_2O$; [1] $6CO_2$; [1]	[3]	
	(b)	Alcohol/ethanol: produced by anaerobic/not by aerobic; [1] Water: produced by aerobic/not by anaerobic; [1] Energy: aerobic produces more than anaerobic; [1]	[3]	
	(c)	**(i)** Glucose; [1] → lactic acid + energy; [1]	[2]	
		(ii) CO_2 (produced in yeast)/yeast produces alcohol, **not** lactate	[1]	9
9	**(a)**	Fertiliser/slurry/urine/faeces/sewage;	[1]	
	(b)	Eutrophication; [1] Plant growth/algal bloom; [1] Plant death; [1] Increased bacterial respiration/decomposition; [1] (any **three**)	[3]	
	(c)	C; [1] 2.7<2.8 mg l^{-1} of oxygen dissolved in the water; [1] Bloodworms are able to survive/tolerate low oxygen concentration; [1]	[3]	7
10	**(a)**	Any **one** from: Reflected off the sea/water; Misses the unicellular algae/absorbed [used] by other plants Some changed into heat/absorbed by water;	[1]	
	(b)	200 000 – (17 000 + 1600); [1] 181 400; [1] kJ [1]	[3]	
	(c)	(200 ÷ 200 000) × 100; [1] 0.1%; [1]	[2]	
	(d)	Shorter food chain/human acting as primary rather than secondary consumer; [1] Less energy lost; [1] Humans would receive 1600 kJ rather than 200 kJ/8 times more energy; **or** have access to 200,000 kJ rather than 1600 kJ/198,400 kJ more/ 125 times more [1]	[3]	9

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					AVAILABLE MARKS
11	**(a)**	**(i)**	**C**;	[1]	
		(ii)	Shape complementary with/fits enzyme's active site; [1] Enzymes are specific; [1] Lock and key [1]	[3]	
	(b)	**(i)**	Correct shape and correct optimum temperature	[1]	
		(ii)	10 °C – slow reaction; [1] enzyme molecules have little (kinetic) energy/reduced number/few collisions; [1] 70 °C – **no** reaction; [1] enzyme denatured; [1]	[4]	9
12	**(a)**	**(i)**	Root hair cell;	[1]	
		(ii)	Large surface area;	[1]	
		(iii)	Replace/provide (nitrates/proteins); [1] Removed/harvested; [1]	[2]	
	(b)	**(i)**	y-axis scale; [1] Plots [× 2]; [2] Lines; [1] Key/lines labelled [5 °C, 25 °C]; [1]	[5]	

(ii) **Indicative Content:**

1 More nitrates absorbed at higher temperature/25 °C;
2 Same [rate] over first 10 min;
3 5 °C – **stops** after 20 min/stays at 0.09 mg; **or** 25 °C – Slows down/continues at slower rate after 10 min/slows down;
4 25 °C/higher temperature gives higher [enzyme] activity;
5 More respiration/energy released;
6 For active transport of nitrates/against diffusion gradient;

Accept: bullet points which start with capital letter, contain a verb and end in full stop as sentences.

Band	Response	Mark
A	Candidates **must use appropriate, specialist terms** throughout **using five of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
B	Candidates **use some appropriate, specialist terms** throughout **using three of the above points**. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
C	Candidates make **little use of specialist terms** throughout **using some or all of the above points**. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
D	Response not worthy of credit.	[0]

[6] 15

Total **100**

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015

Biology

Unit 1
Higher Tier

[GBY12]

GBY12

FRIDAY 5 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twelve** questions.

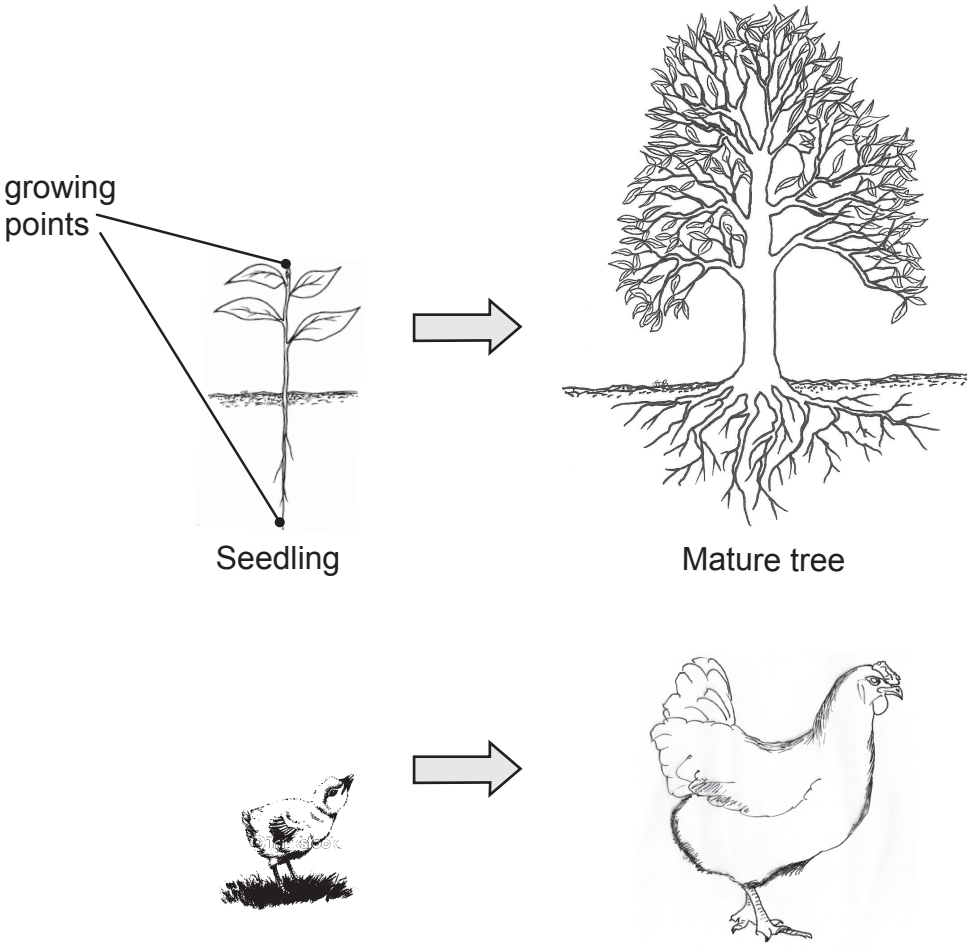
INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **12(e)**.

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1 Animals grow differently from plants.

The drawings show the growth of a seedling to a mature tree and a chick to a chicken.



© Dorling Kindersley/ Thinkstock

Look at the drawings.

(a) **Use the drawings** to compare the patterns of growth of a seedling and a chick.

_____

_____

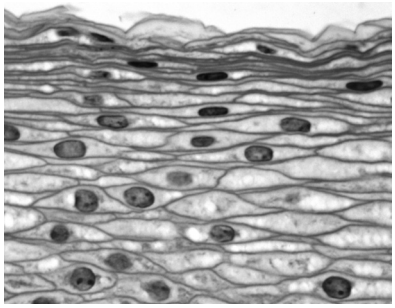
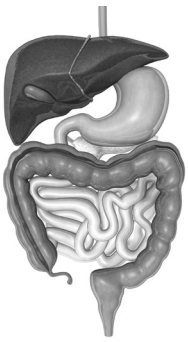
_____

_____ [3]

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(b) Organisms are made up of cells which group together to form different tissues which have higher levels of organisation.

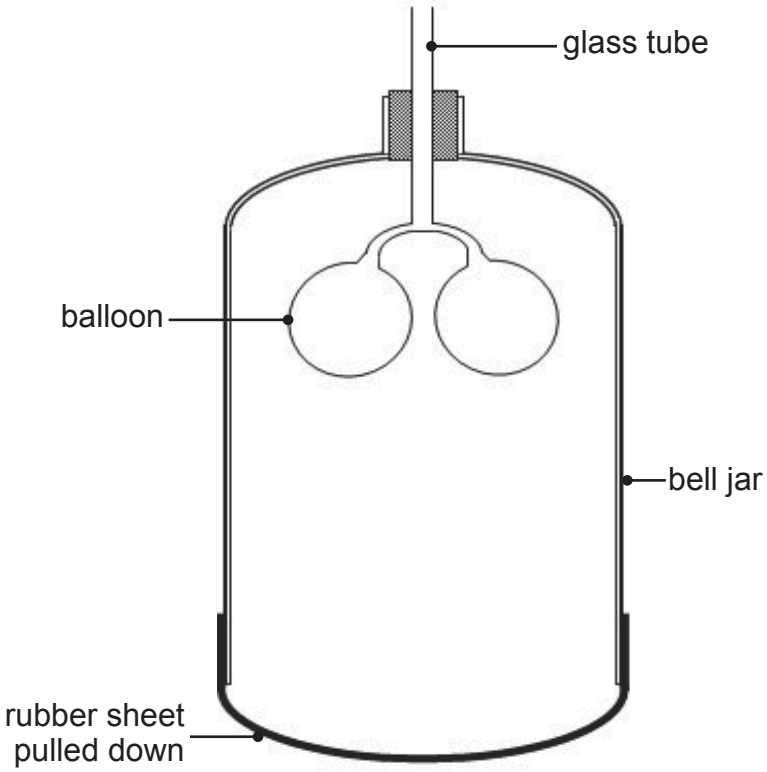
Complete the table to show which level of organisation describes each body part shown.

Body part	Level of organisation
 *Dr Gladden Willis/Visuals Unlimited/ Science Photo Library*	tissue
 *© 3drenderings/ iStock/ Thinkstock.com*	
 *© Anna Omelchenko/ iStock/ Thinkstock.com*	

[2]

[Turn over

2 The diagram shows a model of the respiratory system.



© CCEA

Look at the diagram.

(a) Name the parts of the **respiratory system** represented by the glass tube and the rubber sheet.

glass tube _____ [1]

rubber sheet _____ [1]

(b) **Describe and explain** what would happen to the balloons if the rubber sheet was **pushed up**.

Description _____

_____ [1]

Explanation _____

_____

_____ [2]

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3 A student wanted to compare the number of flying insects in two areas of long grass.

(a) (i) Describe how he could use a net to sample the flying insects in each area.

_____

_____

_____ [2]

(ii) Explain what he should do to make sure the results for the two areas can be compared.

_____

_____

_____ [2]

(b) What apparatus can be set up and left for twenty four hours to collect crawling insects in long grass?

_____ [1]

[Turn over

4 The table shows the results of food tests carried out on a biscuit.

Test reagent	Reagent colour at start	Result of food test
Benedict's	blue	positive
Ethanol	clear	positive
Biuret	blue	negative
Iodine	yellow/brown	positive

© CCEA

Look at the table.

Use the information in the table to draw conclusions about the types of food in the biscuit.

Describe the colour change for each food test.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

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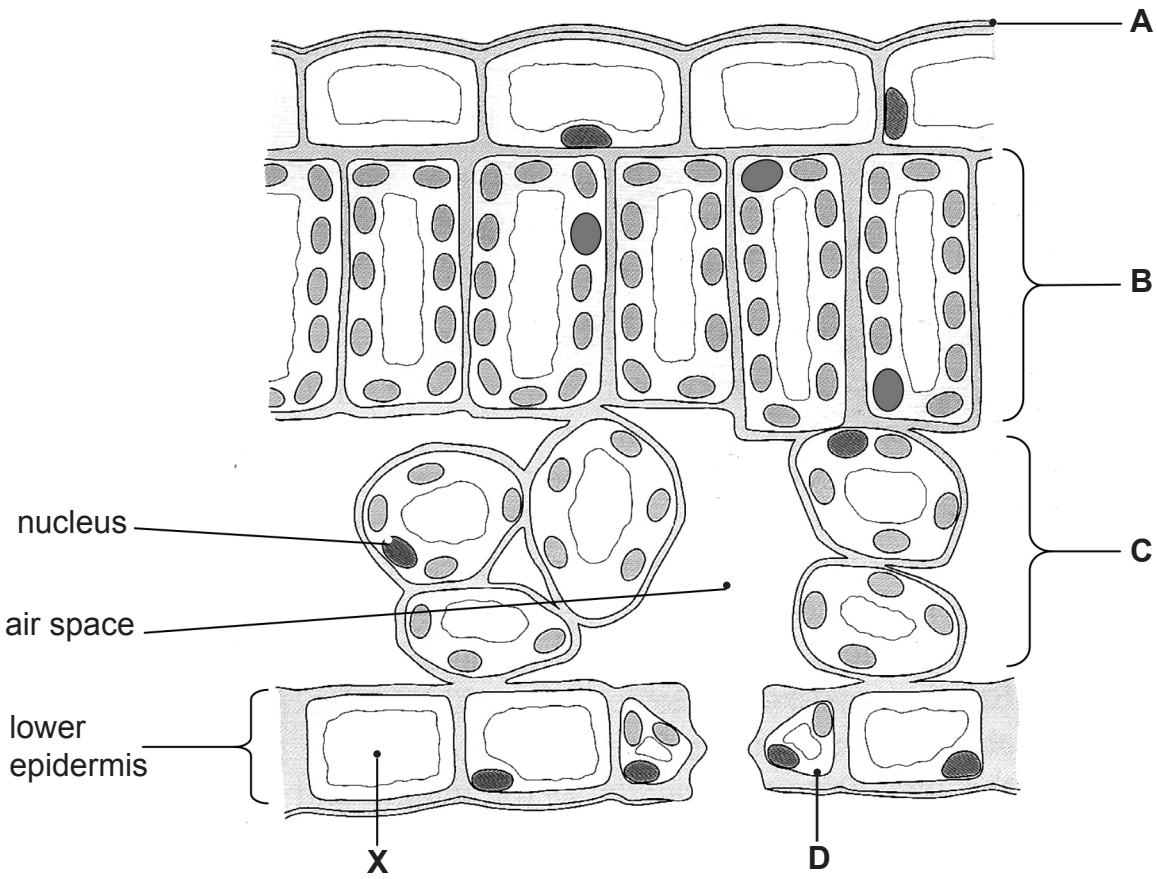
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(Questions continue overleaf)

[Turn over

5 The diagram shows part of a cross section of a leaf viewed through a microscope.



© GCSE Biology for CCEA, 2nd Edition by James Napier. Published by Hodder Education in 2011. ISBN: 9780340983805. Reproduced by permission of Hodder Education

(a) Name layers **A**, **B**, **C** and **cell D**.

A _____ [1]

B _____ [1]

C _____ [1]

D _____ [1]

(b) Suggest why there is no nucleus visible in cell **X**.

_____

_____ [1]

(c) Layer **C** is adapted for gas exchange.

Give **one** adaptation visible in the diagram.

_____

_____ [1]

(d) Use the diagram to describe **two** ways the **cells** in layer **B** are better adapted for absorbing light than the cells in layer **C**.

1. _____

_____

2. _____

_____ [2]

[Turn over

6 **(a)** Plants respond to light.

(i) Name this response.

_____ [1]

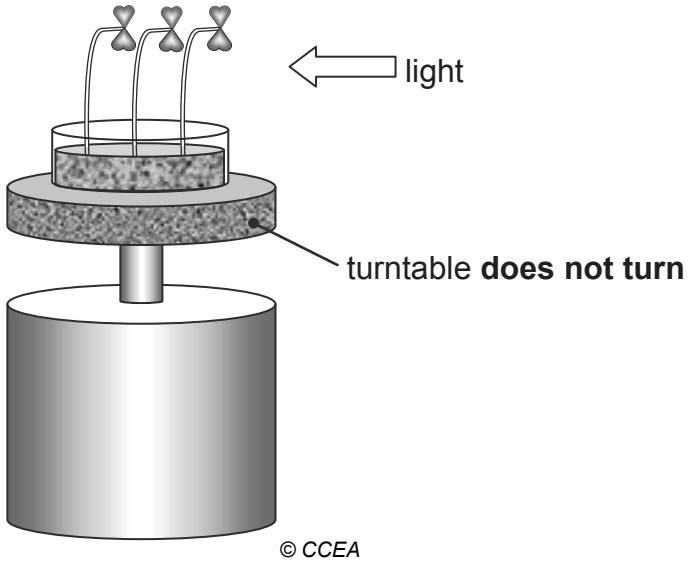
(ii) Name the plant hormone that causes the response.

_____ [1]

The diagram shows the results of an experiment to investigate the effect of light from one side on the growth of seedlings.

Seedlings **A** were placed on a turntable that **does not turn**.

Seedlings A



© CCEA

(b) Explain how the hormone causes the response shown in seedlings **A**.

_____

_____

_____

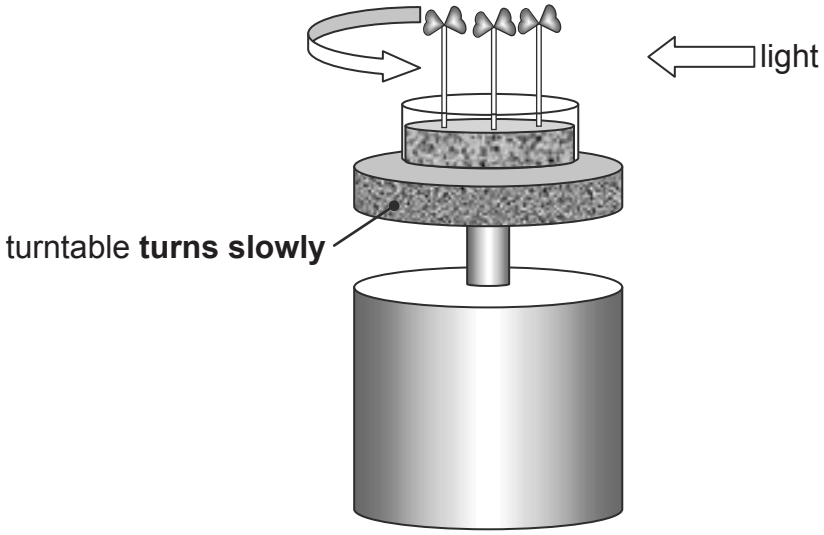
_____ [3]

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(c) The experiment was repeated with the turntable **turning slowly**.

The diagram shows the results.

Seedlings B



© CCEA

Describe and explain the difference in the response of seedlings **B** to the turntable turning slowly.

Description _____

_____ [1]

Explanation _____

_____

_____

_____ [2]

[Turn over

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7 **(a)** An unhealthy diet can cause obesity.

(i) Give **two** components of an unhealthy diet that can cause obesity.

1. _____ [1]

2. _____ [1]

Obesity can also be caused by an imbalance between the amount of energy taken in and the energy used in exercise.

(ii) Describe this imbalance.

_____

_____ [1]

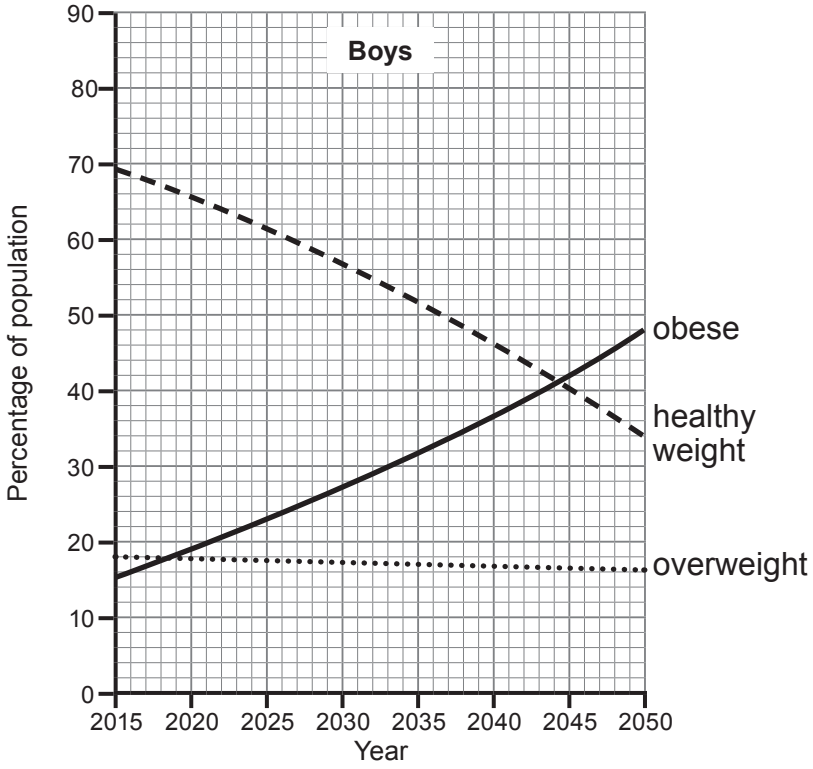
(iii) Name **two** diseases of the circulatory system that are caused by obesity.

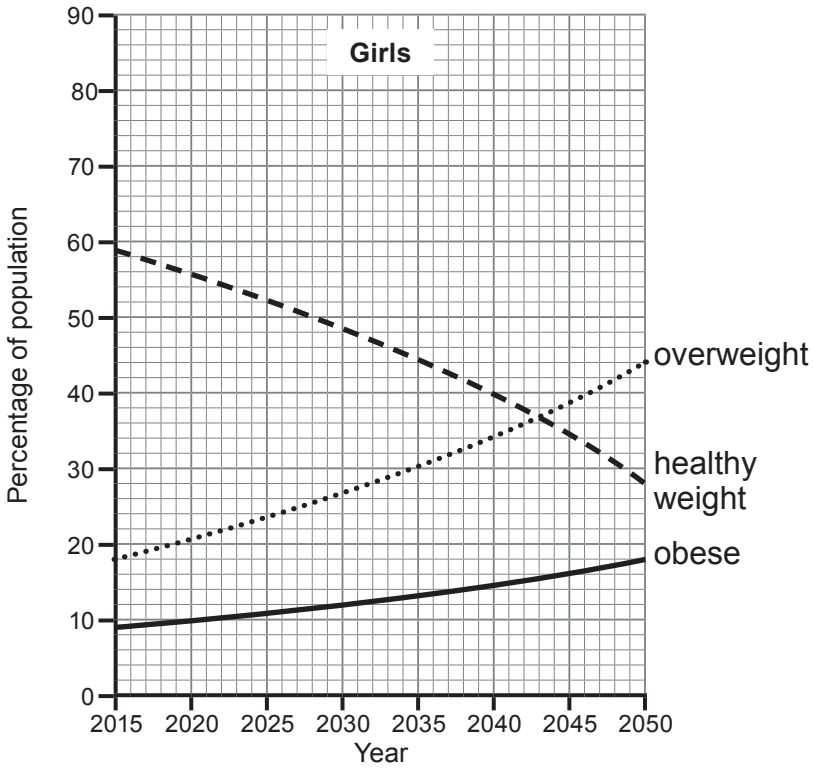
1. _____ [1]

2. _____ [1]

[Turn over

The graphs show the percentage of boys and girls, aged 6 to 10, who are expected to be a healthy weight, overweight and obese between 2015 and 2050 in the UK.





© Crown Copyright - https://www.gov.uk/government/publications/reducing-obesity-modelling-future-trends

Look at the graphs to answer parts **(iv)** and **(v)**.

(iv) Describe **two** similarities in the trends for boys and girls from 2015 to 2050.

1. _____

_____

2. _____

_____ [2]

(v) Describe **two** ways the trends for boys and girls from 2015 to 2050 differ.

1. _____

_____

2. _____

_____ [2]

[Turn over

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(b) The table shows the number of people in Northern Ireland who are obese and the number of people in Northern Ireland with diabetes from 2008 to 2013.

Year	Number of people suffering	
	Obesity	Diabetes
2008	161 871	60 822
2009	165 956	65 066
2010	174 180	68 980
2011	170 840	72 693
2012	167 150	75 837
2013	168 976	79 072

© Crown Copyright - http://www.ninis2.nisra.gov.uk

(i) Give evidence from the table which supports the conclusion that obesity can cause diabetes.

_____

_____

_____ [1]

(ii) Give evidence from the table which suggests that obesity is **not the only** cause of diabetes.

_____

_____

_____ [1]

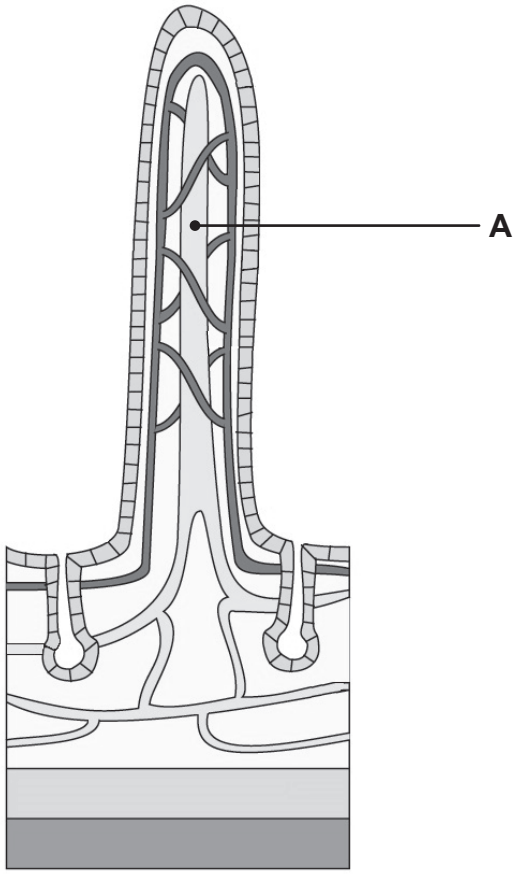
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(Questions continue overleaf)

8 The diagram shows a section through a villus.



© CCEA

(a) Name part **A** and describe its function.

_____

_____

_____ [2]

(b) The villus is adapted for absorbing digested food by maintaining a high concentration gradient.

Explain how the villus maintains a high concentration gradient.

_____

_____

_____ [2]

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(c) Describe **one other** adaptation of the villus and explain how it brings about absorption of digested food.

_____

_____

_____ [2]

[Turn over

9 Photographs **A** and **B** show activities which can lead to global warming.

Photograph **A**



© Mischa Kejiser / Science Photo Library

Photograph **B**



© Dr. Morley Read / Science Photo Library

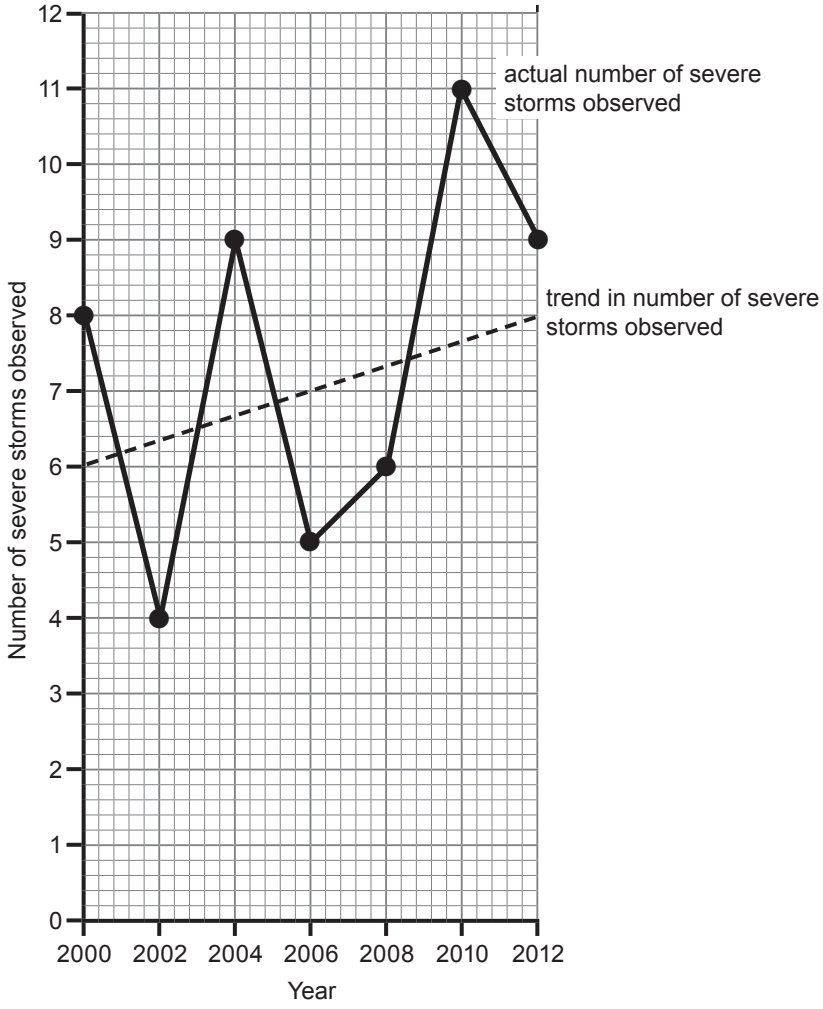
(a) Describe the activity shown in each photograph and explain how these activities may cause increased global warming.

[4]

[Turn over

(b) Changes in the number of severe storms in the North Atlantic are thought to be evidence of global warming.

The graph shows the actual number and the trend in the number of severe storms observed in the North Atlantic Ocean between 2000 and 2012.



Adapted from: www.gfdl.noaa.gov/global-warming-and-hurricanes-figures

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(i) Suggest why scientists use the trend in the number of severe storms as evidence to support increasing global warming.

Include data from the graph in your answer.

_____

_____

_____

_____ [2]

(ii) Explain why the records for the actual number of severe storms observed between 2000 and 2006 could cause uncertainty about the prediction of global warming.

_____

_____

_____

_____ [2]

(iii) Suggest how such uncertainty about the evidence of global warming may be overcome.

_____

_____

_____ [1]

[Turn over

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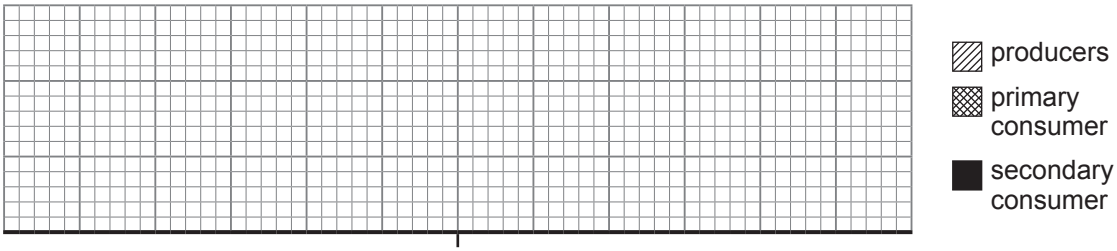
10 (a) The table shows the biomass of organisms at each trophic level in a food chain.

Trophic level	Biomass/g m^{-2}
Producers	11 000
Primary consumers	800
Secondary consumers	40

(i) **Use the information in the table** to draw a pyramid of biomass.

Use a scale of 5 small squares to represent 1 000 g m^{-2}.

Use the key shown.



[3]

(ii) Give one advantage and one disadvantage of using a pyramid of biomass rather than a pyramid of numbers.

Advantage _____

_____

_____ [1]

Disadvantage _____

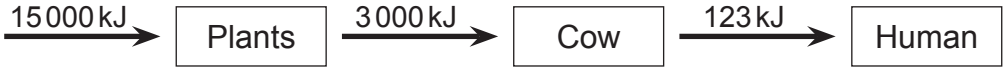
_____

_____ [1]

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(b) The diagram shows the flow of energy through a food chain.

The values are for $1m^2$ of ground.



(i) Calculate the percentage of energy reaching the primary consumer which is available to the secondary consumer.

Show your working.

_____ % [2]

(ii) Explain **two** reasons for this decrease in energy available to the secondary consumers.

_____

_____

_____

_____ [2]

(iii) Charities provide people living in countries suffering from famine with rice or cereals rather than meat.

Use evidence from the food chain to explain why.

_____

_____

_____

_____ [2]

[Turn over

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11 Manufacturers use protease enzymes to pre-digest food for babies.

(a) Suggest why the food is blended to a fine pulp before the enzyme is added.

_____

_____

_____ [2]

(b) A manufacturer carried out an experiment to find out the optimum pH for a protease enzyme.

Equal volumes of different pH solutions were placed in separate test tubes.

0.5 g of blended food was placed in each test tube.

5 ml of 1% protease enzyme solution was added to each test tube.

The time taken to digest the food was recorded for each test tube.

(i) Give **one other** factor that must be controlled in this experiment.

_____ [1]

(ii) Suggest how this factor should be controlled.

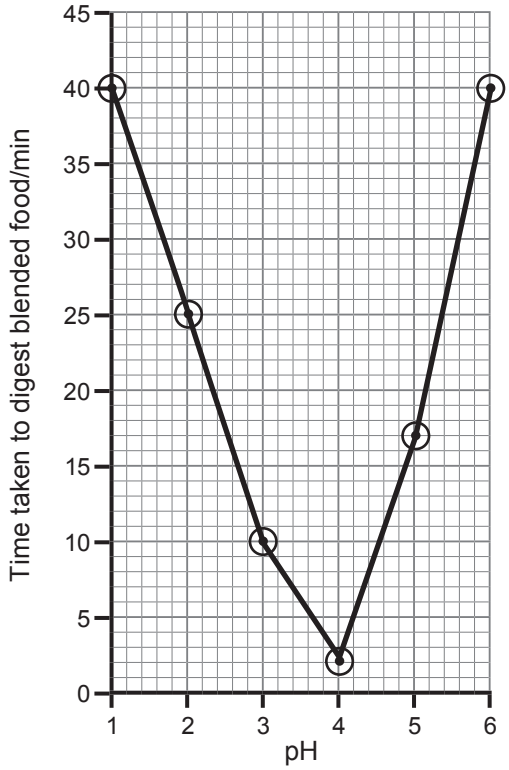
_____

_____

_____ [1]

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(c) The results of the experiment are shown in the graph.



(i) What is the optimum pH for this enzyme?

_____ [1]

(ii) The experiment could be improved to find a more **accurate** value for the optimum pH.

Suggest how.

_____

_____

_____ [1]

[Turn over

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(iii) The rate at which the enzyme digested the 0.5 g of blended food at pH 2 is 0.02 g per minute.

Calculate the rate of digestion at pH 1.

Show your working.

_____ g per minute [2]

(iv) Explain the results for pH 1.

_____

_____

_____

_____ [2]

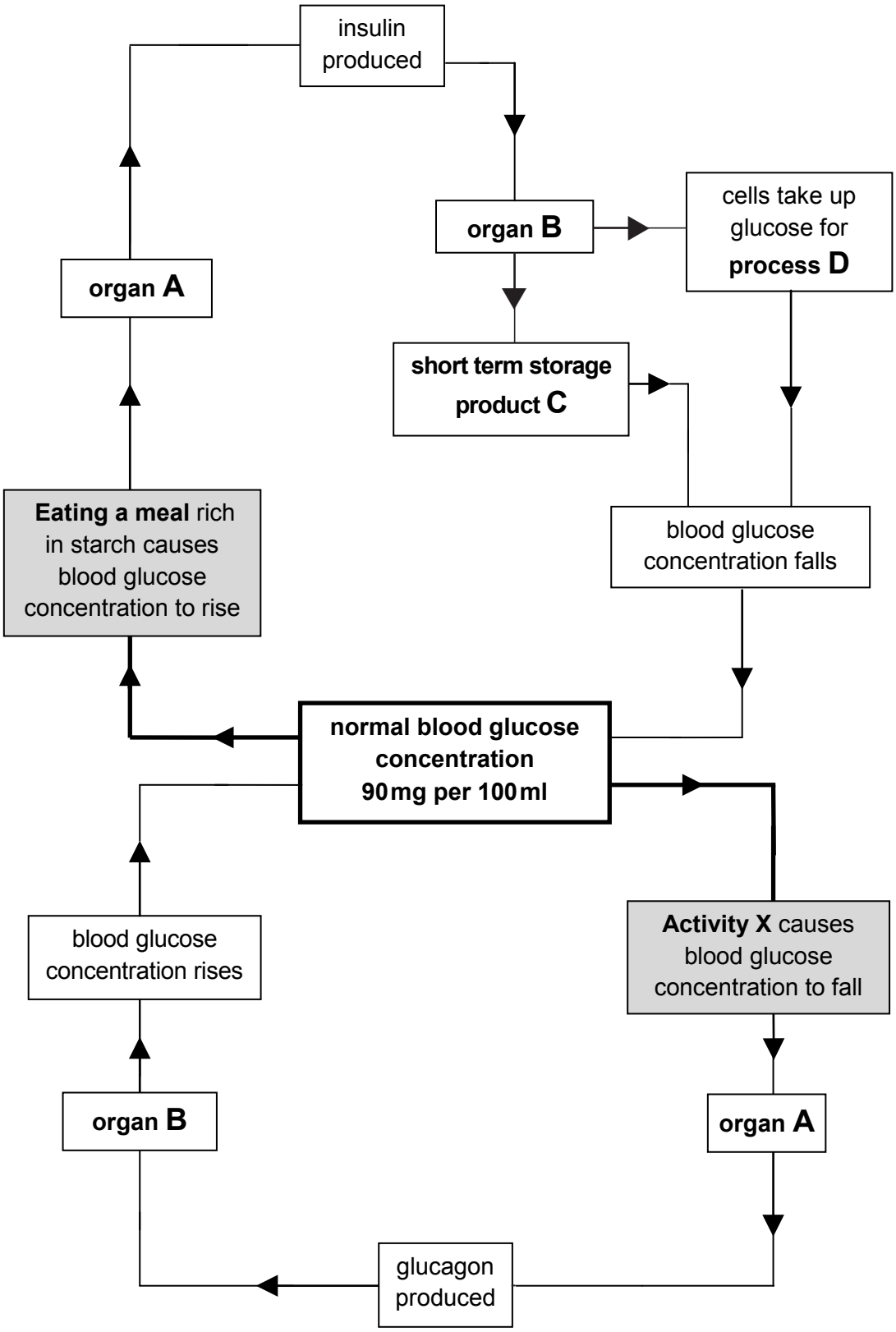
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(Questions continue overleaf)

12 The diagram shows the control of blood glucose.



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(a) Name organs **A** and **B**, the short-term storage product **C** and process **D**.

Organ **A** _____ [1]

Organ **B** _____ [1]

Short-term storage product **C** _____ [1]

Process **D** _____ [1]

(b) Explain why eating a meal rich in starch causes the blood glucose concentration to rise.

_____

_____ [1]

(c) **Activity X** causes the blood glucose concentration to fall.

Suggest one example of **activity X**.

_____ [1]

(d) Use information from the diagram to help describe how the control of blood glucose by insulin is an example of a negative feedback mechanism.

_____

_____

_____

_____

_____

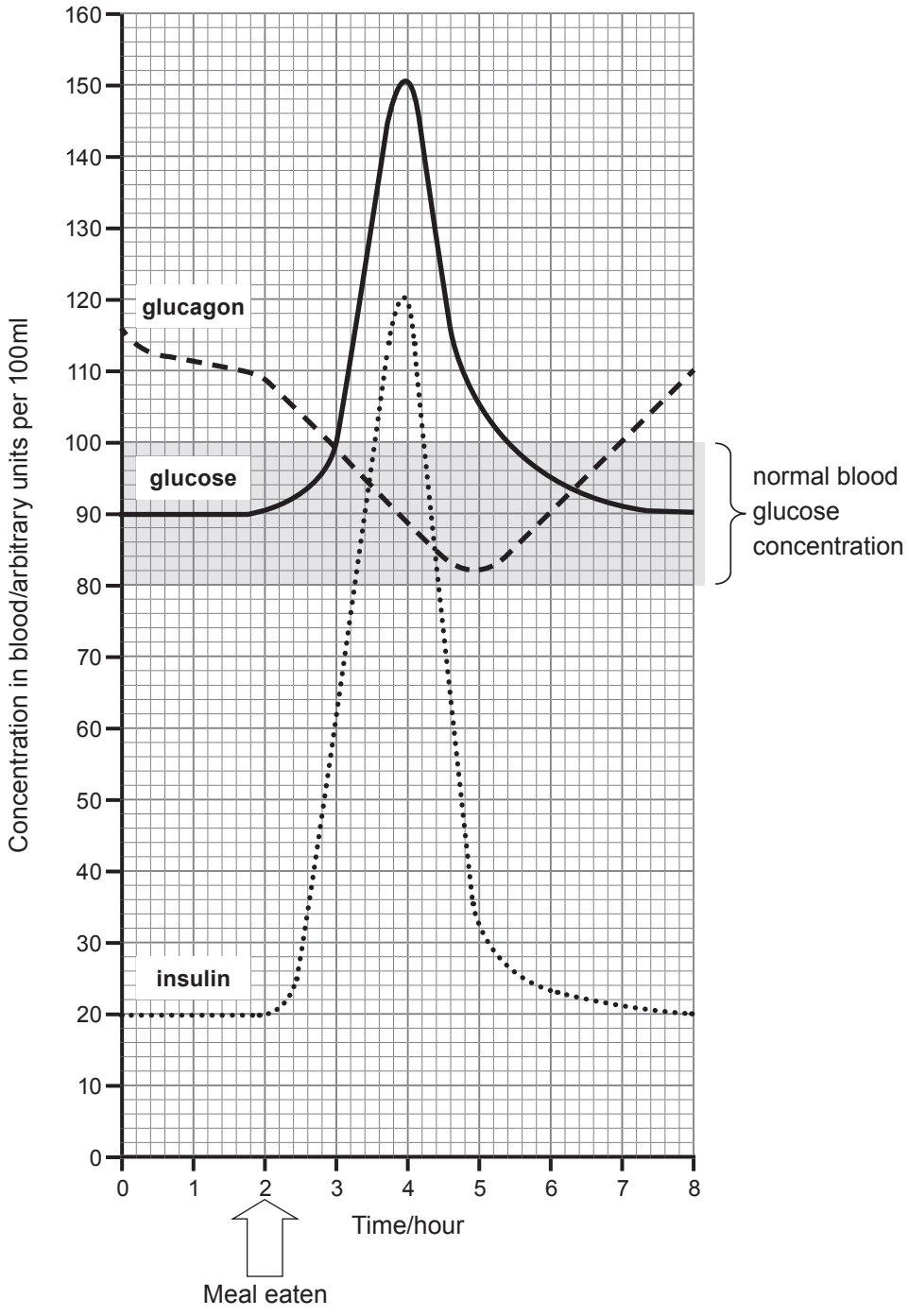
_____

_____

_____ [4]

[Turn over

(e) The graph shows changes in the concentration of glucose, insulin and glucagon in the blood of a healthy adult over a period of 8 hours, during which he ate a meal rich in starch.



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Describe and explain how insulin and glucagon work together to control the concentration of glucose in the blood **before** and **after** the meal.

Use evidence from the diagram and data from the graph to support your answer.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

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Question Number	**Marks**
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11	
12	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015

Biology

Unit 1

Higher Tier

[GBY12]

FRIDAY 5 JUNE, AFTERNOON

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

					AVAILABLE MARKS
1	**(a)**	Plants grow from apices/growing points; [1] Produce/in a branching pattern; [1] Animals grow all over; [1]	[3]		
	(b)	*Digestive system* – (Organ) system; [1] *Eye* – Organ; [1]	[2]		5
2	**(a)**	Trachea; [1] Diaphragm; [1]	[2]		
	(b)	*Description* – Balloons deflate/described; [1] *Explanation* – Reduced volume (inside bell jar); [1] Increased pressure/forces air out; [1]	[3]		5
3	**(a)**	**(i)** Sweep/wave/drag (back and forth/side to side/figure of eight) [1] Through/over the grass; [1]	[2]		
		(ii) Any **two** from: Same net; Sweep net same length of time/number of times; Same day/time of day; Same size of area;	[2]		
	(b)	Pitfall trap;	[1]		5

4 **Indicative content**

1. Sugar/glucose present;
2. Benedict's solution changes from **blue to** brick red;
3. Fats/lipids present;
4. Ethanol changes from **clear to** white (emulsion);
5. Starch present;
6. Iodine changes from **yellow/brown to** blue/black;
7. Protein absent;
8. No colour change of Biuret;

Response	Marks
Candidates **must use appropriate, specialist terms throughout** to describe and explain their conclusions **using at least SIX** of the above points. They use good spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates **use some appropriate, specialist terms throughout** to describe and explain their conclusions **using at least FOUR** of the above points. They use satisfactory spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates **make little use of specialist terms throughout** to describe and explain their conclusions **using at least TWO** of the above points. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

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					AVAILABLE MARKS
5	**(a)**	A – Cuticle [1] B – Palisade (mesophyll); [1] C – Spongy mesophyll [1] D – Guard (cell); [1]		[4]	
	(b)	Not visible in this section/in another section of the cell;		[1]	
	(c)	Large surface area/(contact with) air spaces;		[1]	
	(d)	Any **two** from: Nearer the (upper) surface/(sun)light; Palisade cells end on/at right angles to light/tightly packed; Contains **more** chloroplasts;		[2]	8
6	**(a)**	**(i)** Phototropism;		[1]	
		(ii) Auxin;		[1]	
	(b)	Any **three** from: Auxin/hormone produced at tip/moves down the stem; Unequal amount of auxin/more on shaded side; **Cell elongation** on shaded side; Growth towards light/bends towards light;		[3]	
	(c)	*Description:* shoots/seedlings grow straight/don't grow towards light; [1] *Explanation:* Any **two** from: equal light on all sides; equal amounts of auxin on all sides; cell elongation same on all sides/growth same on all sides; [2]		[3]	8
7	**(a)**	**(i)** High fat (content); [1] High sugar (content); [1]		[2]	
		(ii) **Energy intake** (greater) than **energy used** (in exercise);		[1]	
		(iii) Any **two** from: Strokes; Heart attacks/CHD/heart disease; High blood pressure;		[2]	
		(iv) Proportion/percentage/number of boys **and** girls with **healthy** weight **decreases**; [1] Proportion/percentage/number of boys **and** girls who are **obese increases**; [1]		[2]	
		(v) Proportion/percentage/number of **overweight boys decreases** while proportion/percentage/number **overweight girls increases**; [1] Greater proportion/percentage/number of **boys obese than girls**/healthy weight in boys decreases more; [1] Needs **comparison** between boys and girls **Accept** – More girls **overweight** than boys;		[2]	

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					AVAILABLE MARKS
	(b)	**(i)**	Both the number of people suffering obesity and diabetes increases (2008 to 2010)	[1]	
		(ii)	2010/2011 to 2012 number suffering from obesity falls but number suffering diabetes rises/continues to rise;	[1]	11
8	**(a)**		Lacteal;	[1]	
			Absorb fats;	[1]	[2]
	(b)		(Dense) capillary network/good blood supply;	[1]	
			Carries away absorbed products of digestion;	[1]	[2]
	(c)		Finger-like shape/microvilli;	[1]	
			Increase surface area;	[1]	[2]
			or		
			Thin epithelium/epithelium one cell thick;		
			Short diffusion distance;		
			or (accept if not given in **(b)**)		
			good blood supply; carries away absorbed products/maintains concentration gradient		6
9	**(a)**		Any **four** from:		
			A { Burning fossil fuels; / Produces (extra) CO_2;		
			B { Deforestation; / Reduced **absorption**/use of CO_2 (by photosynthesis); / Reject: photosynthesis unqualified.		
			CO_2 concentration (in atmosphere) increases;		[4]
	(b)	**(i)**	Trend in number of storms increases from 6 to 8;	[1]	
			Agrees with/predicted by global warming/global warming predicts storms/irregular weather;	[1]	[2]
		(ii)	Varies/up and down/2000–2002/2004–2006/reduced number;	[1]	
			Disagrees with/contrary to global warming predictions;	[1]	[2]
		(iii)	Continue measurements over longer period of time/other scientists try to repeat the same/similar measurements;	[1]	9
10	**(a)**	**(i)**	Producers at bottom (centred and labelled)/key used;	[1]	
			Accurate plots (using given scale) × 2	[2]	[3]
		(ii)	*Advantage* – Takes account of **size** of organism;	[1]	
			Disadvantage – Difficult/destructive to measure;	[1]	[2]
	(b)	**(i)**	(123 ÷ 3000) × 100;	[1]	
			4.1 (%);	[1]	[2]
		(ii)	Any **two** from:		
			Energy lost to respiration/heat;		
			Movement;		
			Excretion;		
			Parts of the plant can't be digested/eaten;		[2]

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					AVAILABLE MARKS
	(iii)	People are acting as primary consumers rather than secondary/ 2nd v 3rd trophic levels/3000 v 123 kJ energy; [1] Less energy lost/more energy available/3000 v 123 kJ energy; [1] More efficient		[2]	11
11	**(a)**	Increase surface area; [1] for enzymes to act on; [1]		[2]	
	(b)	**(i)** Temperature;		[1]	
		(ii) Place tubes in a waterbath;		[1]	
	(c)	**(i)** pH 4;		[1]	
		(ii) Use smaller pH intervals (between pH 3 and pH 5) during experiment;		[1]	
		(iii) 0.5 ÷ 40; [1] = 0.0125 g min^{-1}; [1]		[2]	
		(iv) Any **two** from: Enzyme denatured; by acid conditions; Active site altered/substrate no longer fits active site;		[2]	10

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		AVAILABLE MARKS
12 **(a)**	*Organ A* – Pancreas; [1] *Organ B* – Liver; [1] *Storage product C* – glycogen; [1] *Process D* – Respiration; [1] [4]	
(b)	Starch is **digested** into glucose and **absorbed** into blood; [1]	
(c)	Exercise/miss a meal; [1]	
(d)	Blood glucose concentration constantly **monitored/detected**; Increase in blood glucose causes increase in **insulin** produced; Insulin removes glucose from blood/causes liver to store glycogen/ increased respiration (by body cells); Blood glucose concentration returned to normal/lowered; [4]	
(e)	**Indicative content:** **(Before meal/0–2 hours)** 1. Glucose normal so insulin low/glucagon high/glucagon falling; 2. **Data mark:** insulin 20/glucagon 116–110/glucose 90; **(After meal/2–4 hours)** 3. As glucose rises, insulin rises and glucagon falls; 4. **Data mark:** glucose 150/insulin 120/glucagon falling towards 88(/82); **(4–8 hours)** 5. Insulin causes the glucose to fall; 6. (As glucose falls) glucagon rises (and insulin falls); 7. Glucagon causes glucose to rise/level off/stops it falling/keeps it constant; 8. Glucagon converts glycogen to glucose;	

Response	**Marks**
Candidates **must use appropriate, specialist terms** throughout to describe how insulin and glucagon work together **using at least FIVE of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates use **some appropriate, specialist terms** throughout to describe how insulin and glucagon work together **using at least THREE of the above points.** They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates make **little use of specialist terms** throughout to describe how insulin and glucagon work together **using some or all of the above points.** The spelling, punctuation and grammar, form and style are of a **limited** standard.	[1]–[2]
Response not worthy of credit.	[0]

	[6]	16
Total		**100**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014

GCSE Biology

Unit 1

Higher Tier

[GBY12]

GBY12

FRIDAY 6 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

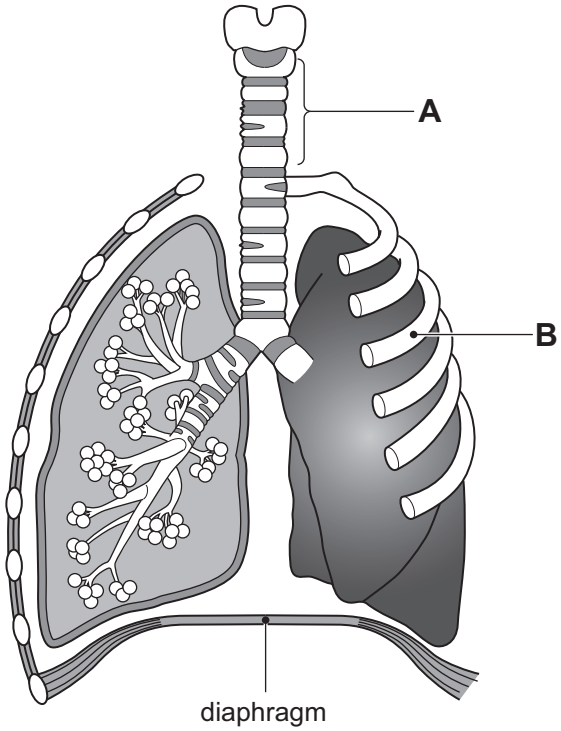
The total mark for this paper is **100**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **10** and **12(d)**.

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1 The diagram shows part of the respiratory system.



© OCR Gateway GCSE Biology by S Broadley, S Hocking, M Matthews, published by Oxford University Press, ISBN 978 0199135684

Look at the diagram.

(a) Name parts **A** and **B**.

A _____ [1]

B _____ [1]

(b) The diaphragm changes when you breathe in and out.

Describe these changes.

Breathe in _____

_____

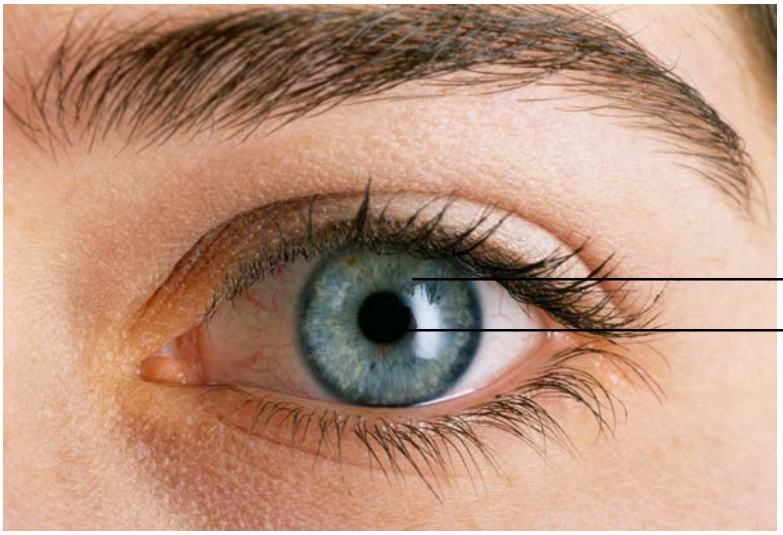
Breathe out _____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 1	

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2 The photograph shows the front of a human eye in bright light.



© *Jupiterimages/Photos.com/ Thinkstock*

Look at the photograph.

(a) Name parts **A** and **B**.

A _____ [1]

B _____ [1]

(b) The bright light is switched off.

(i) Describe what happens to **part B**.

_____ [1]

(ii) Explain why this change in **B** is necessary.

_____

_____

_____ [2]

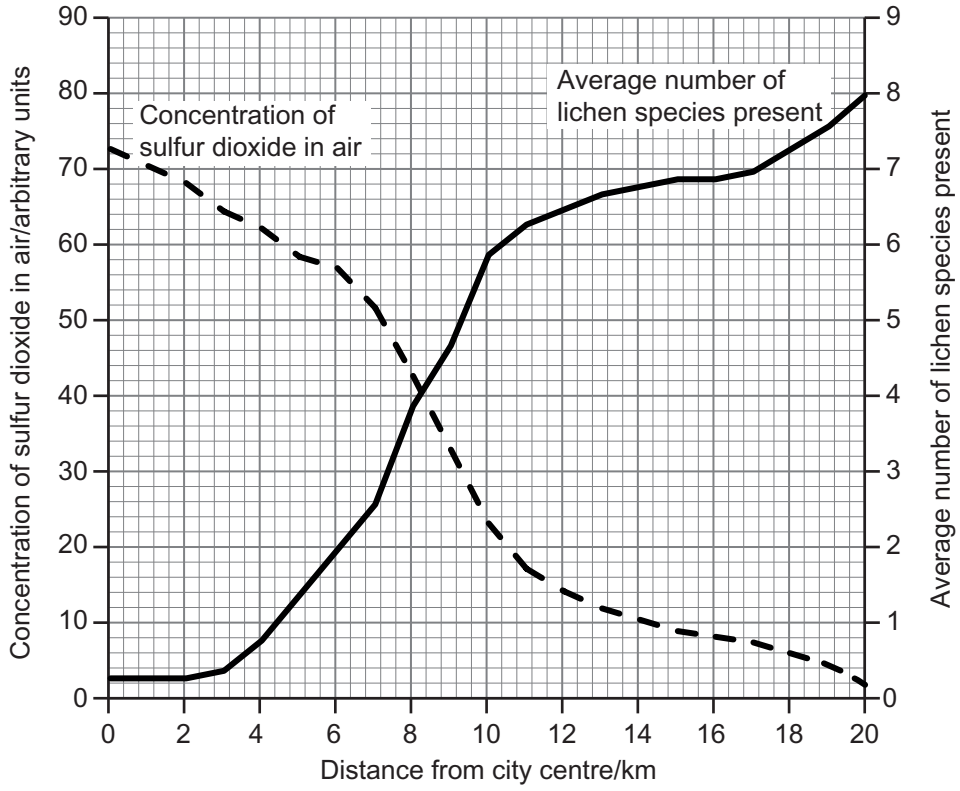
Examiner Only	
Marks	Remark
Total Question 2	

[Turn over

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Examiner Only	
Marks	Remark

3 The graph shows the concentration of sulfur dioxide in the air and the average number of lichen species present on trees at different distances from a city centre.



Source: Chief Examiner

Look at the graph.

(a) The concentration of sulfur dioxide in the air changes as you move away from the city.

Describe the change.

_____

_____

_____ [1]

(b) The graph shows that some species of lichens tolerate high concentrations of sulfur dioxide in the air.

Give data from the graph which supports this conclusion.

_____

_____

_____ [2]

(c) Give **one** source of sulfur dioxide in air.

_____ [1]

(d) Species such as lichens can be used to monitor pollution.

What term is used to describe species like these?

_____ [1]

Examiner Only	
Marks	Remark
Total Question 3	

[Turn over

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4 The table shows the loss of vitamin C content of four types of salad leaves stored for 10 days after picking.

Type of salad leaf	Vitamin C content per 100 g of salad leaves/mg		Percentage loss of vitamin C
	Day 0	Day 10	
Green lettuce	0.10	0.09	
Wild rocket	72.97	3.55	95.10
Lamb's lettuce	59.18	13.61	77.00
Red lettuce	0.07	0.07	0.00

Look at the table.

(a) **Calculate the percentage loss** of vitamin C content in green lettuce.

Show your working.

Write your answer in the table. [2]

(b) **Use data from the table** to explain which type of salad leaf is most suitable for use after storing for 10 days.

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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(c) A bag of fresh mixed salad leaves has a vitamin C content of 20 mg per 100 g.

A portion of fresh salad leaves weighs 60 g.

(i) Calculate the mass of vitamin C in a 60 g portion of fresh mixed salad leaves.

Show your working.

Mass _____ mg [1]

An adult is advised to have a daily intake of 50 mg of vitamin C.

(ii) What percentage of their daily vitamin C is provided by this portion of fresh mixed salad leaves?

Show your working.

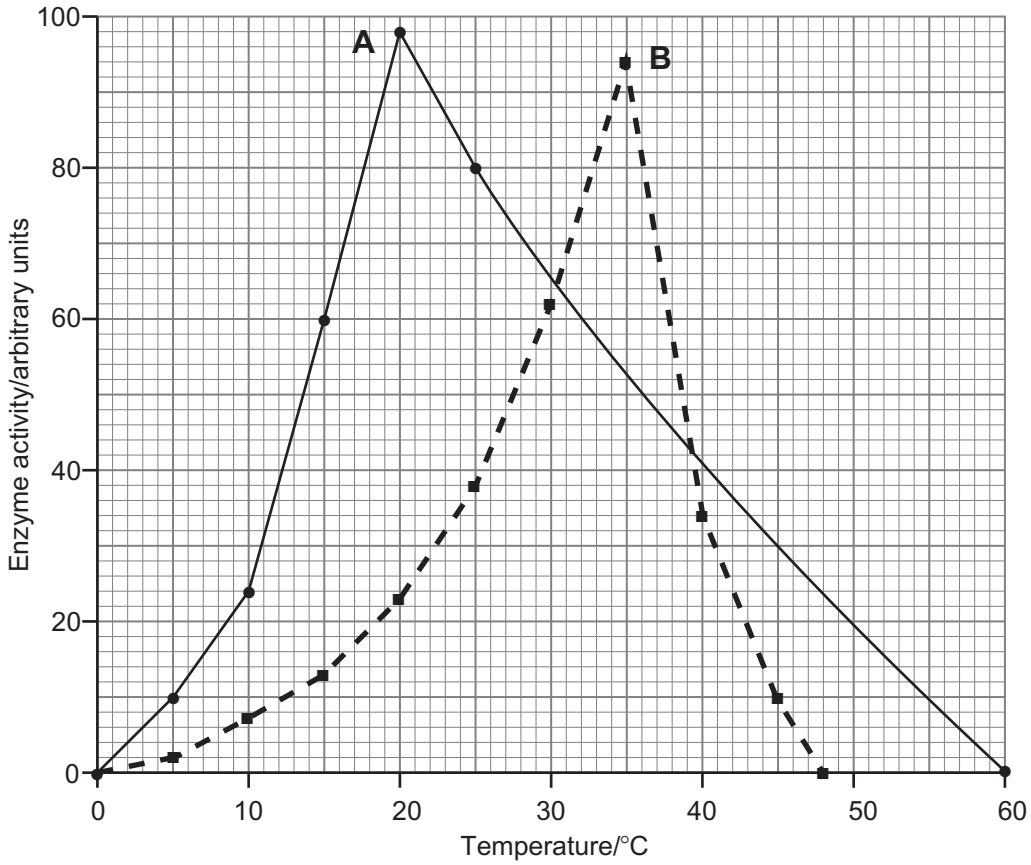
Percentage _____ [1]

Examiner Only	
Marks	Remark
Total Question 4	

[Turn over

5 The graph shows the activity of two different enzymes, **A** and **B**, over a range of temperatures.

Examiner Only	
Marks	Remark



Source: Chief Examiner

(a) Describe **two** differences between the activity of the two enzymes **above 20° C**.

_____

_____

_____

_____ [2]

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Enzyme **A** is found in biological washing powders.

(b) Give the optimum temperature for enzyme **A** and explain why it is more economical to use in washing powders than enzyme **B**.

_____

_____

_____ [2]

Enzyme **B** digests food molecules in the duodenum.

(c) Why is it necessary to digest food molecules?

_____

_____

_____ [2]

Enzymes are described as biological catalysts.

(d) Explain what is meant by a catalyst.

_____

_____ [1]

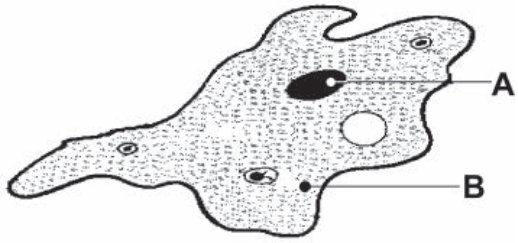
Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

Examiner Only	
Marks	Remark

6 **(a)** The diagram shows an amoeba.

It is a single-celled organism which lives in ponds and feeds on bacteria or algae.



(i) Name parts **A** and **B**.

A _____

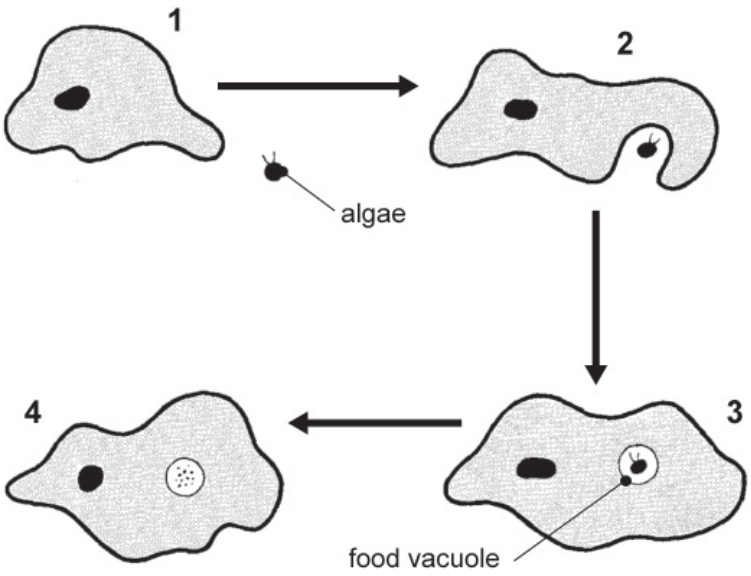
B _____ [2]

(ii) Which kingdom does an amoeba belong to?

_____ [1]

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The diagram shows how an amoeba feeds.



© "Living Things", by V Slaughter 1980. ISBN-10: 0-7131-0416-3 / ISBN-13: 9780713104165.
Reproduced by permission of Hodder Education.

(b) Use the diagram to describe how an amoeba feeds.

_____

_____

_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

[Turn over

The photograph shows Euglena.

It is another single-celled organism.



© *Biophoto Associates/ Science Photo Library*

(c) Euglena is difficult to classify because it has both plant and animal features.

Use the photograph to give **one** plant and **one** animal feature.

plant _____

_____

animal _____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 6	

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DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

Examiner Only	
Marks	Remark

7 **(a)** Diabetes can be treated with injections of insulin into the bloodstream.

Describe what effects insulin has in the liver.

_____

_____

_____

_____

_____ [3]

(b) The graph shows the changes in the blood glucose concentration of two people with diabetes, over a period of twenty-four hours.

One person has started treatment.



© The Association of the British Pharmaceutical Industry

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(i) Give the value for normal blood glucose concentration.

_____ [1]

(ii) Describe what happens to the blood glucose concentration after each meal.

_____ [1]

(iii) Nicholas has not started treatment for his diabetes.

Give two pieces of evidence from the graph which show this.

_____

_____

_____

_____ [2]

(iv) Give **two other** symptoms of diabetes.

1. _____ [1]

2. _____ [1]

(v) Give **two long-term effects** of untreated diabetes.

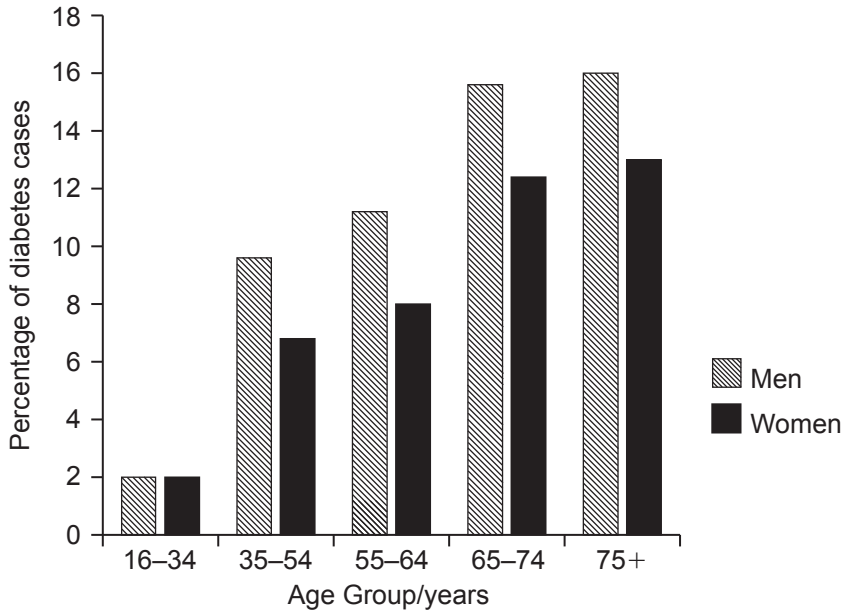
1. _____ [1]

2. _____ [1]

Examiner Only	
Marks	Remark

[Turn over

The bar chart shows the percentage of diabetes cases in the United Kingdom in 2010.



Source: www.diabetes.org.uk/ key statistics on diabetes

(c) Describe **three trends** shown in the bar chart.

1. _____

_____

_____ [1]

2. _____

_____

_____ [1]

3. _____

_____

_____ [1]

Examiner Only	
Marks	Remark
Total Question 7	

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DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

8 The table shows measurements of three men, Ajay, Michael and Rory made during a health check.

Name	Height/m	Mass/kg
Ajay	1.55	63.6
Michael	1.75	81.8
Rory	1.60	81.8

The chart shows the Body Mass Index (BMI) values for men of different heights and masses.

Use the measurements of Ajay, Michael and Rory in the table and data from the chart to compare the BMI of the three men.

Body mass index

Height in metres \ Weight in kilograms	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1.50	45	47	50	52	54	56	59	61	63	65	68	70	72	74	77	79	81	83
1.55	48	51	53	55	58	60	63	65	67	70	72	75	77	79	82	84	87	89
1.60	51	54	56	59	61	64	67	69	72	74	77	79	82	85	87	90	92	95
1.65	54	57	60	63	65	68	71	74	76	79	82	84	87	90	93	95	98	101
1.70	58	61	64	67	69	72	75	78	81	84	87	90	93	95	98	101	104	107
1.75	61	64	67	70	74	77	80	83	86	89	92	95	98	101	104	107	110	113
1.80	65	68	71	75	78	81	84	88	91	94	97	100	104	107	110	113	117	120
1.85	69	72	75	79	82	86	89	92	96	99	103	106	110	113	116	120	123	127
1.90	72	76	79	83	87	90	94	98	101	105	108	112	116	119	123	126	130	134
1.95	76	80	84	88	91	95	99	103	107	110	114	118	122	126	129	133	137	141
	Healthy					Overweight					Obese							

© New Zealand Ministry of Health

Examiner Only	
Marks	Remark

(a) Which man is obese? _____

Use evidence from the chart to support your answer.

_____

_____

_____ [2]

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(b) Another man, Darren, was found to be overweight.

He was advised to reduce his body mass by walking for 1 hour each day instead of watching television for 1 hour.

Walking for 1 hour uses 1090 joules of energy.

The energy required to reduce body mass by 1 kg is 32 700 joules.

Watching television for 1 hour each day uses 32 700 joules in 93 days.

(i) Calculate how much quicker Darren could reduce his body mass by 1 kg if he walks for 1 hour each day instead of watching television.

Show your working.

Number of days less _____ [3]

Once Darren reduces his body mass by the amount advised his BMI will be below 25.

(ii) Suggest what he should do to keep his BMI at 25 and so maintain his ideal mass.

_____

_____

_____ [2]

(c) Give **two other** factors that affect the daily energy requirement of a person.

1. _____

2. _____ [2]

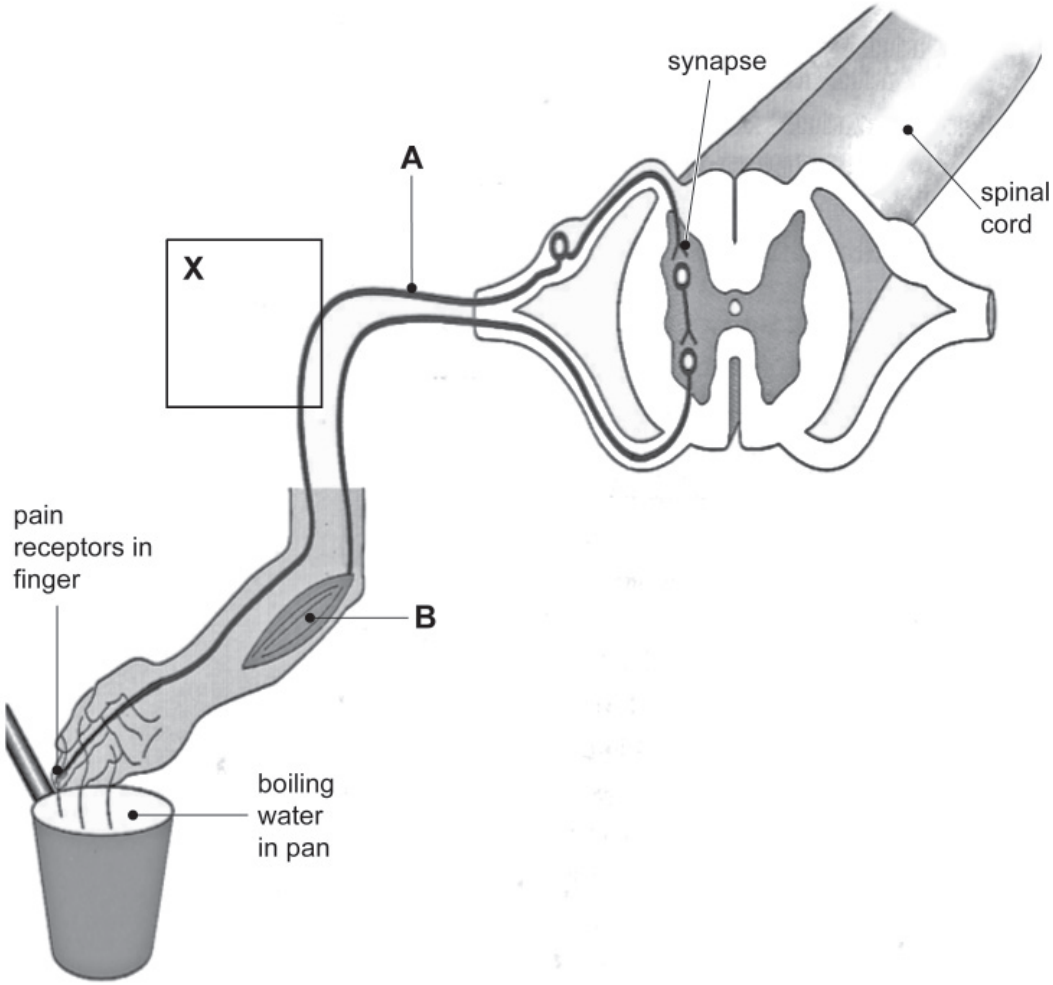
Examiner Only	
Marks	Remark
Total Question 8	

[Turn over

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9 The diagram shows the neurones in a reflex arc.

Impulses in a reflex arc travel very quickly.



© Biology by M Barbor, M Cassidy, K Senior, published by Collins Educational, 1997. ISBN 0003223272. Reproduced by kind permission of HarperCollins Publishers

(a) Name parts **A** and **B**.

A _____ [1]

B _____ [1]

(b) **Draw an arrow** in box **X** to show the direction of the nerve impulse in part **A**. [1]

Examiner Only	
Marks	Remark

(c) **Use information from the diagram** to help explain why the impulses in this reflex arc travel very quickly.

_____

_____

_____ [2]

(d) Explain how a nerve impulse passes across a synapse.

_____

_____

_____

_____

_____

_____ [4]

(e) One disease of the nervous system causes the insulating sheath around some neurones to break down.

Suggest what effect this disease would have on the function of these neurones.

_____

_____ [1]

Examiner Only	
Marks	Remark
Total Question 9	

[Turn over

10 The diagram shows how the growth of a plant responds to light from one side.



© Martin Shields / Science Photo Library

Name and explain the response of the plant to light from one side.

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark
Total Question 10	

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(Questions continue overleaf)

[Turn over

11 A pupil set up an experiment using pond weed.

Each tube contained the same volume of indicator solution.

The tubes were left in different light conditions for 24 hours.

Light condition	Colour of indicator	
	at start	after 24 hours
bright light 	red	purple
dim light 	red	
dark 	red	yellow

© Illustrated Biology Questions (1986), ISBN 0435591010, Philip Booth and Geoffrey Hall, publisher: Pearson. Duplication is prohibited other than for teaching and study.

(a) Describe the contents of a control tube for this experiment.

_____

_____ [1

Examiner Only

Marks	Remark

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(b) It may not be valid to compare the results for each tube.

Suggest **one** reason why.

_____

_____ [1]

(c) Give **two other** variables which must be controlled.

1. _____

2. _____ [2]

(d) Name the indicator solution used in this experiment.

_____ [1]

(e) Explain the colour change observed in the test tube placed in bright light.

_____

_____

_____

_____ [3]

(f) The tube in dim light represents the compensation point.

(i) Give the colour of the indicator in the tube in dim light after 24 hours.

_____ [1]

(ii) What is meant by the compensation point?

_____

_____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 11	

[Turn over

12 Plants absorb nitrates from the soil through their roots.

Examiner Only	
Marks	Remark

(a) Explain why plants need nitrates.

_____

_____

_____ [2]

(b) Name the process roots use to absorb nitrates.

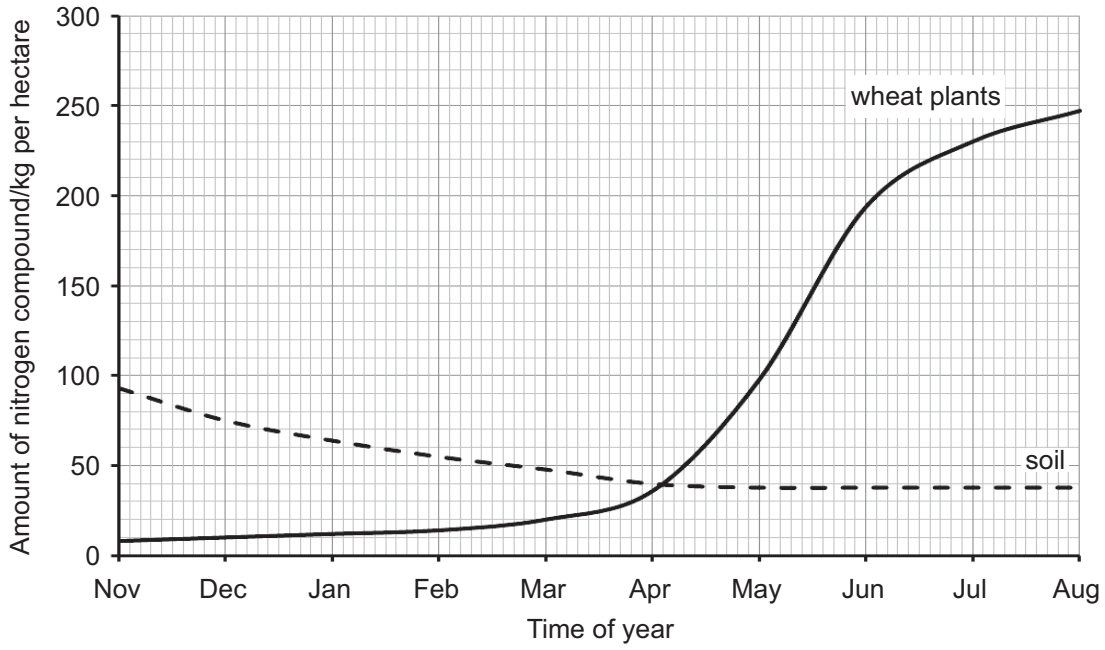
_____ [1]

In the winter months, the temperature is low and the soil is often waterlogged.

In the summer, the temperature increases and the soil dries out.

These environmental conditions affect the bacteria of the nitrogen cycle that are active in the soil.

The graph shows changes in the amount of nitrogen compounds in wheat plants and the soil between November and August.



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(c) The graph shows that between November and January nitrogen compounds in the soil drop from 95 to 65 kg per hectare.

The difference may be due to denitrification.

(i) Explain how this process could cause a fall in the amount of nitrogen compounds in the soil.

_____

_____

_____

_____

_____ [4]

(ii) Leaching may also cause a fall in the amount of nitrogen compounds in the soil during these months.

Explain how.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

[Turn over

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Between May and August, the amount of nitrogen compounds in the soil stays constant while the amount of nitrogen compounds in the wheat plants increases steeply.

(d) Explain how **the bacteria in the nitrogen cycle** maintain this constant amount of nitrogen compounds in the soil while the amount of nitrogen compounds in the wheat plants increases.

In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark
Total Question 12	

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Question Number	**Marks**
1	
2	
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10	
11	
12	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2014

GCSE Biology

Unit 1

Higher Tier

[GBY12]

FRIDAY 6 JUNE, AFTERNOON

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

					AVAILABLE MARKS
1	**(a)**	A – Trachea;		[1]	
		B – Rib;		[1]	
	(b)	Breathe in – diaphragm contracts/flattens	[1]		
		Breathe out – diaphragm relaxes/moves up/dome shaped;	[1]	[2]	4
2	**(a)**	A – Iris;		[1]	
		B – Pupil;		[1]	
	(b)	**(i)** B/pupil larger/increased diameter;		[1]	
		(ii) More light enters eye;	[1]		
		So image can be formed/seen (on retina);	[1]	[2]	5
3	**(a)**	As the distance (from the centre) increases, the concentration of SO_2 decreases;		[1]	
	(b)	At between 0 < 2 km/SO_2 equal to 68 < 73 au; Credit: correct distance/ SO_2 conc			
		Average number of lichen species 0.3 (± 0.1); Reject: 2/3 (must have decimal place)			
		Between 0 and 2 km;		[2]	
	(c)	Burning fossil fuels/petrol/diesel (in vehicles);		[1]	
	(d)	Indicator (species);		[1]	5
4	**(a)**	0.10 – 0.09 = 0.01	[1]		
		(0.01 × 100) ÷ 0.10 = 10%;	[1]	[2]	
	(b)	Red/Lamb's lettuce;	[1]		
		(Red) Loses no vitamin C/(Lamb's) has largest amount of vitamin C left;	[1]	[2]	
	(c)	**(i)** (20 ÷ 100) × 60 = 12;		[1]	
		(ii) 12/50 **or** 24%; ECF		[1]	6

				AVAILABLE MARKS
5	**(a)**	Any **two** from: Description: A activity decreases while B increases **and** decreases; Activity: B **maximum** activity lower than A; Rate: B faster decrease than A; Range: B has narrower range of activity/B **fully** denatured; Optimum temperature: B higher optimum temperature;	[2]	
	(b)	20 °C; (Less cost) for electricity/less energy needed heating water when using a biological washing powder;	[2]	
	(c)	Breakdown of large/complex/insoluble molecules **or** makes small/simple/soluble molecules; so they can pass through the wall of the intestine (capillary)/into the blood;	[2]	
	(d)	Speed up reactions (without being changed themselves);	[1]	7
6	**(a)**	**(i)** A – Nucleus; [1] B – Cytoplasm; [1]	[2]	
		(ii) Protoctista;	[1]	
	(b)	Any **three** from: Amoeba changes shape/moves towards food; Surrounds/engulfs food; Food inside food vacuole; Food digested/broken down in (vacuole); Phagocytosis;	[3]	
	(c)	Plant – Chloroplasts; Animal – Cell wall absent/flagellum for movement;	[2]	8

					AVAILABLE MARKS
7	**(a)**	Any **three** from: Absorbs more glucose from blood/lowers blood glucose concentration; Converts glucose to glycogen/fat; Storage; Glucose respired;		[3]	
	(b)	**(i)** 5.5 mmol per litre;		[1]	
		(ii) Increases;		[1]	
		(iii) (Nicholas) Blood glucose concentration above normal/too high;	[1]	
		(Nicholas) **greater** variation of concentration;	[1]	[2]
		(iv) Any **two** from: Thirst; Lethargy; Urinating frequently; Glucose in urine; Other appropriate response (only once);		[2]	
		(v) Any **two** from: Eye damage; Kidney failure; Heart disease/high blood pressure Stroke; Other appropriate response (only once);		[2]	
	(c)	Any **three** from: Diabetes increases with age; 16–34 number of cases the same; More male cases (in all other age groups); Beyond 65 – number of cases in both genders levels off/increases slower; Biggest difference in cases between 16–34 and 35–54;		[3]	14
8	**(a)**	Rory;	[1]		
		Rory BMI = 31/32;	[1]	[2]	
	(b)	**(i)** 32 700 ÷ 1090;	[1]		
		= 705 (J per day) = 30 days;	[1]		
		93 – 30 = 63 days;	[1]	[3]	
		(ii) Balance energy use and energy intake/Reduce/control food intake;	[1]		
		Continue exercising;	[1]	[2]	
	(c)	Any **two** from: Age; Gender; Pregnancy;		[2]	9

				AVAILABLE MARKS
9	**(a)**	A – Sensory (neurone); B – Muscle/effector;	[1] [1]	
	(b)	X↑;	[1]	
	(c)	Any **two** from: Short distance; Small number of neurones/some long neurones; Small number of synapses;	[2]	
	(d)	Any **four** from: Electrical impulse (arrives at synapse); (Neurotransmitter) **chemical** produced/released (by neurone); **Diffusion** (to chemical (/neurotransmitter)); **Across** gap/space/between neurones; High enough concentration of chemical; Causes/triggers impulse **in next neurone**;	[4]	
	(e)	Slower/no impulses pass along neurone;	[1]	10

10 **Indicative content:**

1. Phototropism;
2. Auxin;
3. (Auxin/hormone) produced (by cells) at tip of shoot/stem;
4. (Auxin/hormone) moves/diffuses down shoot/stem;
5. One-sided light causes uneven distribution/higher auxin/hormone concentration in shaded side;
6. (Auxin/hormone) causes (individual) cells to lengthen;
7. More cells lengthen in shaded side/shaded side grows faster than light side;
8. Shoot/stem **bends**/**grows** towards light;

Response	**Marks**
Candidates **must use appropriate, specialist terms** throughout **using at least FIVE of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates use **some appropriate, specialist terms** throughout **using THREE of the above points**. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory** standard.	[3]–[4]
Candidates make **little use of specialist terms** throughout **using ONE of the above points**. The spelling, punctuation and grammar, form and style are of a **limited** standard.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

				AVAILABLE MARKS
11	**(a)**	Tube containing indicator (but no pond weed);	[1]	
	(b)	Different mass/size/number of leaves;	[1]	
	(c)	Any **two** from: Temperature; **Concentration** of indicator; Mass of plant (if not given in **(b)**); pH; Species of pondweed;	[2]	
	(d)	Hydrogencarbonate (indicator) Accept: bicarbonate indicator	[1]	
	(e)	Photosynthesis **greater than**; [1] Respiration; [1] Carbon dioxide low/decreases/used up; [1]	[3]	
	(f) **(i)**	Red;	[1]	
	(ii)	Any **two** from: Light intensity; At which photosynthesis equals respiration; O_2 production equals consumption/CO_2 produced equals CO_2 used;	[2]	11

				AVAILABLE MARKS
12	**(a)**	To produce amino acids/proteins; [1] for growth; [1]	[2]	
	(b)	**Active** uptake/absorption/transport;	[1]	
	(c)	**(i)** Any **four** from: Waterlogged soil; Little or no oxygen/anaerobic; Denitrifying bacteria **active**; Change nitrates; Into **nitrogen gas**;	[4]	
		(ii) Nitrogen compounds **dissolve**/soluble in water; Percolate/move through soil;	[2]	
	(d)	**Indicative content:** 1. Total of nitrogen compounds produced equals the amount absorbed by plants; 2. Higher temperatures make bacteria more active; 3. **Aerobic** conditions/bacteria; 4. Saprophytic/decomposing bacteria/decomposition; 5. Produce ammonium compounds; 6. Nitrifying bacteria/nitrification; 7. (Ammonia compounds) → nitrates; 8. Nitrogen-fixing bacteria (in soil active/root nodules); 9. Producing nitrate/ammonium compounds from nitrogen (gas); 10. **Reduced** denitrification/**less** nitrates → nitrogen gas;		

Response	**Mark**
Candidates **must use appropriate, specialist terms throughout** to explain how nitrogen cycle bacteria maintain a constant amount of nitrogen compounds in the soil while the amount in the wheat increases **using at least FIVE of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates **use some appropriate, specialist terms throughout** to explain how nitrogen cycle bacteria maintain a constant amount of nitrogen compounds in the soil while the amount in the wheat increases **using at least THREE of the above points**. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates make **little use of specialist terms throughout** to explain how nitrogen cycle bacteria maintain a constant amount of nitrogen compounds in the soil while the amount in the wheat increases **using at least ONE of the above points**. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

		[6]	15
	Total		**100**

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2013

Biology

Unit 1

Higher Tier

[GBY12]

GBY12

WEDNESDAY 5 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twelve** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **4**, **7(c)** and **11(b)**.

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DO NOT WRITE ON THIS PAGE

1 **(a)** Name **two** chemical elements found in all food molecules.

_____ [1]

(b) Complete the table about components of the diet.

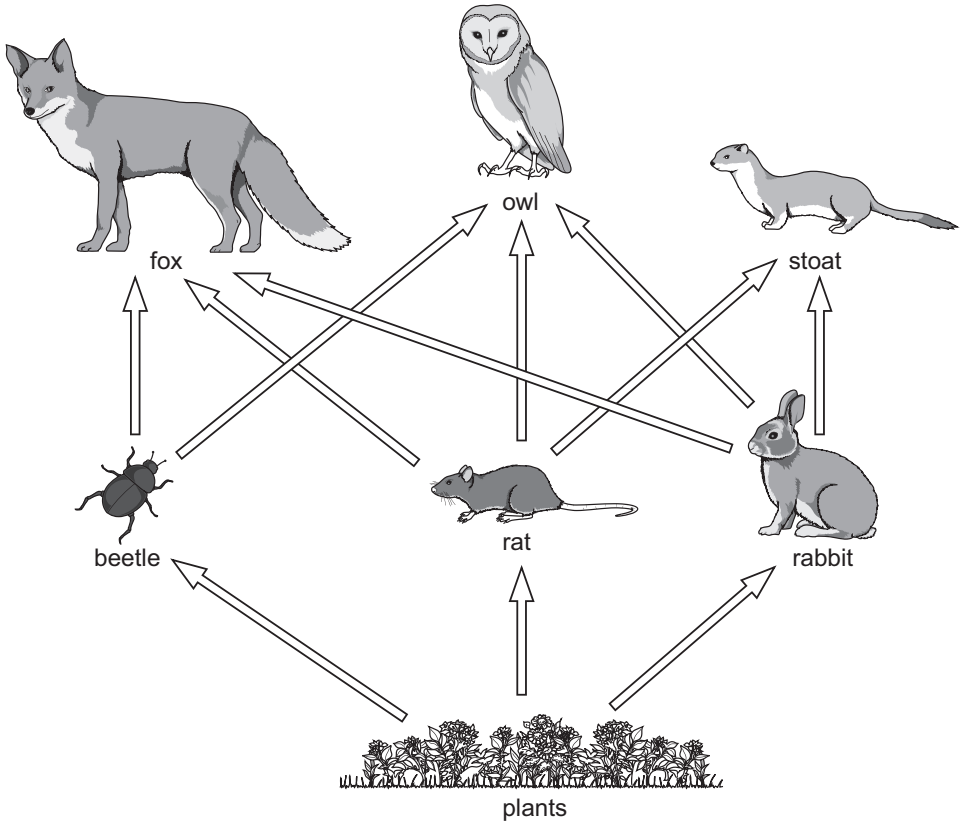
Component	Example	Source	Function	
Carbohydrate	Lactose		Energy	[1]
	D	Milk	Growth of bones and teeth	[1]
Mineral		Red meat	Needed for haemoglobin in red blood cells	[1]

Examiner Only	
Marks	Remark
Total Question 1	

[Turn over

2 The diagram shows part of a food web found in a forest ecosystem.

Examiner Only	
Marks	Remark



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(a) Why are plants important in a food web?

_____

_____

_____ [2]

(b) What do the arrows in the food web represent?

_____

_____ [1]

After a very severe winter a large number of owls died.

(c) Explain how this may affect the number of stoats.

_____

_____

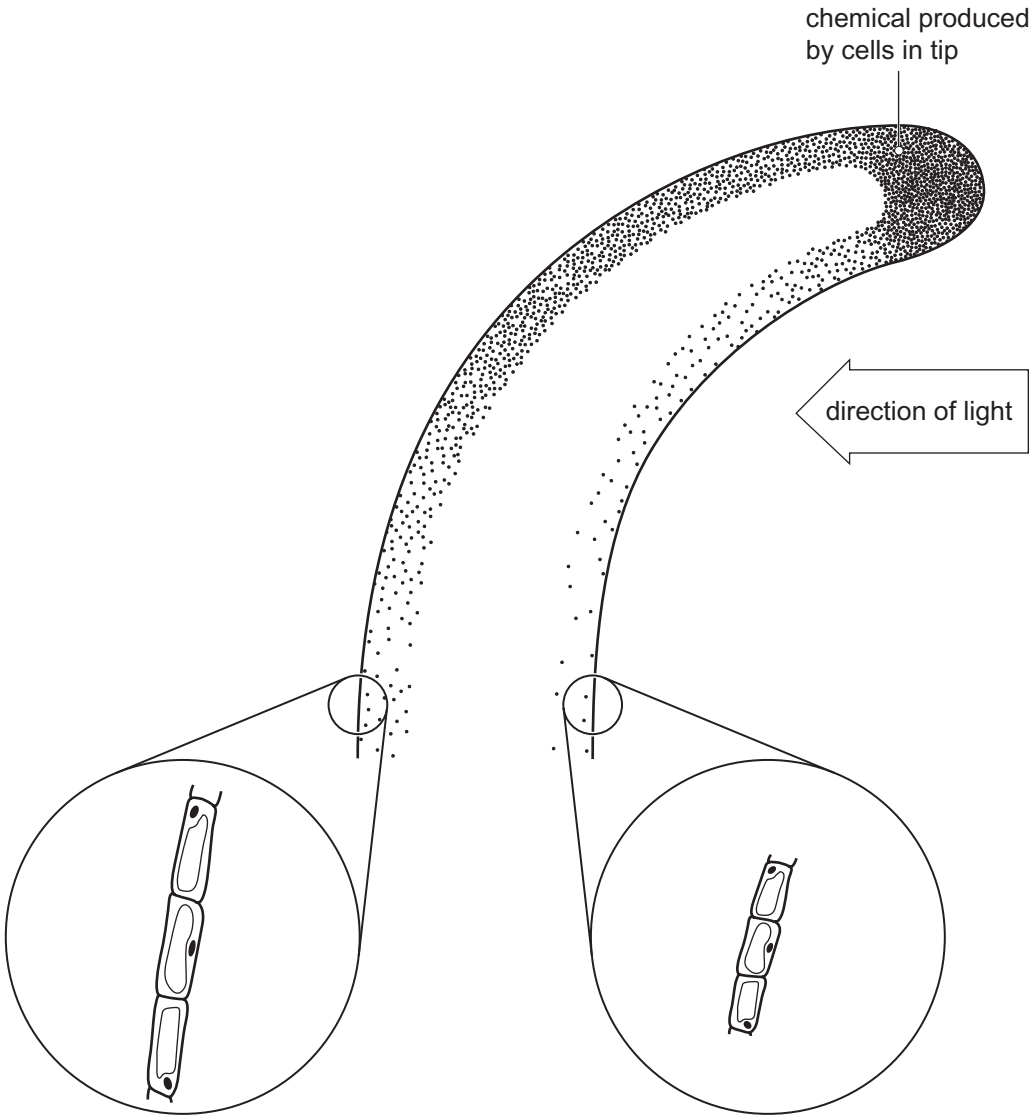
_____ [2]

Examiner Only	
Marks	Remark
Total Question 2	

[Turn over

3 The diagram shows a section of a shoot growing in one-sided light.

Examiner Only	
Marks	Remark



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(a) Name the chemical produced by cells in the tip.

_____ [1]

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Use the diagram to answer the following questions.

(b) (i) Compare the distribution of the chemical in the light and shaded side of the shoot below the tip.

_____

_____ [1]

(ii) How has the chemical affected the cells in the shaded side of the shoot?

_____

_____ [1]

(c) Explain the advantage to the plant of bending towards light.

_____

_____

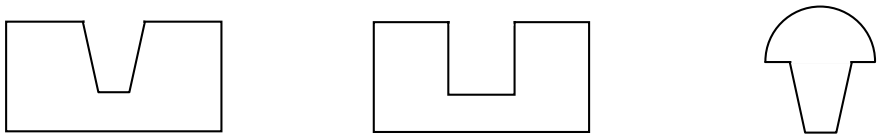
_____ [2]

Examiner Only	
Marks	Remark
Total Question 3	

[Turn over

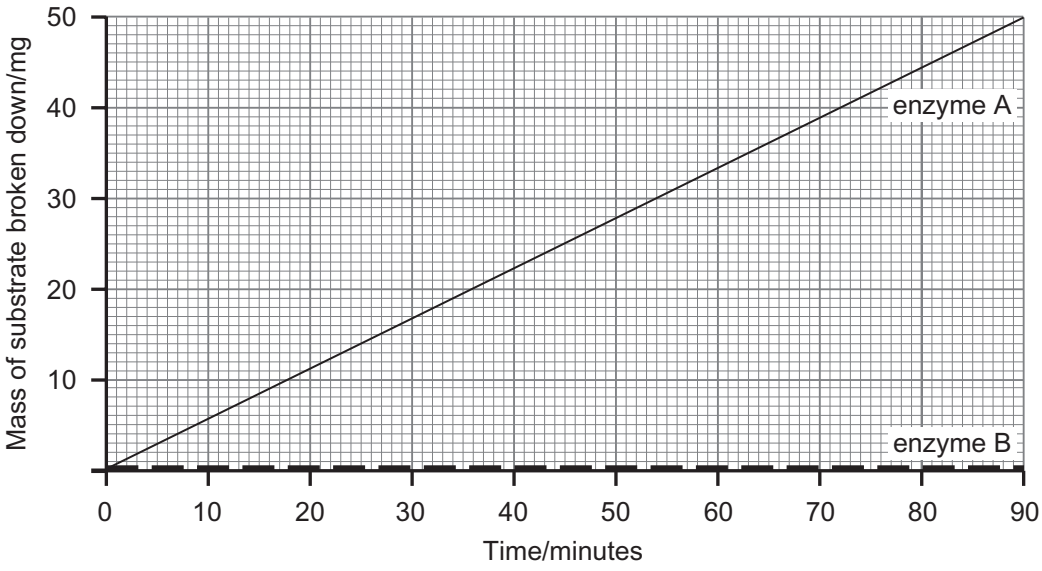
4 The diagram shows the shape of two enzyme molecules and a substrate molecule.

Examiner Only	
Marks	Remark



Enzyme A Enzyme B Substrate

The graph shows the mass of substrate broken down by each enzyme over 90 minutes.



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Use the information in the diagrams and your knowledge to help explain the shape of the two lines on the graph.

In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

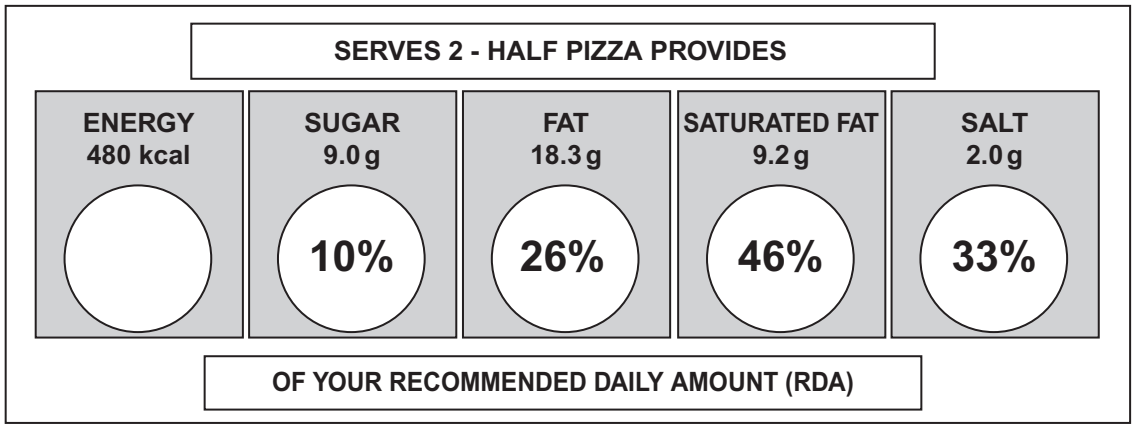
Examiner Only	
Marks	Remark
Total Question 4	

[Turn over

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5 Food labelling helps people make healthy food choices.
The label shown below is from a pizza box.

Examiner Only	
Marks	Remark



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The recommended daily amount (RDA) of energy required for a woman is 2000 kcal.

(a) (i) **Complete the label for energy** by calculating the percentage of a woman's RDA provided by this half pizza.
Show your working.

[2]

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The half pizza provides a man with 19% of his RDA for energy.

(ii) Explain why the half pizza provides a man with a lower percentage of his RDA than it does for a woman.

_____

_____

_____ [2]

(b) Give **two** factors, **other than** age and gender, which would affect the RDA of energy needed by a person.

_____ [1]

_____ [1]

(c) Eating a whole pizza may be a risk to health.
Use the information in the label about the saturated fat content to suggest why.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 5	

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Examiner Only	
Marks	Remark

6 **(a)** What is a species?

_____

_____

_____ [2]

(b) Why are viruses difficult to classify?

_____

_____ [1]

Classification is used to help identify living organisms.

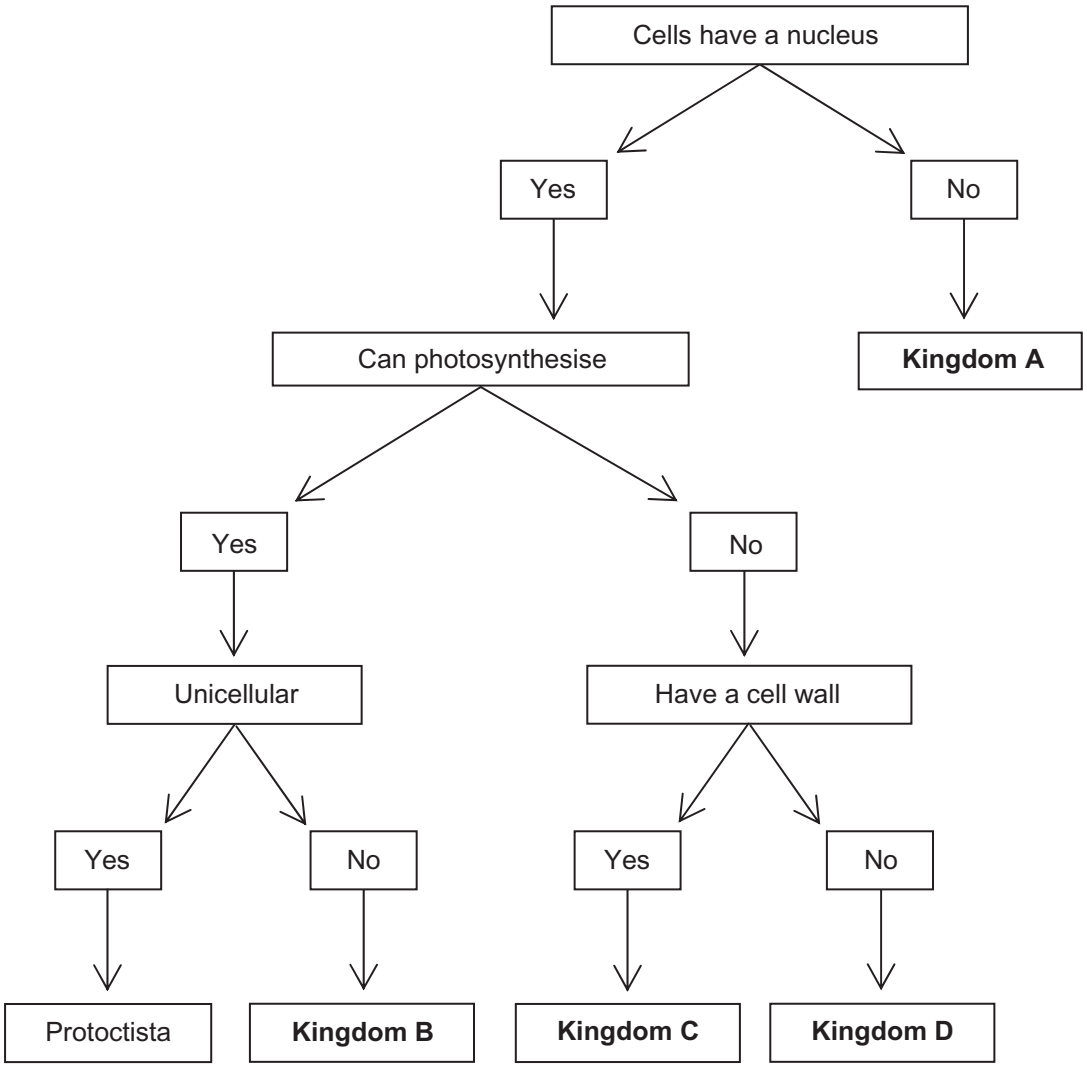
(c) Give **one other** reason why classification of living organisms is important.

_____

_____ [1]

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The key shows the classification of organisms into five kingdoms.



(d) Use the key to identify kingdoms A, B, C and D.

Kingdom A _____ [1]

Kingdom B _____ [1]

Kingdom C _____ [1]

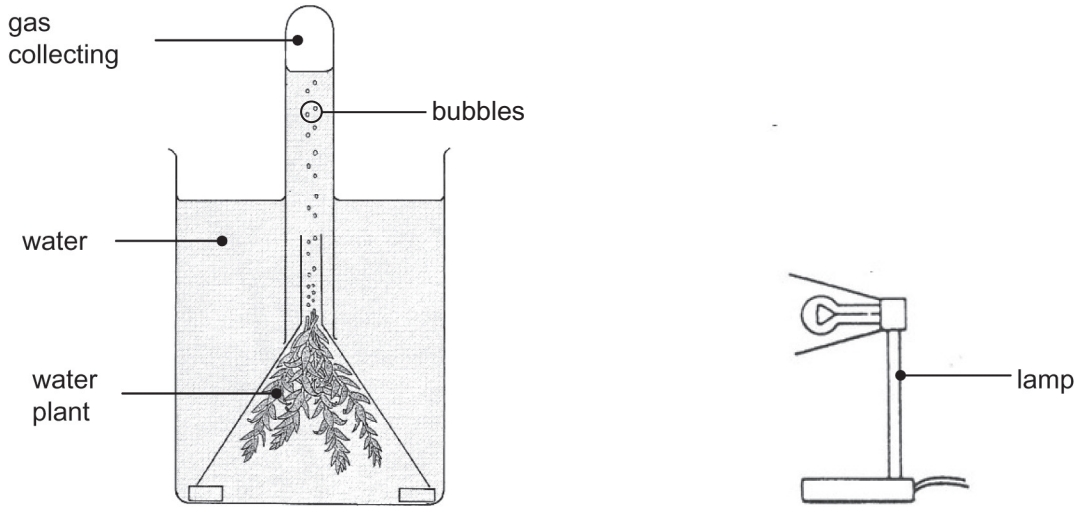
Kingdom D _____ [1]

Examiner Only	
Marks	Remark
Total Question 6	

[Turn over

Examiner Only	
Marks	Remark

7 **(a)** The apparatus shown was used by a group of students to investigate how light intensity affects the rate of photosynthesis.



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(i) Name the gas collecting in the test tube.

_____ [1]

(ii) Describe how this apparatus can be used to measure the rate of photosynthesis.

_____

_____

_____ [2]

(iii) Describe **one** way the students could have increased the light intensity.

_____

_____ [1]

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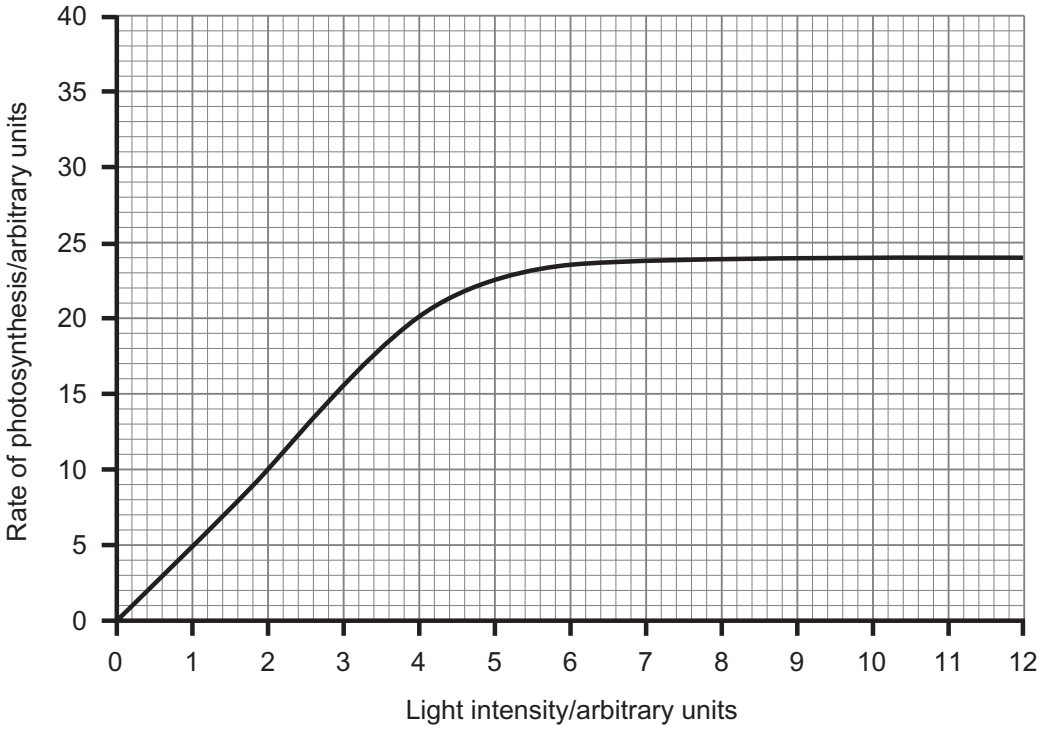
(iv) Give **one** disadvantage of this way of changing the light intensity and describe how it can be overcome.

_____

_____

_____ [2]

(b) The line graph shows the results of this investigation.



The investigation was repeated with sodium hydrogencarbonate added to the water to provide additional carbon dioxide.

(i) **On the graph** sketch a line to show the results of the investigation with additional carbon dioxide provided. [2]

(ii) What is the limiting factor between 0 and 5 arbitrary units of light intensity?

_____ [1]

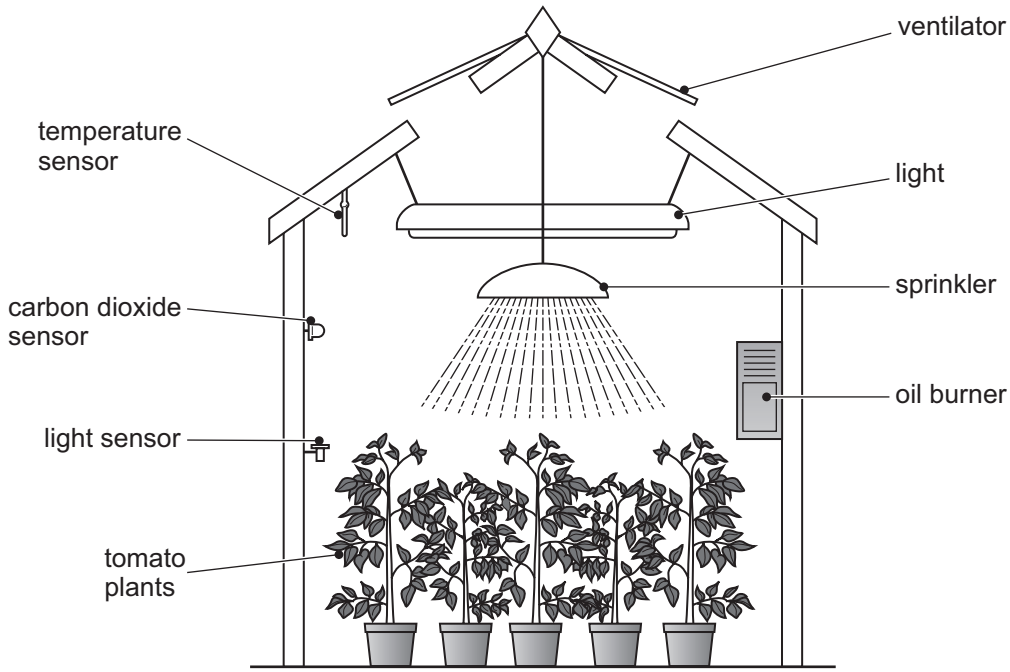
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Marks	Remark

[Turn over

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The diagram shows some of the features of a commercial greenhouse used by a market gardener to grow tomatoes.



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Examiner Only	
Marks	Remark

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(c) **Use evidence from the diagram** to help describe how this greenhouse environment is controlled and explain why it may help the market gardener to make more profit.

In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

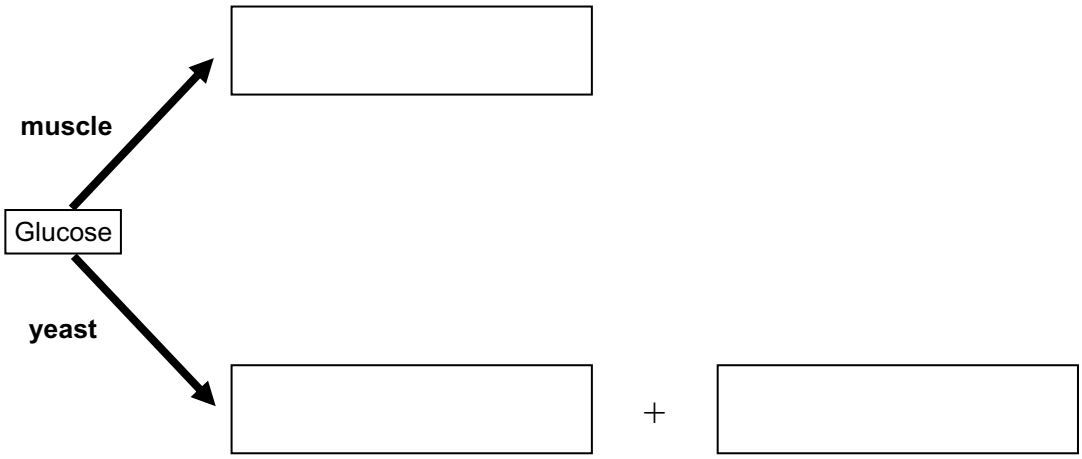
[6]

Examiner Only	
Marks	Remark
Total Question 7	

[Turn over

Examiner Only	
Marks	Remark

8 **(a)** Complete the equations by writing the names of the products of **anaerobic** respiration in muscle and yeast.



[3]

(b) Give **three** ways aerobic respiration differs from anaerobic respiration in muscles.

_____

_____

_____

_____

_____

_____ [3]

Total Question 8

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

9 **(a)** Describe how acid rain is formed.

_____

_____

_____

_____

_____

_____ [3]

In 1999 the Gothenburg Protocol, an international treaty on air pollution was signed.

(b) Explain why such international treaties are necessary.

_____

_____

_____

_____ [1]

(c) Describe **one other** strategy used to reduce the production of acid rain.

_____

_____

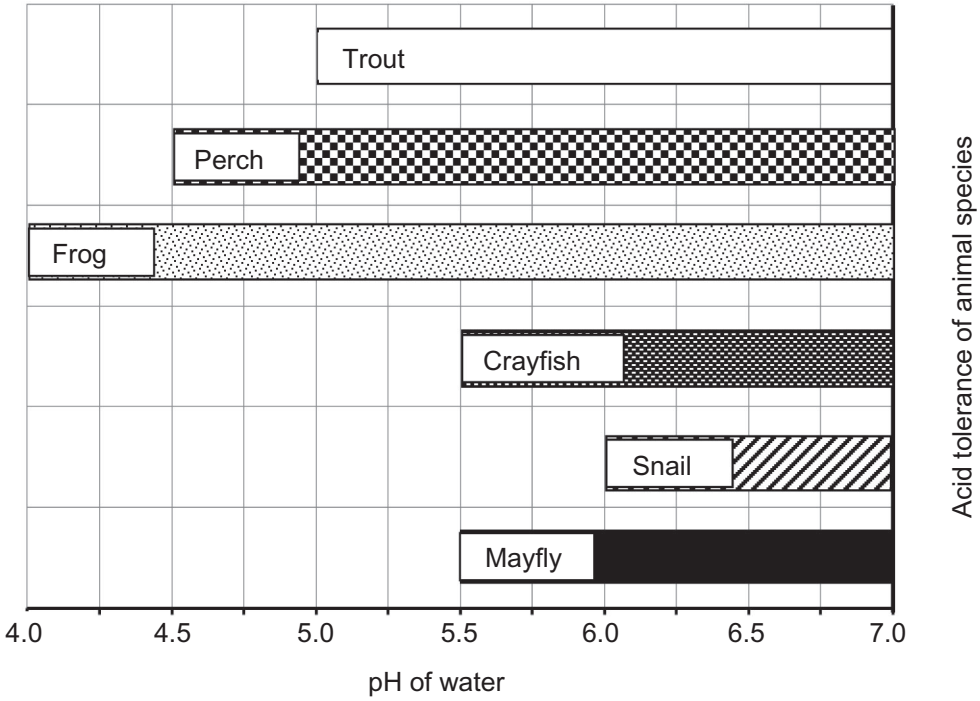
_____ [1]

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Acid rain reduces the pH of water in lakes.

Only species tolerant to acid conditions can survive.

The graph shows the range of pH values different animal species can tolerate in a lake.



Source: US Environmental Agency http://www.epa.gov/acidrain/effects/surface_water.html

(d) Name the animal species in the lake which is least tolerant of increasing acidity?

_____ [1]

(e) Name the animal species which can tolerate pH 5.25 but not pH 4.75.

_____ [1]

(f) Describe the effect of increasing acidity on the biodiversity of the lake.

_____

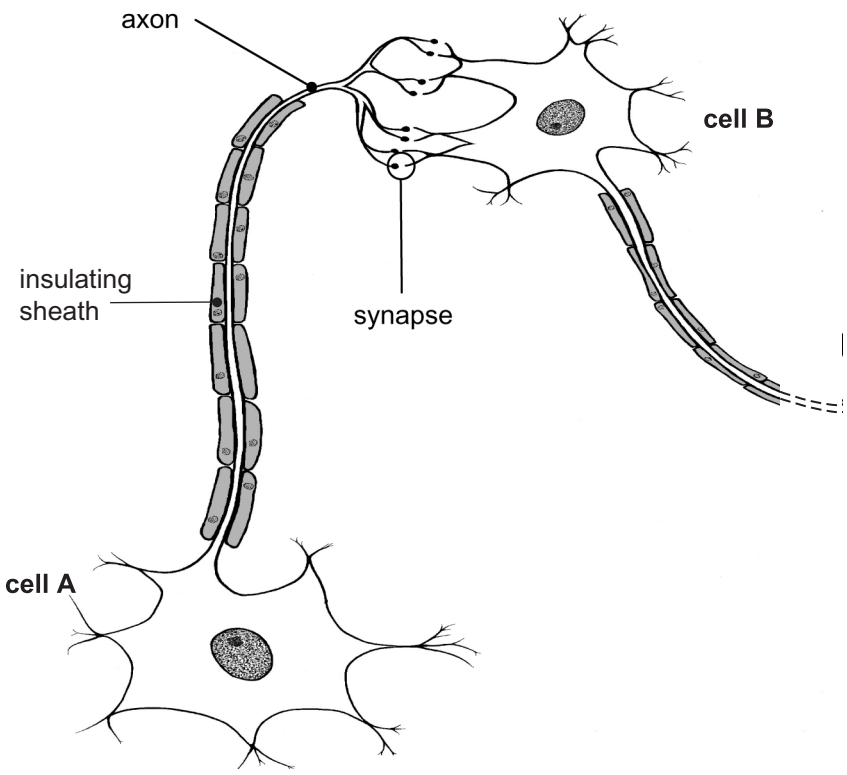
_____ [1]

Examiner Only	
Marks	Remark
Total Question 9	

[Turn over

10 The diagram shows two specialised cells which carry impulses in the body.

Examiner Only	
Marks	Remark



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(a) Name this type of specialised cell.

_____ [1]

(b) **Draw an arrow** on the axon of cell A to show the direction of an impulse. [1]

Cell A is adapted to its function by being long and having an insulating sheath.

(c) Explain how each of these features adapts cell A to its function.

Long _____

_____ [1]

Insulating sheath _____

_____ [1]

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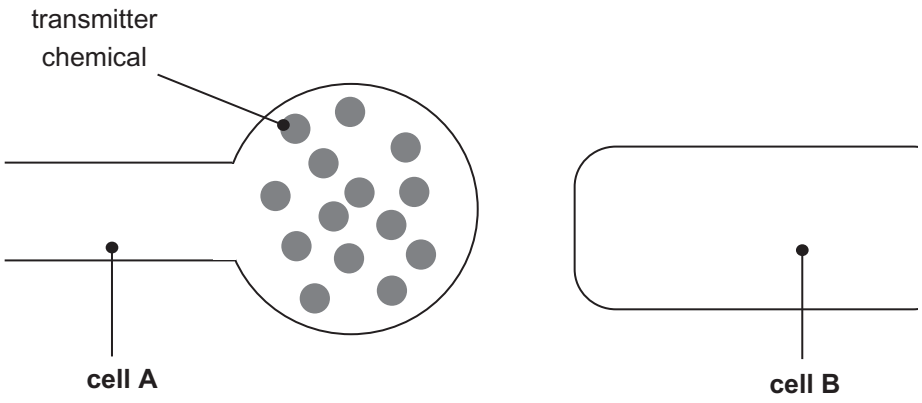
The cell body of each of these specialised cells has many branches.

(d) Suggest **one** advantage of having many branches.

_____

_____ [1]

The diagram shows a magnified synapse.



(e) **Use the diagram and your knowledge** to describe how a nerve impulse passes from cell A to cell B.

_____

_____

_____

_____

_____

_____

_____

_____ [5]

Examiner Only	
Marks	Remark
Total Question 10	

[Turn over

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Examiner Only	
Marks	Remark

11 An investigation was carried out to find the effect rabbits have on the populations of three plant species growing in an area of grassland.

Twenty quadrats were used to measure the average percentage cover of each plant species at the end of each week over a 12 week period.

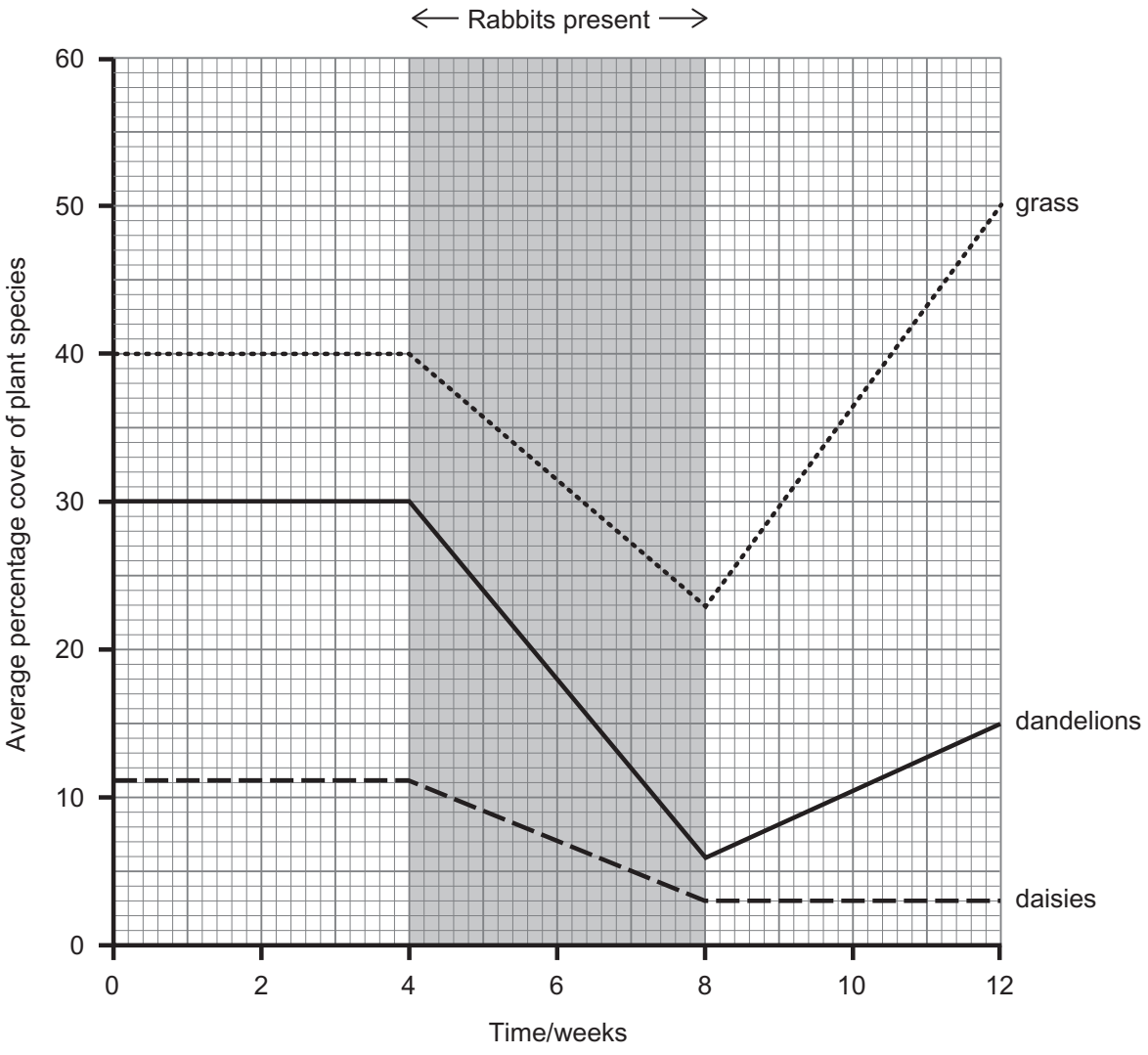
After 4 weeks a small population of rabbits was introduced. The rabbits were left in the area for 4 weeks before being recaptured and removed.

(a) Describe what should have been done to ensure that the sampling method was valid.

_____

_____ [1]

The results of the investigation are shown in the graph.



8221

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Dandelions have large leaves which are held above the ground and deep roots from which new plants can grow.

Daisies have much smaller leaves which grow close to the ground and shallow roots which do not give rise to new plants.

(b) **Use this information and the graph** to help describe and explain the trends in the average percentage cover of dandelions and daisies from the end of week 4 until the end of week 12.

In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark

[Turn over

(c) (i) Compare the **rate of change** in the average percentage cover of grass with that of dandelions and daisies after the rabbits were removed.

_____

_____

_____

_____ [1]

The change in the average percentage cover of grass is not only caused by structural adaptations of the grass.

(ii) Explain **one other** reason for the change in the average percentage cover of grass after the rabbits were removed.

_____

_____

_____ [2]

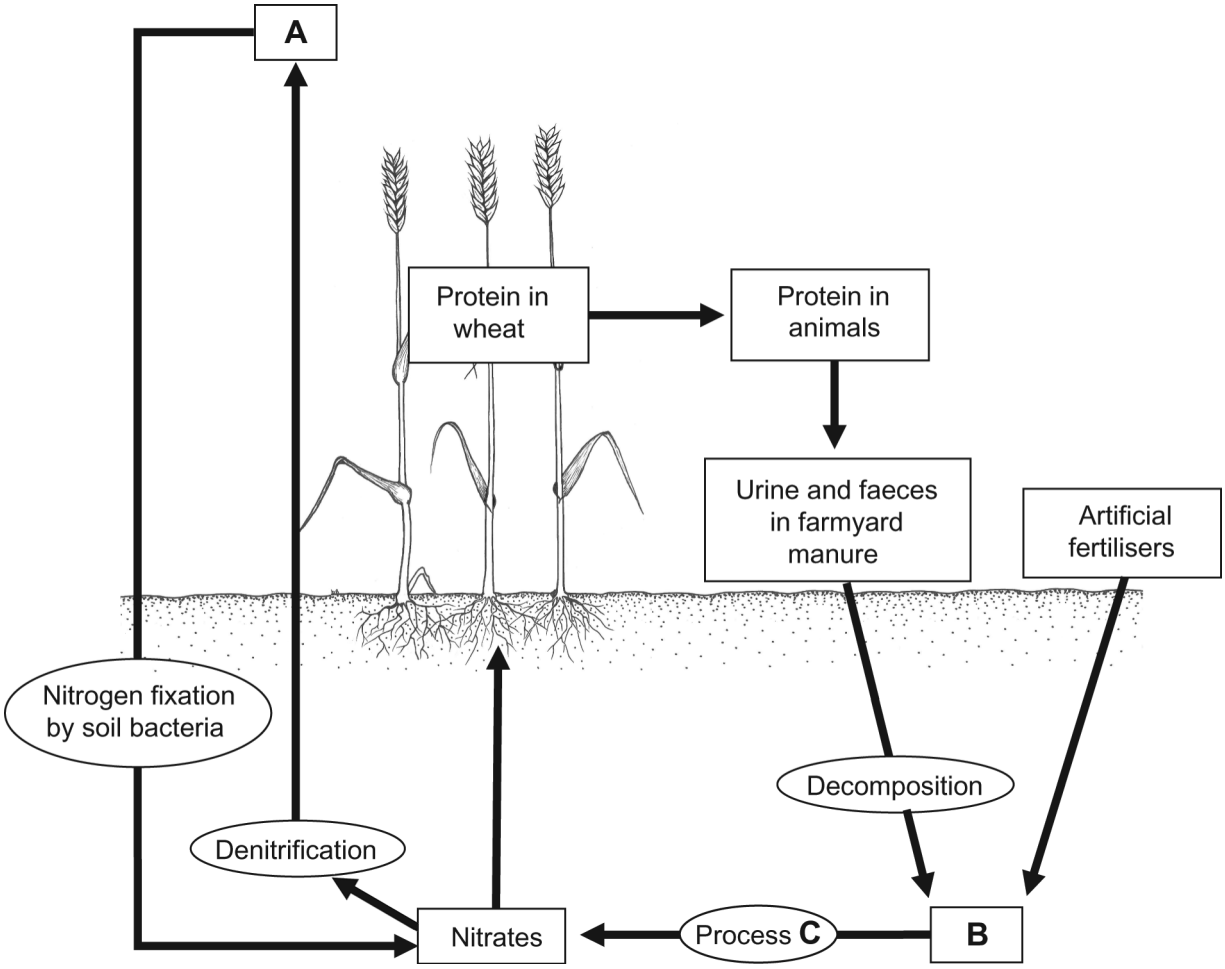
Examiner Only	
Marks	Remark
Total Question 11	

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(Questions continue overleaf)

12 The diagram shows part of the nitrogen cycle.



Examiner Only	
Marks	Remark

(a) (i) Name substances A and B.

A _____ [1]

B _____ [1]

(ii) Name process C.

C _____ [1]

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(iii) Explain in detail how the wheat absorbs nitrates through its roots.

[4]

(iv) **Use the diagram** to help explain why farmyard manure or artificial fertilisers are added to the soil just before planting each crop of wheat in the same field.

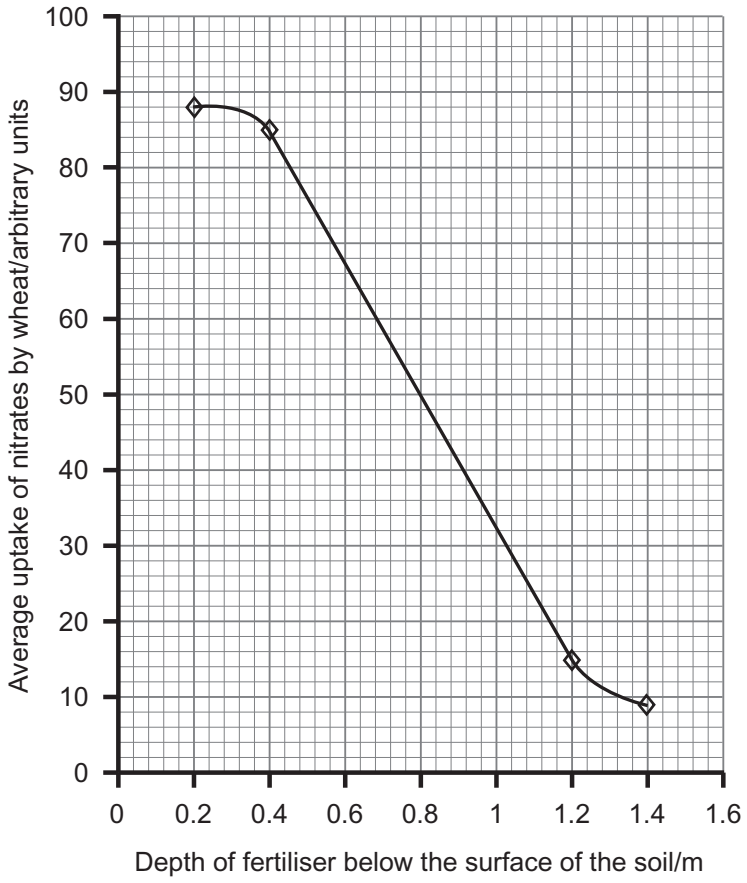
[4]

Examiner Only	
Marks	Remark

[Turn over

(b) The graph shows the results of an investigation into the amount of nitrates taken up by wheat plants.
The plants were grown in containers in a laboratory and the fertiliser was placed at four different depths below the soil surface.
The procedure was repeated ten times for each depth and an average was calculated.

Examiner Only	
Marks	Remark



Adapted from: P. W. Freeland, Problems in Theoretical Advanced Level Biology, Hodder and Stoughton,1985

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One conclusion suggested from these results was that when growing wheat, fertiliser should be placed just below the surface of the soil.

(i) **Give evidence from the graph** which

supports this conclusion.

_____

_____

_____ [2]

suggests why this conclusion may not be justified.

_____

_____ [1]

(ii) Suggest **one** way of improving this investigation.

_____

_____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark
Total Question 12	

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For Examiner's use only	
Question Number	**Marks**
1	
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11	
12	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2013

Biology

Unit 1

Higher Tier

[GBY12]

WEDNESDAY 5 JUNE, AFTERNOON

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

				AVAILABLE MARKS
1	**(a)**	Any **two** from Carbon/C, Hydrogen/H, Oxygen/O;	[1]	
	(b)	Milk/dairy produce/named example; Vitamin; Iron;	[1] [1] [1]	4
2	**(a)**	Any **two** from Producer; Make own food/photosynthesis/absorb (use) energy from the sun; Provide food energy **for** rest of food web/chain/consumers/animals;	[2]	
	(b)	Consumption/eating/feeding/flow of energy/elements (C/N);	[1]	
	(c)	<u>Stoats</u> have more food; Number of stoats increase;	[2]	5
3	**(a)**	Auxin;	[1]	
	(b)	**(i)** More chemical/auxin on shaded side/dark side;	[1]	
		(ii) Longer **cells**;	[1]	
	(c)	More light absorbed; (more) photosynthesis/more/faster growth; } Require "more" once only	[2]	5

4 **Indicative content**:

1 Mass of substrate broken down/used up by enzyme A (increases with time);
2 No substrate broken down/used up by enzyme B;
3 Lock and key model;
4 Substrate fits/complementary to active site of A;
5 Substrate does not fit/complementary to site B;
6 Enzymes are specific;
7 Increased/greater reaction rate in A;
8 Enzymes are proteins/biological catalyst;

Response	Marks
Candidates **must use** appropriate, **specialist terms throughout** to explain the shape of the graph **using at least five of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates **use some** appropriate, **specialist terms throughout** to explain the shape of the graph using **at least three** of the above points. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates **make little use** of specialist terms **throughout** to explain the shape of the graph **using some or all** of the above points. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6]

AVAILABLE MARKS

6

					AVAILABLE MARKS
5	**(a)**	**(i)**	(480 × 100) ÷ 2000; 24%;	[2]	
		(ii)	Higher energy requirement (for muscle contraction)/higher RDA; More <u>muscle</u>;	[2]	
	(b)		Exercise/activity; [1] Pregnancy; [1]	[2]	
	(c)		Any **two** from 92% (of RDA)/described; Increased risk of heart disease/attack/stroke/high blood pressure/obesity;	[2]	8
6	**(a)**		Group of organisms with similar features; Reproduce to produce **<u>fertile</u>** offspring;	[2]	
	(b)		Lack cellular organisation/not made of cells/non-living;	[1]	
	(c)		Any **one** from Compare biodiversity; Conserve/protect <u>species</u>/prevent extinction; Study how organisms change through time; Recognition of a new/unknown species;	[1]	
	(d)		**Kingdom A** – Bacteria; [1] **Kingdom B** – Plants; [1] **Kingdom C** – Fungi; [1] **Kingdom D** – Animals; [1]	[4]	8

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AVAILABLE MARKS

7 **(a)** **(i)** Oxygen/O_2; [1]

(ii) Count the number of bubbles; per minute; [2]

(iii) Increase wattage of bulb/lamp move closer to plant; [1]

(iv) Increased heat (from light)/increasing water temperature;
Use heat sink/place another beaker of water between light and beaker with water plant; [2]

(b) **(i)** Further increase along the same line;
levels off at higher level (above 24); [2]

(ii) Light intensity; [1]

(c) Indicative content:
Maximum of three explanations from points 1–5

1. Sensor monitors/controls conditions;
2. Oil burner produces heat/CO_2;
3. Light (sensor) controls/maintains light levels;
4. Ventilators cool/allow gas exchange;
5. Sprinkler provides/maintains water;

Maximum of three explanations from points 6–9

6. Sensors maintain optimal environment/without limiting factors.
7. Maximum/more photosynthesis;
8. (Maximum) growth/yield;
9. Running costs reduced/no excess costs;

Response	Marks
Candidates **must use** appropriate, **specialist terms throughout** to describe how the greenhouse environment is controlled and explain why this may be more profitable using **at least five** of the above points. They use good spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates must **use** appropriate, **specialist terms throughout** to describe how the greenhouse environment is controlled and explain why this may be more profitable using **at least three** of the above points. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates must use appropriate, specialist terms throughout to describe how the greenhouse environment is controlled and explain why this may be more profitable using **at least one** of the above points. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6]

15

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				AVAILABLE MARKS
8	**(a)**	Lactate/lactic acid; Carbon dioxide; Alcohol/ethanol;	[3]	
	(b)	Aerobic respiration uses/needs oxygen; Aerobic respiration produces CO_2; Aerobic respiration produces **more** energy; Aerobic respiration produces water;	[3]	6
9	**(a)**	Gas produced by burning fossil fuels; NOx/SOx; **Reacts** with/dissolves in water (in the atmosphere/clouds);	[3]	
	(b)	Air pollution produced in one country can be blown into/fall in/affects another country;	[1]	
	(c)	Any **one** from: Flue-gas desulphurisation/scrubbers; Catalytic convertors/low sulphur fuels; Increased use of public transport/cycling/walking/other example described; Use of renewable energy sources, example described;	[1]	
	(d)	Snail;	[1]	
	(e)	Trout;	[1]	
	(f)	Biodiversity decreased/reduced/falls/goes down/declines;	[1]	8
10	**(a)**	Neurone;	[1]	
	(b)	Arrow drawn on axon A away from cell body → to cell B;	[1]	
	(c)	Long – connects different parts of the body; Insulating sheath – speeds up impulses;	[1] [1]	
	(d)	Can connect/synapse with more than one/many cells (neurones)/can form network of cells;	[1]	
	(e)	Any **five** from Transmitter/chemical (produced) at end of cell A; Transmitter/chemical moves/passes across synapse; (Transmitter/chemical moves) by diffusion; If transmitter/chemical concentration is high enough in cell B; Triggers impulse; Electric impulse;	[5]	10

11 **(a)** Place the quadrats at random; [1]

(b) **Indicative content:**

1 (Percentage cover of) both daisies and dandelions decreases;
2 Dandelions decrease faster (than daisies);
3 Dandelions recover;
4 One correct reference to data in **1**, **2** or **3**;
5 Rabbits (prefer to) eat the large leaves of dandelion;
6 Dandelions can grow (back) from (large) root (which isn't eaten);
7 (Once eaten) daisies cannot/don't grow back;
8 Because they have shallow roots which do not give rise to new plants;

Response	**Mark**
Candidates **must use appropriate, specialist terms throughout** to describe and explain the percentage cover of dandelions and daisies **using at least 5 of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates use **some appropriate, specialist terms throughout** to describe and explain the percentage cover of dandelions and daisies **using at least 3 of the above points**. They use satisfactory spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates make **little use of specialist terms throughout** to describe and explain the percentage cover of dandelions and daisies using **at least 1 of the above points**. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6]

(c) **(i)** Grass (population/percentage cover) increases more rapidly than other species; [1]

(ii) Less competition;
For named resource (e.g. light/space/nutrients/minerals/water); [2]

10

AVAILABLE MARKS

					AVAILABLE MARKS
12	**(a)**	**(i)**	**A** – Nitrogen (gas/in air); **B** – Ammonium compounds;	[2]	
		(ii)	Nitrification;	[1]	
		(iii)	Any **four** from Root hair cells; Active uptake/absorption/transport; Uses energy; Requires oxygen/aerobic (respiration) (Nitrates/minerals) moved against concentration gradient;	[4]	
		(iv)	(Farmyard manure/fertilisers) contain nitrogen compounds/nitrates; Replace (nitrogen compounds/nitrates) lost from soil; Any **two** from (Removed)/when crop/grain/straw/harvested; Lost by leaching/runoff; Lost by denitrification (in anaerobic conditions);	[4]	
	(b)	**(i)**	**Supports –** Trend shows the deeper the fertiliser the less nitrate uptake/inverse relationship; Appropriate numerical values from graph;	[1] [1]	
			Not justified – No readings between 0 and 0.2 cm depth;	[1]	
		(ii)	Repeat same method with fertiliser at **more**/different depths (between 0 < 0.2 m or 0.4 < 1.2 m) below surface;	[1]	15
				Total	**100**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012

Biology

Unit 1

Higher

[GBY12]

GBY12

WEDNESDAY 30 MAY, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Use blue or black ink.
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Answer **all twelve** questions in the spaces provided.

INFORMATION FOR CANDIDATES

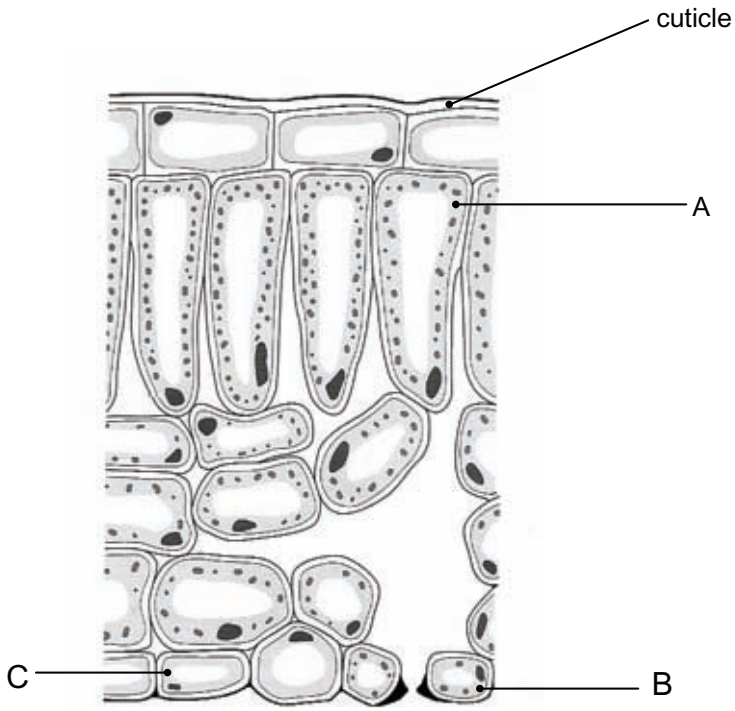
The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **4**, **7(c)** and **12(c)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
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12	
Total Marks	

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Examiner Only	
Marks	Remark

1 The diagram shows part of a leaf.



© GCSE Biology for CCEA by R McIlwaine & J Napier, published by Hodder & Stoughton, 2003. ISBN 0340858257."Reproduced by permission of Hodder Education".

(a) Name cells A, B and C.

A _____ [1]

B _____ [1]

C _____ [1]

(b) Explain how the cuticle is adapted to allow light to reach the mesophyll cells.

_____

_____ [1]

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Examiner Only	
Marks	Remark

2 The nervous and hormonal systems carry information from one part of the body to another.

(a) Describe how the nervous and hormonal systems differ in the type of signal they use.

Nervous _____ [1]

Hormonal _____ [1]

(b) The table shows the relationship between the diameter of a neurone and the speed of conduction.

Organism	Neurone diameter/μm	Speed of conduction/m s^{-1}
Cat	1	3
Crab	30	5
Worm	50	30
Squid	500	35

(i) Describe the relationship between the diameter of a neurone and the speed of conduction.

_____

_____ [1]

(ii) Suggest why the large diameter of the squid's neurones helps it to escape predation by whales.

_____

_____ [1]

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Examiner Only	
Marks	Remark

3 When investigating the energy requirements of boys and girls with a normal activity level, a scientist found the following table in a research document.

Age/years	Energy requirement/kJ per day	
	Boys	Girls
1–3	5 150	4 878
4–6	7 180	6 469
7–10	8 248	7 285
11–14	9 295	7 725
15–18	11 535	8 834

(a) What conclusions can be reached from these results?

_____

_____

_____

_____

_____ [2]

(b) A thirteen year old boy with normal activity level has a daily energy intake of 9500 kJ.

Describe **two** ways the boy's adult health may be affected by this daily energy intake.

_____

_____

_____ [2]

(c) Explain why the energy requirements change when a woman becomes pregnant.

_____

_____ [1]

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Human health can be affected by the quantity of food eaten, healthy food choices and infections by microorganisms.

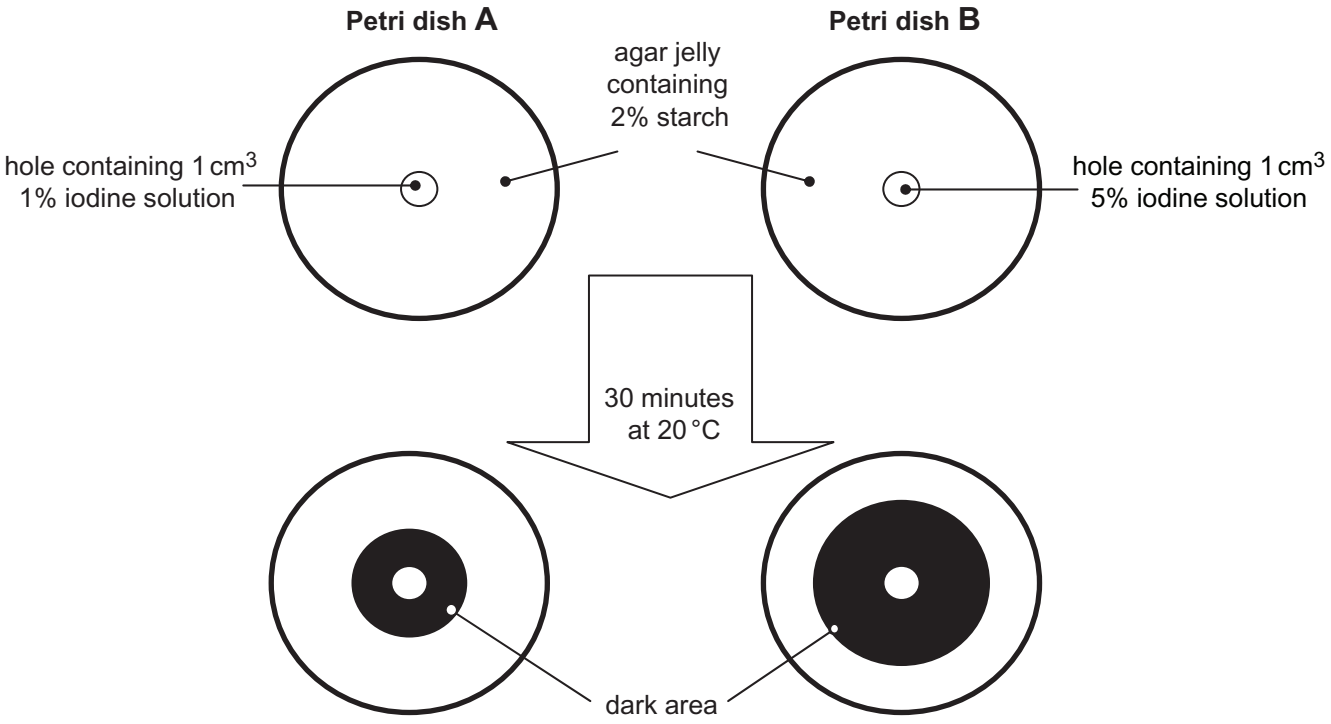
(d) Give **one other** factor which affects human health.

_____ [1]

Examiner Only	
Marks	Remark

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4 The diagram shows an experiment to investigate the effect of increasing the concentration of iodine solution on the rate at which iodine diffuses through agar jelly.



Describe and explain the conclusions that can be made from the results of this experiment.

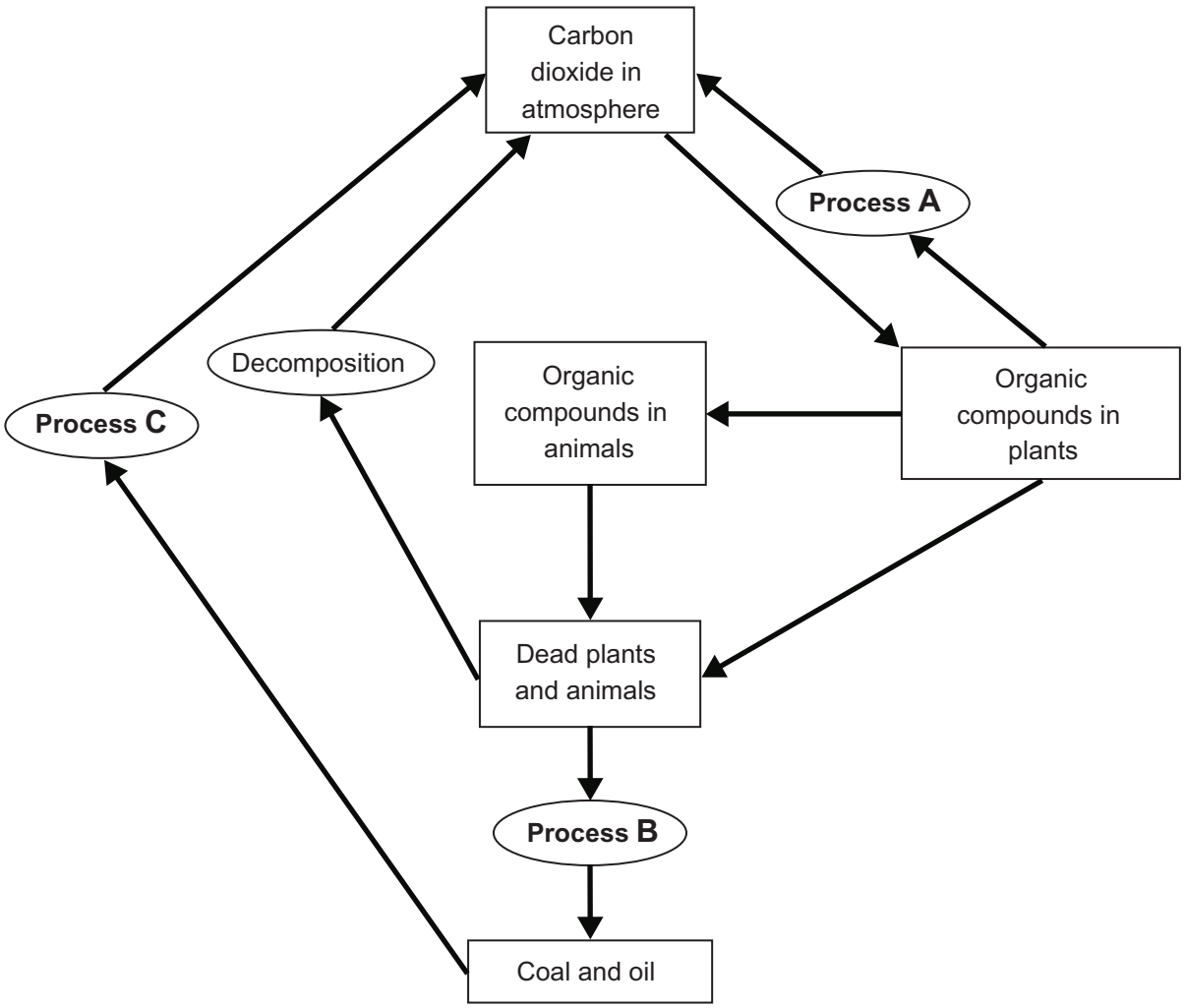
In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark

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5 The diagram shows some of the processes of the carbon cycle.



Examiner Only	
Marks	Remark

(a) (i) Name processes A, B and C.

A _____ [1]

B _____ [1]

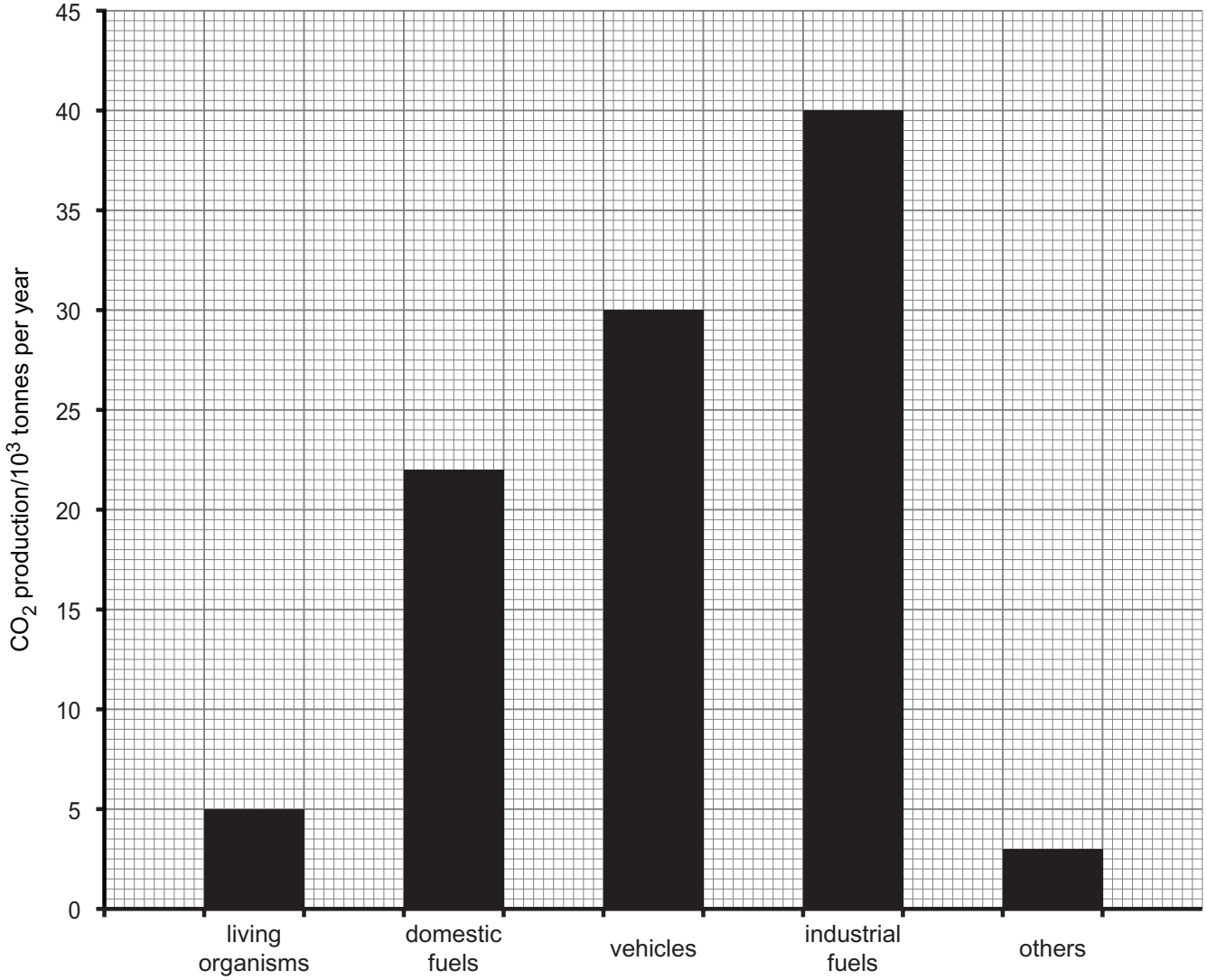
C _____ [1]

(ii) Name the only process which decreases the carbon dioxide in the atmosphere.

_____ [1]

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(b) The graph shows the annual amount of carbon dioxide emissions produced by five different sources in a city.



Examiner Only	
Marks	Remark

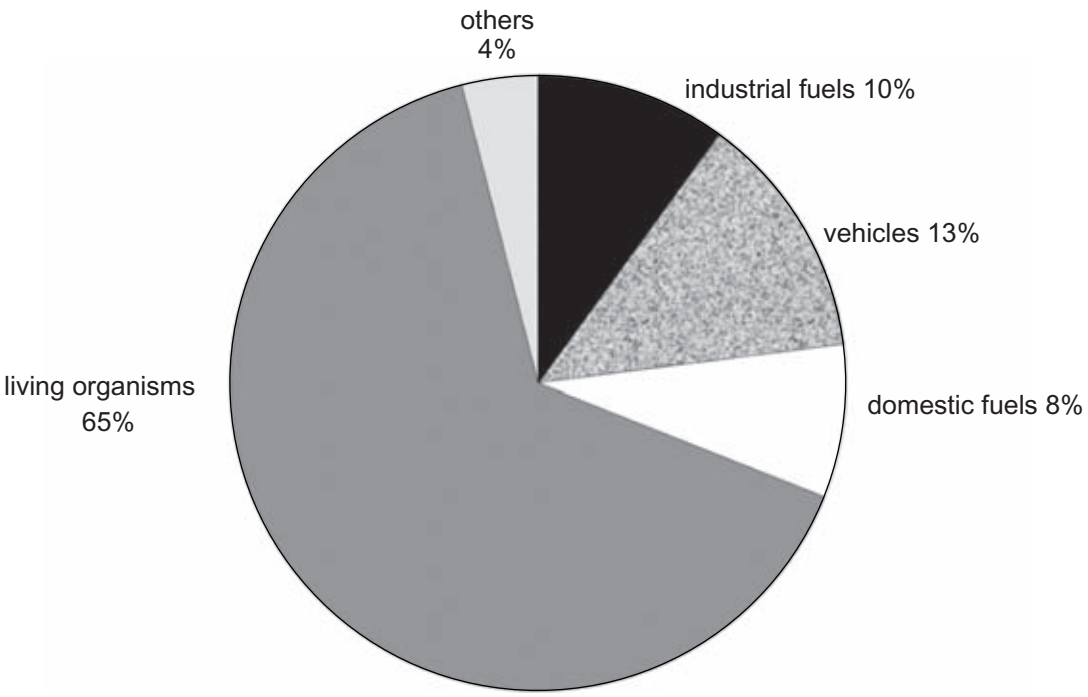
(i) Calculate the percentage of the total carbon dioxide emissions that is produced by domestic fuels.

Show your working.

Answer _____ [2]

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The pie chart shows the annual amount of carbon dioxide produced by the same five sources in the countryside.



(ii) Explain **two** differences between the carbon dioxide produced in the city and the countryside.

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

6 Researchers may obtain human stem cells from embryos or adult sources. Stem cells can be cultured and used to produce tissues. It may then be possible to use these cultured cells to replace damaged tissues in people with certain diseases such as Parkinson's disease.

(a) What is a stem cell?

_____

_____

_____ [2]

(b) Suggest **two** advantages of using embryonic rather than adult stem cells.

_____

_____

_____

_____ [2]

(c) Explain why some people object to human stem cell research for ethical reasons.

_____

_____

_____

_____

_____ [3]

Parkinson's disease is caused by degeneration of tissue in the brain.

(d) Suggest what type of tissue researchers need to culture to help in the treatment of this disease.

_____ [1]

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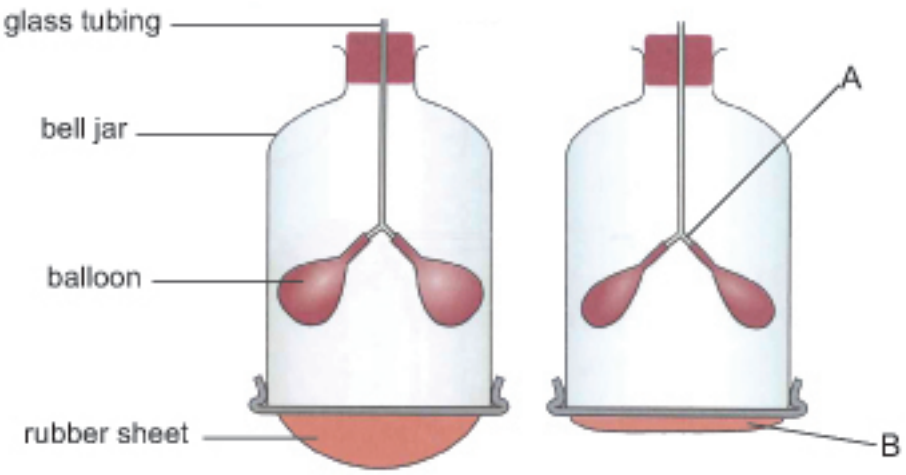
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Examiner Only	
Marks	Remark

7 The diagram shows a lung model.



© GCSE Biology for CCEA second edition Revision Book by James Napier & Neal McKnight, published by Hodder Education, 2012

(a) (i) Name the parts of the respiratory system represented by A and B.

A _____ [1]

B _____ [1]

(ii) Give **one** structure found in the respiratory system that is not represented in this lung model.

_____ [1]

(iii) Explain the changes in the bell jar which cause the balloon to inflate.

_____

_____

_____

_____ [2]

(b) Describe and explain how **two** named features of the respiratory system adapt it for efficient gas exchange.

1. _____

_____

_____ [2]

2. _____

_____

_____ [2]

The table shows the percentage of some gases in inhaled and exhaled air.

Gas	Inhaled air/%	Exhaled air/%
Oxygen	21	16
Carbon Dioxide	0.04	4
Nitrogen	78	78

(c) Describe and explain the differences in the composition of inhaled and exhaled air.

In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 The diagram shows a section through part of the ileum.

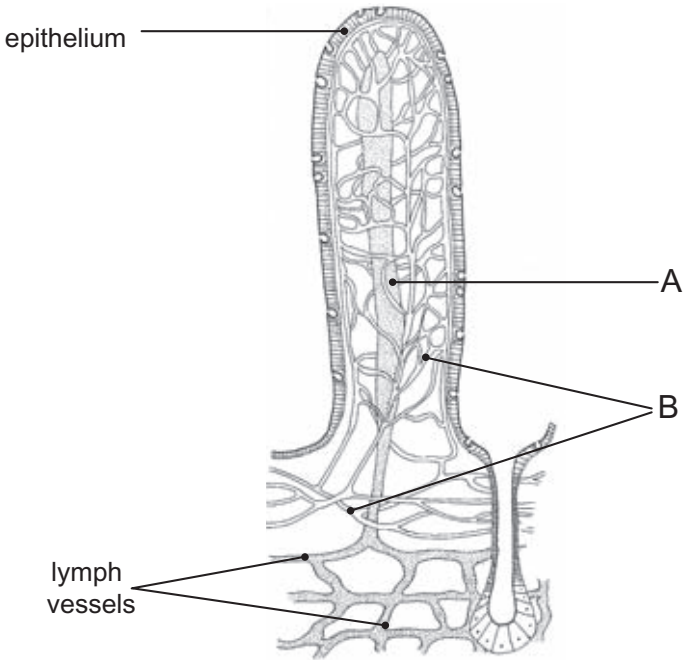


Diagram from Biology: a Modern Introduction by B S Beckett (OUP, 1976), copyright © Oxford University Press 1976, reprinted by permission of Oxford University Press

(a) Name the structure shown in the diagram.

_____ [1]

(b) Identify parts A and B.
Explain the role of each in the absorption of digested food.

A _____

_____

_____ [2]

B _____

_____

_____ [2]

(c) How does the epithelium aid the absorption of digested food?

_____

_____

_____ [1]

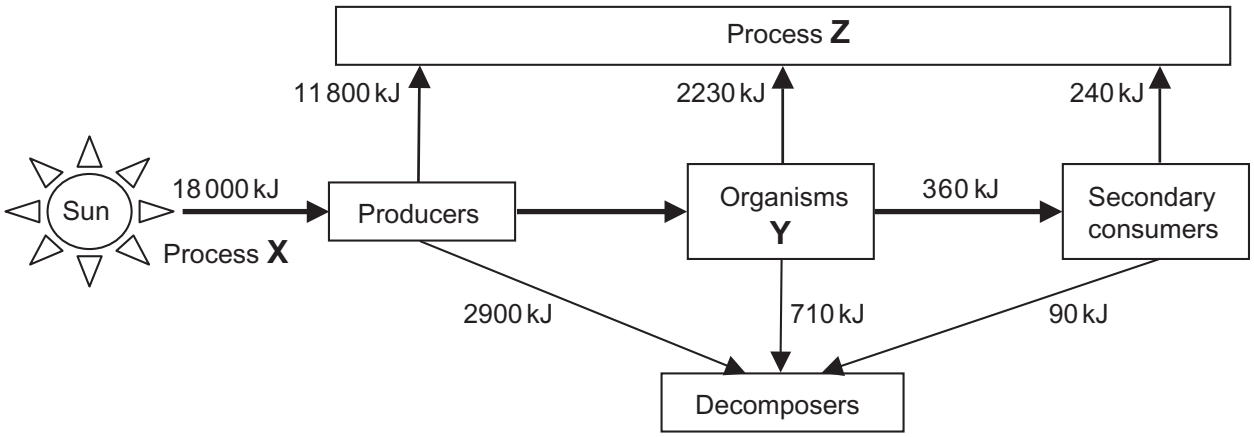
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9 The diagram shows the energy flow in a food chain.



Examiner Only	
Marks	Remark

(a) Name process **Z**.

_____ [1]

(b) Give the term used to describe organisms **Y**.

_____ [1]

(c) **(i)** Calculate the amount of the energy passed from the producers to organisms **Y**.

Show your working.

Answer _____ [2]

One reason why this value is smaller than the energy absorbed by producers is because some of the energy passes to process **Z**.

(ii) Explain **two other** reasons why this value is smaller than the energy absorbed by producers.

_____

_____

_____ [2]

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(d) Use evidence from the diagram to help explain why this food chain has only three trophic levels.

_____

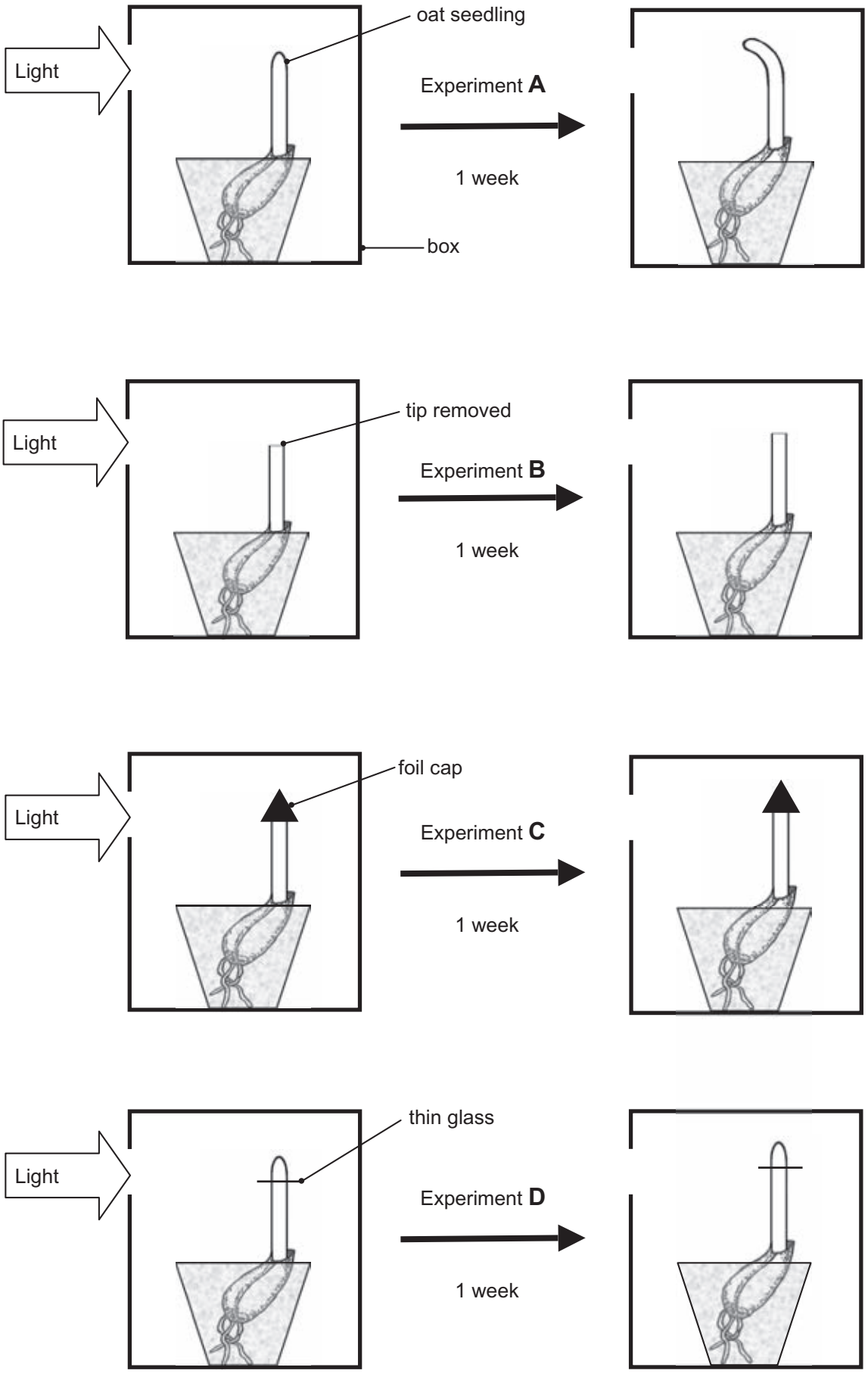
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

10 The diagrams show experiments used to investigate the effect of one-sided light on the growth of oat seedlings.



(a) (i) Name the response shown by the oat seedling in experiment **A**

_____ [1]

(ii) Name the plant hormone which causes the response.

_____ [1]

Experiment **A** is the control experiment in the investigation and demonstrates that oat seedlings respond to light.

(b) Choose **one other** experiment and explain how it shows that this response

is sensitive to light. _____

_____

_____ [2]

involves the diffusion of a plant hormone from the tip.

_____

_____

_____ [2]

(c) Explain how the plant hormone causes bending in experiment **A**.

_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

Daniel has found many dandelions growing in his lawn and has been advised to spray selective weed killer. The broad leaves of the dandelion plants absorb the weed killer and the plants die. The grasses remain unharmed.

(d) Suggest why the selective weed killer kills only the dandelions.

_____

_____

_____ [2]

Once the dandelions and other weeds had been killed Daniel noticed that the grass plants grew faster and produced more leaves.

(e) Suggest why the grass plants grew faster in the absence of weeds.

_____

_____

_____ [2]

Plant hormones can also be used to stimulate all the fruit in an orchard to form at the same time.

(f) Suggest why this is economically useful for apple farmers.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

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11 Read the passage on the discovery of insulin and answer the questions below.

Examiner Only	
Marks	Remark

The discovery of insulin started in the nineteenth century with observations that those who died from diabetes frequently had a diseased pancreas. In 1869 Paul Langerhans identified groups of cells in the pancreas which did not have a known function.
Twenty years later two other German scientists, Minkowski and Mering, showed that if the pancreas was removed from a dog it got diabetes but if the tube from the pancreas to the intestine was surgically tied the dog only suffered minor digestive problems. This suggested that the pancreas not only produced digestive juices but also released a substance directly into the blood stream which controlled the blood glucose concentration.
Many attempts were made to isolate the anti-diabetic substance produced by the pancreas but significant progress was not made until 1921 when Fredrick Banting and his assistant Charles Best started a series of experiments, under the supervision of Professor John Macleod at the University of Toronto. They extracted a substance they called “isletin” which, when injected into a diabetic dog several times a day, returned it to full health.
To obtain larger volumes Banting and Best used the pancreas of cattle and showed that it also could be used to treat diabetic dogs. Work progressed quickly and the extract, renamed insulin, was eventually purified sufficiently to make it a successful treatment for human diabetics.

1 3 5 7 9 11 13 15 17 19 21

Source: www.nobelprize.org

(a) Give **three** reasons why the discovery of insulin is an example of the collaborative nature of science.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

(b) Explain how the results of scientific experiments (lines 14–16), such as those of Banting and Best, are validated by the scientific community.

_____

_____ [1]

One symptom of diabetes is high blood glucose concentration.

Examiner Only	
Marks	Remark

(c) Give **one other** symptom of diabetes.

_____

_____ [1]

(d) Explain how the control of blood glucose concentration by insulin is an example of a feedback mechanism.

_____

_____

_____

_____

_____ [2]

A second hormone called glucagon is now known to help control the blood glucose concentration.

(e) Describe the role of glucagon in controlling blood glucose concentration.

_____

_____

_____

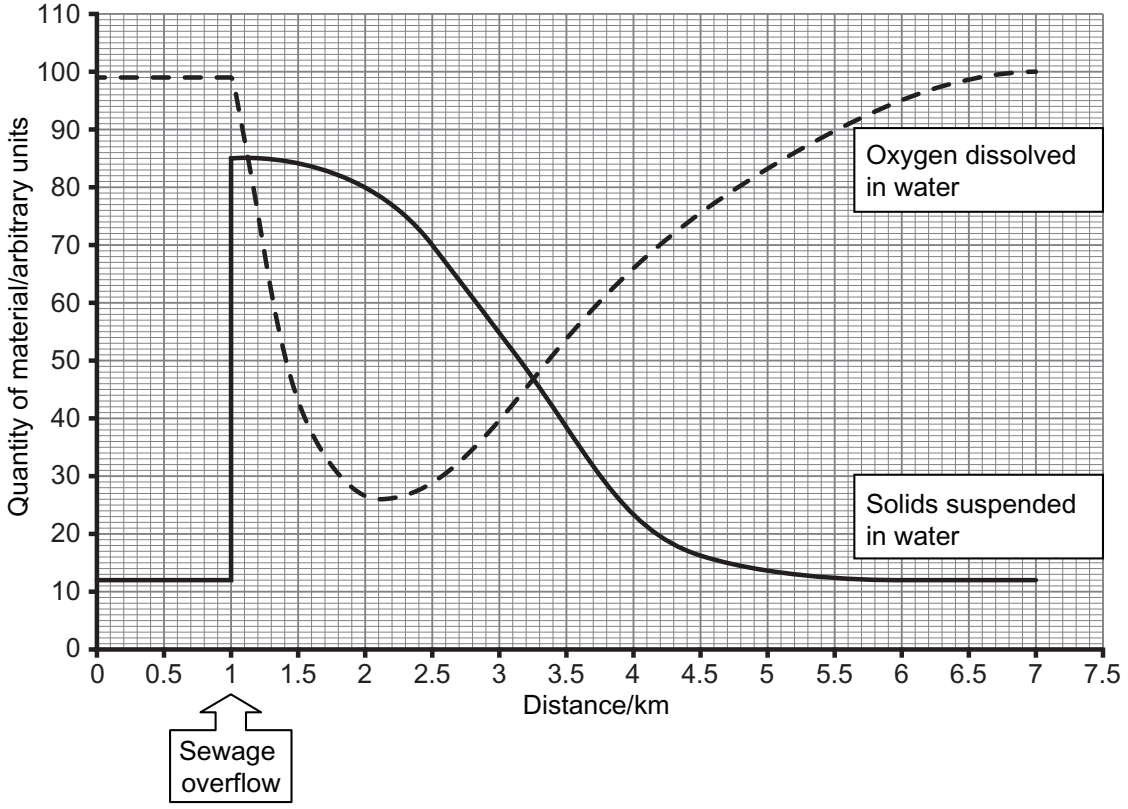
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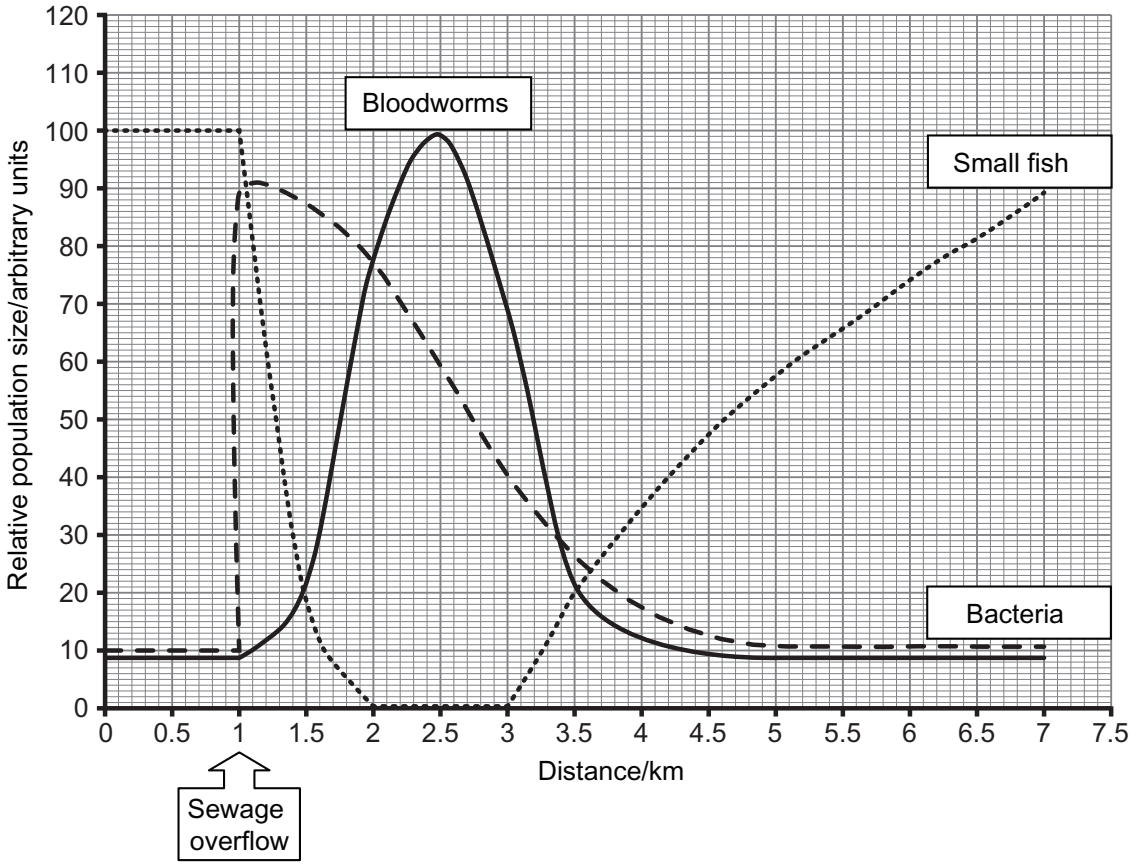
_____

_____ [3]

12 During periods of heavy rain some sewage treatment plants overflow and release sewage directly into a river. The sewage released contains suspended solids which have a high concentration of nitrogen compounds. The graphs show changes which occur in a river when sewage is released into it.

Examiner Only	
Marks	Remark





© The Biology of Polluted Waters by H B N Hynes, published by Liverpool University Press, 1978. ISBN 0853232008

(a) Suggest what effect the high concentration of suspended solids in the sewage entering the river would have on the plants in the river.

[3]

(b) At what distance from the sewage overflow are no fish left alive?

[1]

(c) Use information from the graphs to help explain the link between the numbers of bacteria and bloodworms with the quantity of suspended solids found in the river.

In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

[6]

Examiner Only

Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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Unit 1

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WEDNESDAY 30 MAY, AFTERNOON

MARK SCHEME

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				AVAILABLE MARKS
1	**(a)**	A – Palisade (mesophyll cell); B – Guard cell; C – Lower epidermis (cell);	[1] [1] [1]	
	(b)	Thin/clear/transparent/no pigment;	[1]	4
2	**(a)**	Nerves carry **electrical** (impulses); Hormonal system uses **chemical** (messages);	[1] [1]	
	(b) **(i)**	The larger the diameter of the nerve, the higher/faster the speed (of conduction);	[1]	
	(ii)	Faster **response**/**reflex**/**reaction rate** (/time); **Reject**: "faster conduction rate" unqualified	[1]	4
3	**(a)**	As age increases so does the amount of energy required; Boys require more energy than girls;	[2]	
	(b)	Increased weight/BMI/obesity; Increased risk of heart disease/heart attack/stroke/high blood pressure/ diabetes/arthritis;	[2]	
	(c)	More energy required for **growing**/**developing** embryo;	[1]	
	(d)	Genetics/inherited factors/alcohol/smoking/drugs;	[1]	6

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		AVAILABLE MARKS

4 (a) Indicative content:

1 Dish B (/with more iodine) has a larger dark (blue/black) area than dish A;
2 Iodine turns starch blue/black colour;
3 Larger concentration of/more iodine in **B**/**5%**;
4 Iodine (diffuses) through the agar;
5 Increasing the concentration of iodine solution speeds up the rate of **diffusion**;
6 From region of high concentration to region of low concentration;

Response	Marks
Candidates must use appropriate specialist terms throughout to describe and explain the conclusions from the results using **at least 5** of the above points. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use some appropriate specialist terms throughout to describe and explain the conclusions from the results using **at least 3** of the above points. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates make little use of specialist terms throughout to describe and explain the conclusions from the results using **at least 1** of the above points. The spelling, punctuation and grammar, form and style are of a **limited** standard.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

5 (a) (i) A – respiration; [1]
B – fossilisation; [1]
C – combustion; [1]

(ii) Photosynthesis; [1]

(b) (i) (22 × 100) ÷ 100;
22%; [2]

(ii) Any **two** from:
(**In city**) more factories/more industrial;
More vehicles/cars etc;
More houses;
Less living organisms;
Accept: converse in countryside [2] 8

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				AVAILABLE MARKS
6	**(a)**	(Animal) cell which divides/clones/mitosis; Unspecialised/undifferentiated/later becomes specialised/described;	[2]	
	(b)	Any **two** from: Easier to **grow**/**culture**; Easier to extract/obtain/plentiful; Can develop into different cell types/tissues; **Accept**: converse for adult stem cells **Accept**: more in placenta/umbilical than in adult bone marrow	[2]	
	(c)	Any **three** from: Involves killing/destroying embryo/human life; Against their religion/playing God; Human rights of embryo; Other appropriate response;	[3]	
	(d)	Nervous; **Reject**: brain/brain tissue	[1]	8

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AVAILABLE MARKS

7 **(a)** **(i)** A – bronchus; [1]
B – diaphragm; [1]

(ii) Ribs/intercostal muscles/pleural membranes; [1]

(iii) **Pulling rubber** sheet/diaphragm/B **down**;
(Belljar/thorax/chest/lung) volume increases or
Pressure decreases; [2]

(b) Any **two pairs** *(feature; appropriate adaptation;)* from:
(Many) alveoli; Large surface area;
Close to blood supply/surrounded by capillaries; Maintain (high) diffusion;
Thin walls; short diffusion distance;
Moist (lining); Allows gases to **dissolve**;
Permeable (membranes); Allows gases to diffuse through;
Ventilation; (maintain high) **diffusion** gradient; [4]

(c) **Indicative content:**
1 Oxygen % reduced (in exhaled);
2 Carbon dioxide % increased (in exhaled);
3 More moisture/water vapour (exhaled);
4 More heat/warmer (are exhaled);
5 Respiration (in cells);
6 In (body) cells; into blood;
7 Transported in/diffused into blood/lungs;
Reject: reference to nitrogen

Response	Mark
Candidates must use appropriate specialist terms throughout to explain how named features of the respiratory system are adapted for gas exchange **using at least 5 of the above points**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates use some appropriate specialist terms throughout to explain how named features of the respiratory system are adapted for gas exchange **using at least 3 of the above points**. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates make little use of specialist terms throughout to explain how named features of the respiratory system are adapted for gas exchange **using at least 1 of the above points**. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6]

15

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				AVAILABLE MARKS
8	**(a)**	Villus;	[1]	
	(b)	A – lacteal; transports/absorbs fats;	[2]	
		B – capillary; Transports/soluble (digested) food molecules/named example/ or maintains diffusion gradient;	[2]	
	(c)	One cell thick/short diffusion distance; **Accept**: microvilli; produces mucus;	[1]	6
9	**(a)**	**Z** – Respiration;	[1]	
	(b)	**Y** – Primary consumer;	[1]	
	(c)	**(i)** = 3300; kJ;	[2]	
		(ii) Energy passes to decomposers; Not all plant (cells/tissues) can be **digested/absorbed** by Y;	[1] [1]	
	(d)	Any **two** from: Only certain amount/limited amount of energy fixed by producers; Energy lost at each trophic level/step/stage; After 3 trophic levels 30 kJ left; Not enough energy/secondary consumers in the area to support another level/Tertiary consumers would have to eat many secondary consumers;	[2]	8

				AVAILABLE MARKS
10	**(a)**	**(i)** Phototropism;	[1]	
		(ii) Auxin;	[1]	
	(b)	**Sensitive to light**: B/C;	[1]	
		Tip covered so no light hits tip;	[1]	
		Involves diffusion of plant hormone from tip;	[1]	
		D; Glass stops hormone moving down stem; or B; no tip to produce hormone/no auxin/no response;	[1]	
	(c)	Light causes uneven distribution (of hormone);	[1]	
		Hormone causes **cell** elongation;	[1]	
		More (Cell) elongation/growth on dark side;	[1]	
	(d)	Any **two** from: Dandelions have larger surface area; (Dandelions) absorb **more** or **lethal** concentration of weedkiller; Abnormal/excessive growth/respiration leading to death;	[2]	
	(e)	Less **competition**; For **named** resource/able to access more of a **named** resource; **Accept**: water/light/nutrient/space	[2]	
	(f)	Any **two** from: All fruit same/uniform size/fully developed; Ripe at same time/harvested at same time; Decreased harvesting costs/more profit;	[2]	15
11	**(a)**	(Involves different) scientists **working together/in teams**; Sharing ideas/publishing results/research of past discoveries; Different scientists did their own type of experiment/did further work;	[3]	
	(b)	Peer review/by other scientists **repeating** the work; Do **not** accept: Bauting and Best were supervised	[1]	
	(c)	Presence of glucose in urine/lethargy/thirst/frequent urination;	[1]	
	(d)	Blood glucose concentration constantly **monitored** (by pancreas); Change in concentration of insulin produced returns blood glucose concentration to normal;	[2]	
	(e)	Any **three** from: Produced in the pancreas; In response to **falling** blood glucose; Acts in liver; Causes glycogen to be converted to glucose; which is released into the blood or increases glucose concentration;	[3]	10

	AVAILABLE MARKS

12 (a) Any **three** from:
More nitrates;
Eutrophication;
algae growth/plants grow;
Light blocked by suspended solids/shading;
Nutrients used up;
Therefore plants die [3]

(b) 1 km; [1]

(c) **Indicative content**:
1 Bacteria breakdown/decay/feed on sewage (suspended solids)
2 Bacteria grows/increase when/are high in sewage (/suspended solids) released;
3 Bacteria/respiration is anaerobic;
4 (so) Dissolved oxygen falls between 1 and 2 km along river;
5 Bloodworms can survive in low oxygen (anaerobic conditions)/ increased population in low oxygen;
6 Bloodworms are indicator species/indicate polluted water;
7 3 km all sewage solids decomposes therefore bacteria/ bloodworms decrease/O_2 rises;

Response	**Mark**
Candidates must use appropriate specialist terms throughout to explain the link between bacteria and bloodworms **using at least FIVE of the above points, in a logical sequence**. They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates use some appropriate specialist terms throughout to explain the link between bacteria and bloodworms **using at least THREE of the above points, in a logical sequence**. They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates make little use of specialist terms throughout to explain the link between bacteria and bloodworms **using at least ONE of the above points, in a limited sequence**. The spelling, punctuation and grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6] 10

Total **100**

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