CCEA GCSE DOUBLE AWARD SCIENCE

SCIENCE



EXAM QUESTION PACK

BIOLOGY UNIT B1 HIGHER TIER GSD12 PAPERS

STEMUP

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

WEDNESDAY 9 NOVEMBER 2016, MORNING

MARK SCHEME

STEMUP.CO.UK

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

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			AVAILABLE MARKS
1	**(a)**	Any **three** from: put down transect line/tape/line/string/belt transect/described; use quadrat; at different distances/placing of quadrats front to back of dunes/sampling across the dunes; measure % cover marram grass in each quadrat/measure marram grass in quadrat; [3]	
	(b) **(i)**	increases then decreases/increases then exception or anomaly at 40 [1]	
	(ii)	salt content 2.5; pH 8.1; [2]	
	(c)	pH paper/pH probe or pH sensor/soil testing kit/universal indicator/ pH meter/pH indicator [1]	
	(d)	animals or named, e.g. snails eating marram grass/disease/ competition (from other species)/organisms that feed on the marram grass/humans/predators/insects [1]	8

AVAILABLE MARKS

2 **(a)** Accept:

- one Petri dish into box; } Petri dish; with lamp
- shine lamp from one side } from one side = OK for 2 marks
- take 2nd Petri dish;
- shine light from above/put into box with opening only at the top;
- time
- record results

Band	Response	Mark
A	Candidates use appropriate terms throughout to give at least five points from the indicative content. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5]–[6]
B	Candidates use appropriate terms throughout to give at least three or four points from the indicative content. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3]–[4]
C	Candidates use appropriate terms throughout to give 1 or 2 points from the indicative content. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

(b) seedlings grow straight up with light from above;
seedlings in box grow to side with the hole/or to where light coming from;
one bent to light and other straight = 1 mark [2]

(c) Any **two** from:
type/variety/species of seedling/number/size;
time/light exposure;
distance of lamp from seedlings/light intensity/bulbs/brightness;
temperature/heat;
water [2]

(d) **(i)** tip [1]

(ii) auxin [1] 12

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AVAILABLE MARKS

3 (a) (i) Accept:
1st mark: lignin;
2nd and 3rd mark: can be 'comparison + 1 data' or '2 data'

comparison
most/more remaining (after 15 weeks) than starch/cellulose
or
starch/cellulose have much less remaining (after 15 weeks)
or
only starts to be broken down after 10 weeks/only starts to break down at 15 weeks

data
lignin: 90% remaining after 15 weeks
10% broken down after 15 weeks

starch: 90% broken down at 15 weeks
10% remaining after 15 weeks
80% more starch (than lignin) broken down at 15 weeks

cellulose: 40% broken down by 15 weeks
60% remaining after 15 weeks
30% more remains after 15 weeks [3]

(ii) type 2 [1]

(iii) 90/60/30 = 1 mark
6 = 2 marks [2]

(iv) glucose **not**: sugar [1]

(b) (i) root hair (cells) [1]

(ii) water/H_2O [1]

(iii) amino acids/proteins [1]

(c) (i) Any **three** from:
long;
folds;
villi;
microvilli; [3]

(ii) Any **two** from:
short diffusion distance/thin/ one cell thick/thin wall/thin lining
permeable;
moist;
good blood supply/diffusion gradient/described blood supply,
e.g. network of capillaries; [2]

15

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					AVAILABLE MARKS
4	(a)	• most carbon dioxide produced/or more/most CO_2; • (most) respiration; need **word most only once** • enzymes worked best • best temp/optimum temp/highest temp		[3]	
	(b)	(i) at start brick red/red; because glucose present;		[2]	
		(ii) at end no glucose – blue or less glucose – blue/green or green or orange;		[2]	
	(c)	ethanol/alcohol		[1]	8
5	(a)	(i) brain and spinal cord		[1]	
		(ii) muscle or named/gland		[1]	
	(b)	(i) anomalous result/significantly departs from the mean/does not fit the trend/doesn't follow pattern		[1]	
		(ii) 0.9 + 0.25 = 1.15; 1.15/0.156 = 7.37; (7.37 [2] marks 7.371 [1] mark 7.4 [1] mark) correct answer = 2 marks		[2]	
	(c)	hormonal		[1]	6

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			AVAILABLE MARKS
6	**(a)**	not all absorbed/not all the wavelengths of light can be used/some light passes through/some light is reflected off the leaves/some light shines on areas where there are no phytoplankton/light reflected off water/ light doesn't hit chloroplasts or chlorophyll [1]	
	(b) **(i)**	Any **two** from: • increasing sunlight/more sunlight; • greater nos. of phytoplankton or bloom or reproducing. or fewer zooplankton (to consume phytoplankton) [2]	
	(ii)	10 000 and 780; $\frac{780}{10\,000} \times 100 = 7.8$; correct answer = [2] marks 7.8 78 = 1 mark as working out ok [2]	
	(iii)	• less zooplankton/less phytoplankton for zooplankton • for fish to feed on [2]	
	(c) **(i)**	Any **four** from: eutrophication; increase in numbers of algae/plants/phytoplankton; because of more nitrates/minerals; shading by algae/plants/phytoplankton/mineral depletion; causes algae/plants/phytoplankton to die; algae/plants/phytoplankton decomposed by bacteria; the bacteria use up the oxygen; [4]	
	(ii)	Any **two** from: more heat/light; (more algae) to decompose/more decomposition; **or** higher light/temperature; (more bacteria) for decomposition; **or** less water in lake in summer; so minerals more concentrated or less O_2 in warmer water = [1] mark [2]	13

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7

	Boiling tube	Colour	Explanation	
(a)	A	yellow	no photosynthesis but respiration occurs/respiration only; carbon dioxide given out/increases; more CO_2/high levels CO_2 any two	[3]
(b)	B	purple	greater photosynthesis rate than respiration rate; carbon dioxide taken in/decreases; any two	[3]
(c)	C		no photosynthesis and no respiration; so no change in carbon dioxide level/ normal CO_2 levels;	[2]

Total

AVAILABLE MARKS

8

70

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

TUESDAY 17 MAY 2016, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

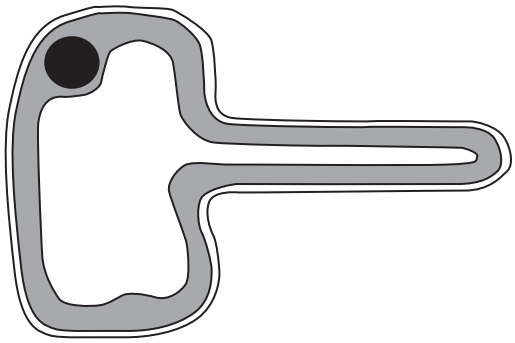
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all nine**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

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 Question **4(b)**.

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1 **(a)** Plants take up minerals from the soil using specialised cells.
The drawing shows one of these specialised cells.



Source: Principal Examiner

(i) Name this specialised cell.

_____ [1]

(ii) Use the drawing to describe and explain how this cell is adapted for its role in mineral uptake.

_____

_____

_____

_____

_____ [2]

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(b) Farmyard manure is a natural fertiliser.
The table shows the mass of three minerals in farmyard manure and in an artificial fertiliser.

	Mass of mineral/kg/tonne		
Fertiliser	**Nitrate**	**Phosphate**	**Potassium**
Farmyard manure	6.0	3.5	8.0
Artificial fertiliser	200.0	100.0	100.0

(i) Plants use nitrates to make a substance needed for growth.
Name this substance.

_____ [1]

(ii) There is an advantage in using artificial fertiliser rather than farmyard manure.
Give **data** from the table that supports this statement.

_____

_____

_____

_____ [1]

(iii) Give **three** advantages of using farmyard manure rather than artificial fertiliser.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

[Turn over

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2 **(a)** When coal and oil are burned, they produce air pollutants.
Sulfur dioxide is one of these air pollutants.
Coal and oil are the main fuels burned for heating homes in Belfast.
Natural gas is another fuel that has become recently available for heating homes in Belfast.

The table shows sulfur dioxide levels in Belfast city centre from 1990 to 2010.

Year	Sulfur dioxide level/μg/m^3
1990	65
1995	47
2000	18
2005	7
2010	5

© Crown Copyright. Air pollution in Northern Ireland by Alison Loader and Paul Willis. Department of Environment. ISBN: 978-1-907053-39-9

Use the table and the information given to answer the following.

(i) Which **10 year** period showed the greatest decrease in sulfur dioxide levels? Give this decrease.

Show your working.

- 10 year period: _____ to _____
- Decrease: _____ μg/m^3 [2]

(ii) Explain why sulfur dioxide levels have decreased.

_____

_____

_____ [1]

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Lichens are small organisms that are found living on rocks, walls and trees.
They are sensitive to air pollution, especially sulfur dioxide.

The photographs show three types of lichen, a crusty, a leafy and a shrubby lichen.



Crusty lichen

© Dr Jeremy Burgess / Science Photo Library



Leafy lichen

© Claude Nuridsany & Marie Perennou / Science Photo Library



Shrubby lichen

© mtreasure / iStock / Thinkstock

- Crusty lichens can survive in levels of sulfur dioxide up to 70 µg/m^3.
- Leafy lichens can survive in levels of sulfur dioxide up to 59 µg/m^3.
- Shrubby lichens only survive in levels of sulfur dioxide below 19 µg/m^3.

(b) Use this information and the table opposite to give the type of lichen that would have been found in Belfast city centre in 1990.

Type of lichen: _____

Reason for choice: _____

_____

_____

_____ [2]

(c) Sulfur dioxide levels in Belfast city centre are now low.
Explain why it is still important to continue monitoring the level of sulfur dioxide.

_____

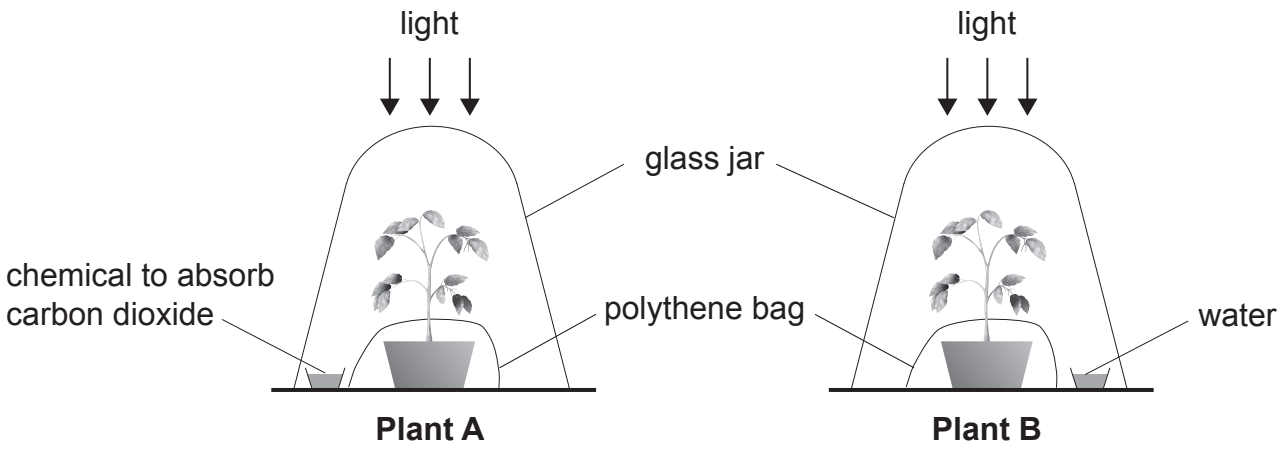
_____

_____ [1]

[Turn over

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24GSD1205

3 **(a)** The diagram shows an experiment to investigate if carbon dioxide is needed for photosynthesis.



Source: Principal Examiner

Both plants were destarched before the experiment.
They were **then** left in warm, sunny conditions for 24 hours.

(i) How were the plants destarched?

_____

_____

_____ [1]

(ii) Why were the plants destarched?

_____

_____

_____

_____ [1]

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24GSD1206

(iii) Bacteria are living organisms present in the soil in the plant pots.
Suggest why the plant pots are covered with polythene bags.

[2]

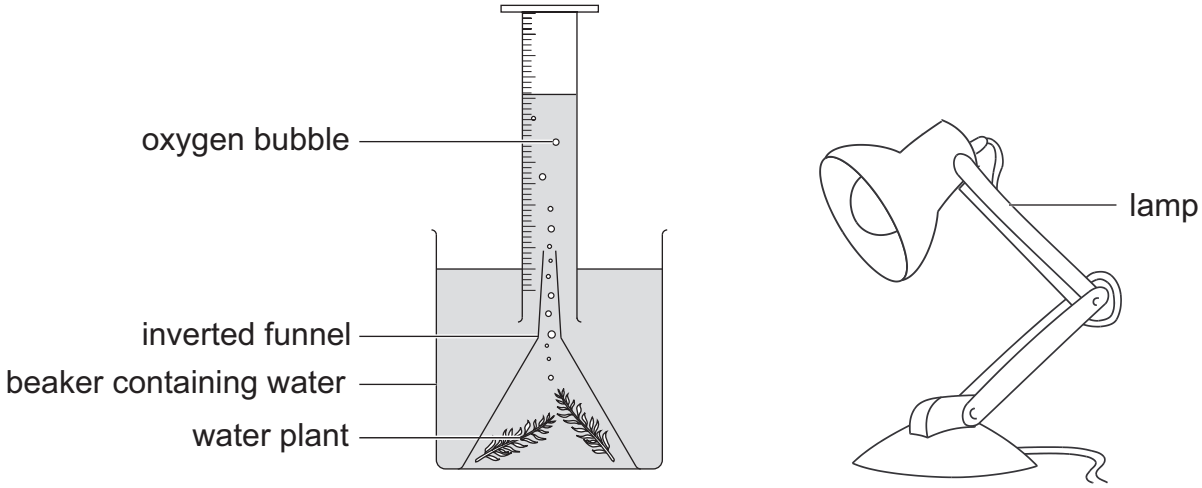
(iv) After 24 hours in warm, sunny conditions, a leaf from plant **A** and a leaf from plant **B** were tested for starch using iodine solution.
Describe and explain the results you would expect for the leaf from plant **A** and the leaf from plant **B** after testing with iodine solution.

[3]

[Turn over

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(b) Jude carried out an experiment to measure the rate of photosynthesis in a water plant at different light intensities.
The diagram shows the apparatus he used.

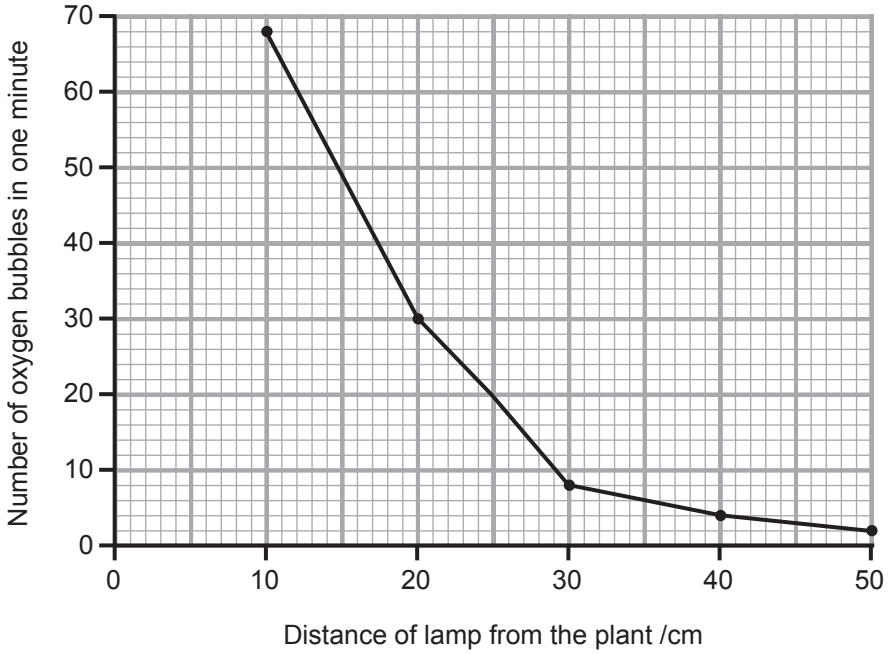


Source: Principal Examiner

The light intensity decreases as the lamp is moved further away from the plant.

Jude counted the number of oxygen bubbles given off by the plant in one minute at different distances of the lamp from the plant.

The graph shows the results of Jude's experiment.



(i) Use the information given opposite and the graph to describe what happens to the number of oxygen bubbles given off by the plant as the light intensity decreases.

_____

_____ [1]

(ii) At what distance of the lamp from the plant did the plant produce **24 oxygen bubbles** in one minute?

_____ cm [1]

(iii) When Jude moved the lamp to a different distance, he waited for two minutes before counting the number of oxygen bubbles.

Explain why he did this.

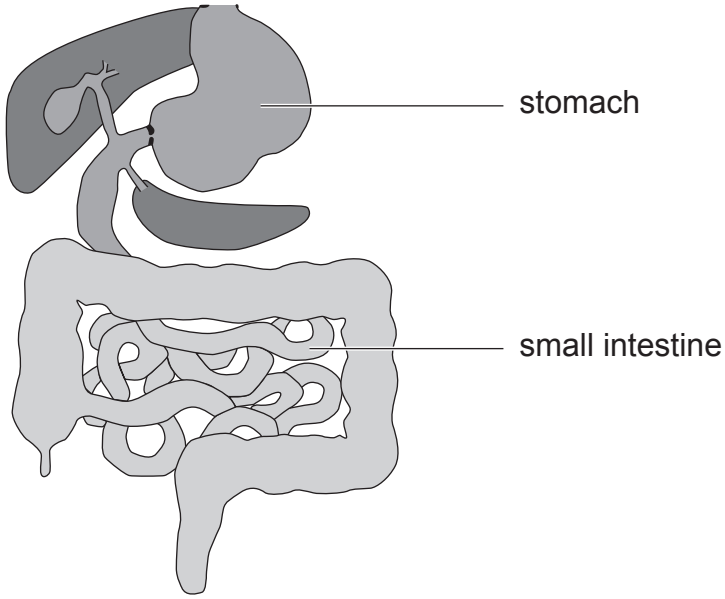
_____

_____ [1]

[Turn over

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4 The diagram shows part of the digestive system.



© GCSE Biology for CCEA, Rose McIlwaine and James Napier (ISBN-9780340858257).
"Reproduced by permission of Hodder Education".

(a) State **two** ways in which the small intestine is adapted for digestion.

1. _____

2. _____ [2]

(b) Meat is a major source of protein in our diet.
Digestion of meat starts in the stomach and is completed in the small intestine.

As George got older, he produced less hydrochloric acid in his stomach.
After eating any meal containing a lot of meat, George felt his stomach remaining full for longer, compared to when he was younger.

- Describe and explain the effect of reduced acid production on digestion of meat in the stomach of an older person like George.
- Describe the digestion of meat in the **small intestine**.
- Describe what happens to the products of digestion of meat in the small intestine.

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

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[6]

[Turn over

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24GSD1211

5 **(a)** The photographs show a bat and an owl.

Bat



© KirsanovV / iStock / Thinkstock

Owl



© Andy Harmer / Science Photo Library

Read the passage and use the information and your knowledge to answer the questions that follow.

Owls feed on bats.
While flying, bats eat large numbers of small flies that feed on a few trees.

(i) Draw a pyramid of numbers for the organisms given in the passage.
Label the organisms.

[3]

(ii) As well as feeding on trees, the small flies feed on crops like wheat.
Give **one** advantage to a crop farmer of having bats living nearby his fields.

_____

_____

_____ [1]

(b) Fish also eat small flies.
Ponds have large numbers of small flies. This makes ponds good habitats for both bats and fish.
If there is a sudden increase in the fish population, their waste substances can lead to a build-up of nitrates in the pond.
This can cause eutrophication.

(i) Describe and explain how eutrophication can result in a lack of oxygen in the pond.

[4]

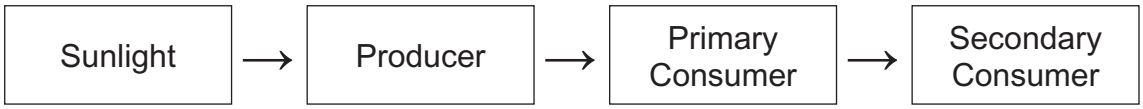
(ii) The lack of oxygen can lead to the death of fish in the pond.
Describe and explain how this may affect the bat population living near the pond.

[2]

[Turn over

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6 The diagram shows the flow of energy through a grassland ecosystem.



(a) At what trophic level are producers found?

_____ [1]

(b) The amounts of energy in a food chain for a Northern Ireland beef cattle farm are given below.
Figures are in kJ/m^2/year.



(i) Name the secondary consumer in this food chain.

_____ [1]

(ii) Calculate the percentage of energy that is transferred between the grass and the beef cattle.

Show your working.

_____ % [2]

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24GSD1214

(iii) Give **two** reasons for the loss of energy between the grass and the beef cattle.

1. _____

_____

_____

2. _____

_____

_____ [2]

(iv) The farmer decided to keep the beef cattle in a shed.
The beef cattle do not have much space to move around in the shed.
Suggest why keeping the beef cattle in the shed is more profitable for the farmer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

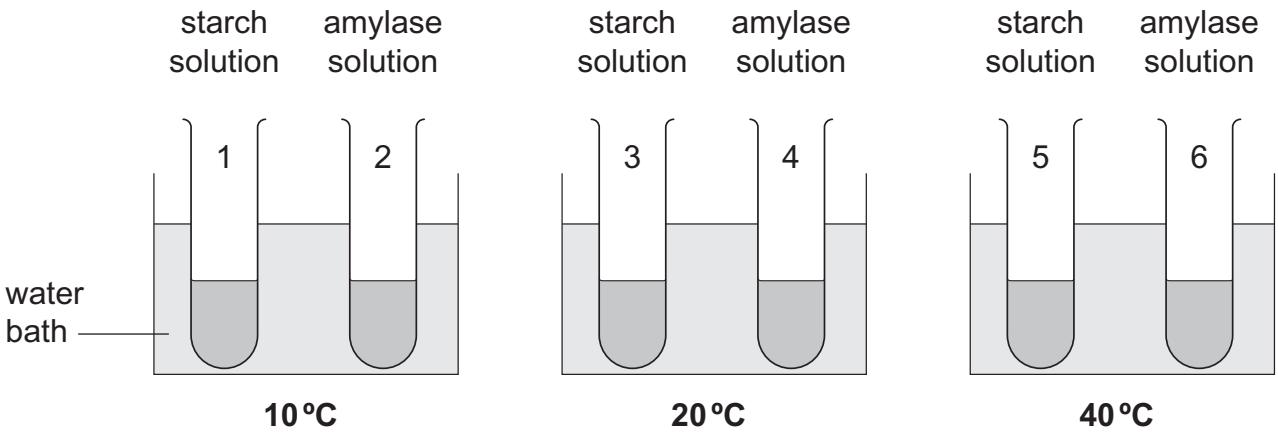
_____

_____ [2]

[Turn over

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7 Amy carried out an experiment to investigate the effect of three different temperatures on the activity of the enzyme amylase.
The diagram shows the set-up at the start of the experiment.



Source: Principal Examiner

Amy kept the starch and amylase solutions separate in their water baths for five minutes.
She then added the contents of test tubes 1 and 2 together, 3 and 4 together and 5 and 6 together and placed them back in their water baths.
After mixing, she took a small sample from each of the three mixed solutions and tested it with iodine solution immediately and at one minute intervals, **until no blue/black colour was seen**.

The table shows her results.

Temperature/°C	Time taken until no blue/black colour was seen/minutes	Speed of reaction
10	17	
20	8	
40	3	

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24GSD1216

(a) Explain why Amy kept the starch and amylase solutions separate in their water baths for five minutes before adding them together.

_____

_____ [1]

(b) Complete the table opposite to describe the speed of the starch/amylase reaction at the three temperatures.
Choose from the words **fast**, **medium** and **slow**. [1]

(c) What colour would the iodine solution be if added to the mixed solution after 18 minutes at 10 °C?

_____ [1]

(d) The results may not show the best temperature for amylase activity.
Suggest how the experiment could be modified to find the best temperature for amylase activity.

_____

_____

_____ [1]

(e) Describe and explain how the results of this experiment would differ if Amy had used boiled amylase solution.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

[Turn over

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8 Animals and plants contain protein.
Nitrogen is present in protein.

(a) Describe how the nitrogen in protein is **released** into the soil when animals and plants die.

[2]

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24GSD1218

Waterlogged soil contains very little oxygen compared to normal soil.
The photograph shows a crop growing in waterlogged soil.



© photosbyjim / iStock / Thinkstock

The crop is not growing well.

(b) Use your knowledge of the **nitrogen cycle** to explain why the crop is not growing well in the waterlogged soil.

[3]

[Turn over

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9 The table shows the sources and masses of carbon dioxide emissions between 1990 and 2013 in the United Kingdom (UK).

Source	Mass of carbon dioxide emissions/millions of tonnes	
	1990	**2013**
Electricity generation	241.5	178.5
Transport	119.6	116.7
Business	113.7	75.4
Residential	79.0	76.9
Other	37.3	16.8
Total	591.1	464.3

© Crown Copyright. 2013 UK greenhouse gas emissions.
Department of Energy & Climate Change, National Statistics

Use the table and your knowledge to answer the following questions.

(a) Suggest **two** reasons for the decrease in the amount of carbon dioxide emissions caused by **electricity generation**.

1. _____

_____

_____

2. _____

_____

_____ [2]

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(b) The total mass of carbon dioxide emissions in the UK from all sources has decreased between 1990 and 2013.
Suggest **two** reasons why **global** emissions of this gas continue to rise.

1. _____

_____

2. _____

_____ [2]

(c) A hectare is an area of land.
The total land area available to plant trees in the UK is 23 million hectares.
A one hectare area of trees absorbs, on average, 11 tonnes of carbon dioxide in one year.

(i) Use the **data** in the table opposite to calculate the **area of trees** that would need to be planted to absorb the total mass of carbon dioxide emissions in the UK in 2013. Give the units.

Show your working.

Area of trees _____ [3]

(ii) Planting trees is only part of the solution in reducing the mass of carbon dioxide emissions in the UK.
Use your calculated area from **(c)(i)** and the information given to explain why this statement is true.

_____

_____

_____

_____ [1]

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24GSD1222

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 17 MAY 2016, AFTERNOON

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					AVAILABLE MARKS
1	(a)	(i)	Root hair (cell)	[1]	
		(ii)	Extended with long OK Cell has extension/described; that gives increased surface area	[2]	
	(b)	(i)	Protein/amino acids	[1]	
		(ii)	Artificial fertiliser: 200 nitrate, FYM 6.0/Diff 194/times 33 100 phosphate, FYM 3.5/96.5/28.6 100 potassium, FYM 8.0/92/12.5 Any **one** **Options** More + 1 data statement 2 data statements difference times with numbers	[1]	
		(iii)	Any **three** from: Farmyard manure has: • Slower release of minerals • (Minerals) less likely to be leached/washed out of soil/less runoff/less soluble/less **water** pollution/less eutrophication • Costs less/'free' byproduct from farms/already on farm • Improves soil structure/crumb structure/adds humus/adds organic matter/improves soil texture • Encourages more earthworms/air in the soil	[3]	8
2	(a)	(i)	10 year period: 1990–2000; Decrease: 47 µg/m^3	[2]	
		(ii)	Less burning of fossil fuels Switch to natural gas/less coal or oil used/more renewable sources used or named, e.g. solar Natural gas contains less SO_2/less reliance on fossil fuels	[1]	
	(b)		Crusty lichens; they are the only ones that can grow at 65 µg/m^3 sulfur dioxide they can grow up to 70/others can't survive at 65 or up to 70	[2]	
	(c)		To trigger action if level starts to increase/ensure targets for clean air are being met/in case levels start to go up/avoid fines	[1]	6

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					AVAILABLE MARKS
3	(a)	(i)	In a dark cupboard for 24 hours (or more)	[1]	
		(ii)	To show that any starch made is made during the experiment/ to ensure that all starch has been used up/ensure no starch present	[1]	
		(iii)	Bacteria in soil **respire**; to stop carbon dioxide entering the flask (around the plant)/bacteria produce CO_2	[2]	
		(iv)	• **A** – Leaf is yellow-brown and **B** – Black/blue; not blue on its own both for 1st mark • No starch in **A or** starch in **B**; • No carbon dioxide in **A or** carbon dioxide present in **B**	[3]	
	(b)	(i)	Less/decreased/smaller number of bubbles	[1]	
		(ii)	23 cm	[1]	
		(iii)	To allow the plant to adjust/acclimatise	[1]	10

4 **(a)** Any **two** from:
- Large surface area
- Long/the length
- Folds/twists
- Villi/microvilli
- (Produces) enzymes/named enzymes/enzymes present [2]

(b) **Indicative content**

Reduced hydrochloric acid in the stomach: – in Q
- Reduced enzyme activity/enzyme action
- Protease (named as enzyme involved)
- So less digestion of the meat/protein/breakdown slower/takes more time/longer to digest/less food broken down
- **Meat** remains in the stomach for longer
- There will be less amino acids produced (credit mention of amino acids only once in answer)

Small intestine:
- Meat/protein is digested by proteases – do not credit protease if mentioned above
- To amino acids (do not credit if mentioned above)

Products:
- They are absorbed/diffused/active transport;
- Into the blood/capillary/villi/bloodstream;

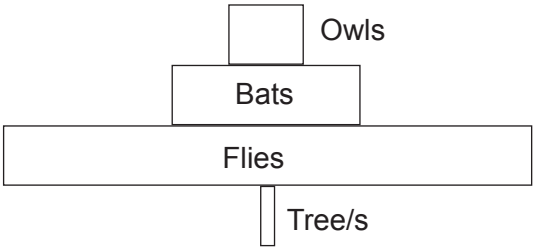
Response	Marks
Candidates use appropriate terms throughout to explain the effect of reduced hydrochloric acid production on digestion in the stomach and describe protein digestion and absorption in the small intestine. They use **five to six** points from the indicative content. They use good spelling, punctuation and grammar. Form and style are of a high standard.	[5]–[6]
Candidates use appropriate terms throughout to explain the effect of reduced hydrochloric acid production on digestion in the stomach and describe protein digestion and absorption in the small intestine. They use **three to four** points from the indicative content. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3]–[4]
Candidates use **one or two** points from the indicative content to explain the effect of reduced hydrochloric acid production on digestion in the stomach and/or describe protein digestion and absorption in the small intestine. They use limited spelling, punctuation and grammar. They make limited use of specialist scientific terms.	[1]–[2]
Response not worthy of credit.	[0]

[6]

AVAILABLE MARKS

8

5 **(a)** **(i)**



1 mark for tree – smaller than the flies bar and labelled and at bottom;
1 mark for correct pyramidal shape of the top three bars;
1 mark for labels of top three bars in ascending order of flies, bats, owls [3]

(ii) Eat flies that are crop pests/prevent yield loss/promote owls to come to farm [1]

(b) **(i)** Any **four** from:

- nitrates stimulate the growth of algae/plants
- these cause shading/described
- leads to the death of algae/plants
- bacteria/micro-organisms **decompose** the (dead) algae/plants
- bacteria/micro-organisms use up the oxygen [4]

(ii) Increase in bat population;
as more flies for the bats to eat/less competition [2]

10

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		AVAILABLE MARKS
6	**(a)** First trophic level [1]	
	(b) **(i)** Human [1]	
	(ii) 4000; ÷ 60 000 × 100; = 6.7/6.67 [2]	
	(iii) Any **two** from: • energy loss as heat/respiration (by the grass) • not all grass is eaten • some grass eaten by other herbivores, e.g. rabbits • some grass passes to the decomposers • reproduction assume grass unless otherwise stated [2]	
	(iv) 1st mark { less energy lost in movement/heat/respiration cattle have more energy because of less movement/heat/respiration 2nd mark { cattle grow faster/can be sold earlier/bigger cattle more beef/fatter cattle/cattle gain weight [2]	8
7	**(a)** To ensure that starch and amylase were at the same temperature before being added together [1]	
	(b) Slow Medium Fast [1]	
	(c) Yellow-brown [1]	
	(d) Repeat the experiment at different temperatures above and/or below 40°C/ wider range of temperatures [1]	
	(e) Any **three** from: Blue/black colour remains/no colour change; at all three temperatures/at every temperature; starch not broken down/substrate not broken down; as amylase is denatured/damaged/starch no longer fits into the active site of the enzyme (amylase) no E–S complex formed [3]	7

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			AVAILABLE MARKS
8	(a)	Decomposed/broken down (by bacteria/fungi) to give ammonia/ammonium/NH_4^+ [2]	
	(b)	• Denitrifying bacteria present/Denitrification; • Respire anaerobically; • which convert nitrate to nitrogen gas; **or** • **reduced/less** nitrification/less nitrifying bacteria; • Respire aerobically; • so less ammonia converted to nitrate; **or** • less/reduced nitrogen fixing bacteria/nitrogen fixation; • respire aerobically; • so less nitrogen gas converted into nitrates **also** • crop has shortage of nitrate/lack of amino acids/protein **or** • less respiration/energy of plant • less active uptake of nitrate } max [2] – to get [3] must mention one type of N-bacteria or nitrogen process [3]	5
9	(a)	Any **two** from: • less burning of fossil fuels (at power stations)/Kyoto agreement • solar/wind/wave/geothermal/tidal (alternative electricity generation)/ renewable sources • better insulation (more) efficient energy usage (so there is less need for electricity generation)/people use less electricity • nuclear [2]	
	(b)	Any **two** from: • increased air traffic • increased world population • deforestation • burning of fossil fuels **in other countries** • failure to sign up to international treaties • trying to grow economy in other countries/more industrialisation in other countries/more factories [2]	
	(c)	**(i)** 464.3 ÷ 11; = 42.2/42.21/42; million hectares [3]	
		(ii) There is not enough **land** to absorb all the carbon dioxide produced/ 42 million hectares needed but only 23 million hectares available/ land is needed to produce food [1]	8
		Total	**70**

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Biology

GSD12

Unit B1
Higher Tier

[GSD12]

WEDNESDAY 24 FEBRUARY 2016, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 Question **4(a)**.

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

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Examiner Only	
Marks	Remark

1 Rebecca tested each of three solutions, **A**, **B** and **C**, with Benedict's reagent, Biuret reagent and iodine solution.

One solution contained only starch, one contained only protein and one contained only glucose.

She recorded positive results with a tick ✓.
She recorded negative results with a cross ✗.

The table shows her results.

Solution	Benedict's test result	Biuret test result	Iodine test result	Name of substance present
A	✓	✗	✗	
B	✗	✗	✓	
C	✗	✓	✗	

(a) Complete the table by writing in the name of the substance present in each solution. [3]

(b) **(i)** Describe how Rebecca carried out the Benedict's test.

_____

_____

_____

_____ [2]

(ii) Give the colour change that shows a positive result for the Benedict's test.

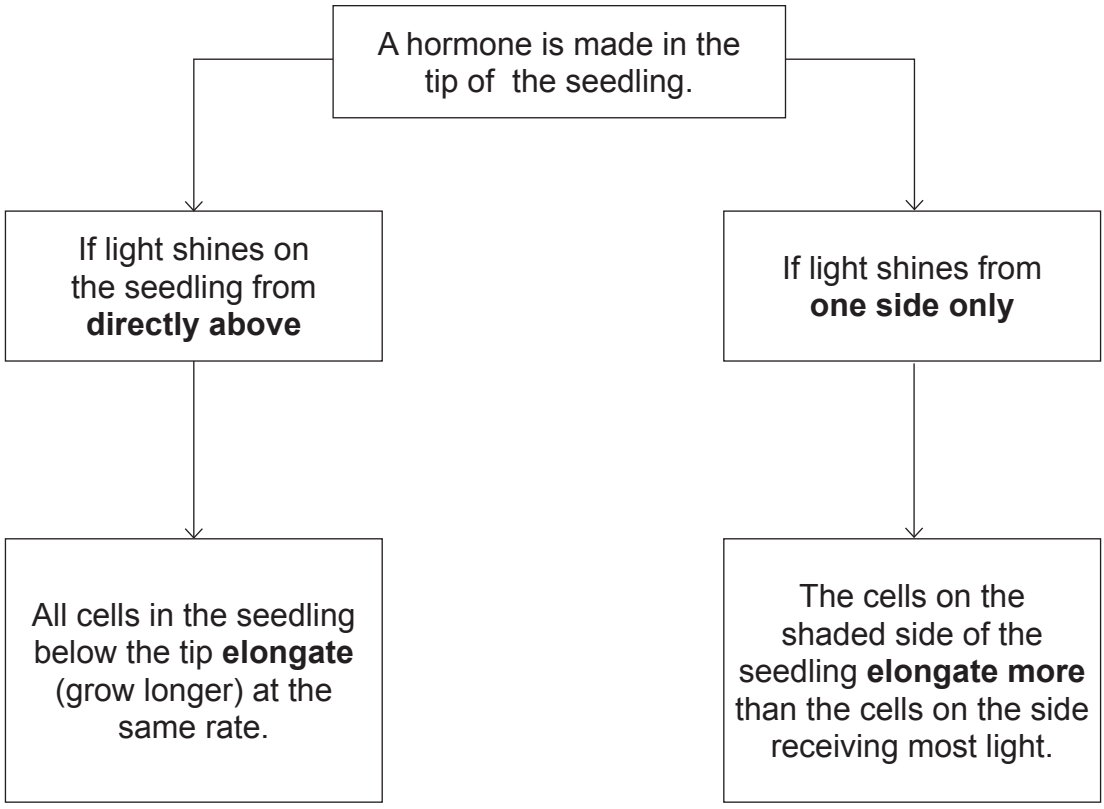
_____ to _____ [1]

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Examiner Only	
Marks	Remark

2 The growth of a seedling is affected by the direction from which light shines on it.

The flow diagram describes a seedling's growth response to light.



(a) (i) Name the seedling's growth response to light.

_____ [1]

(ii) Name the plant hormone that causes this growth response in the seedling.

_____ [1]

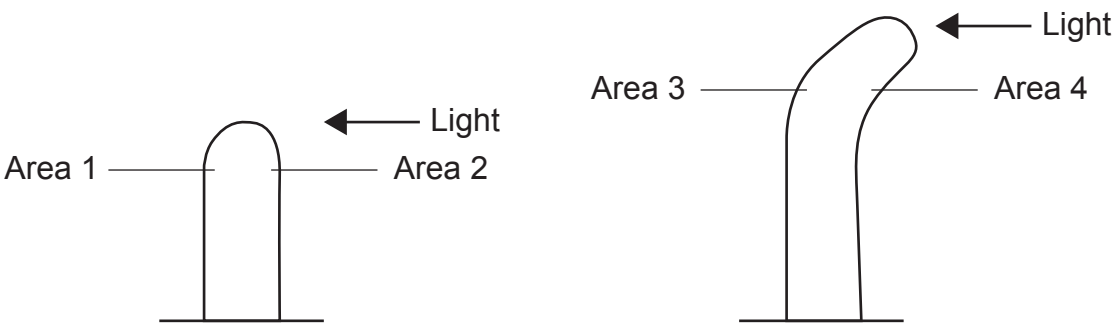
(iii) Explain the advantage to the seedling of this growth response to light.

_____

_____

_____ [2]

(b) The diagram shows how shining a light from **one side only** affects the growth of a seedling.

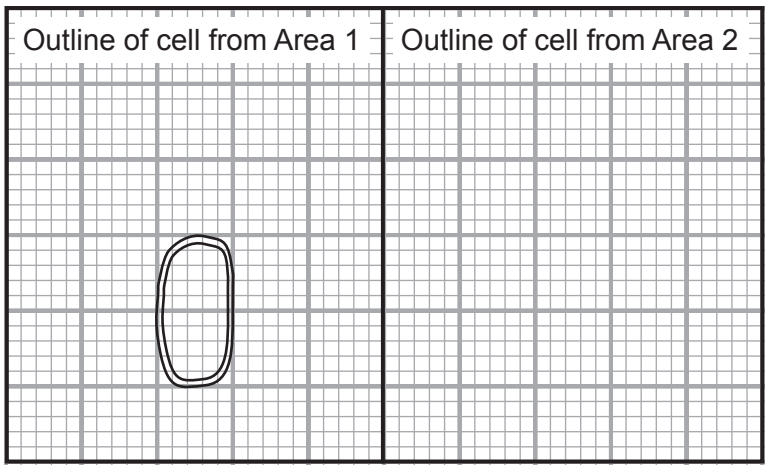


At start **After two days**

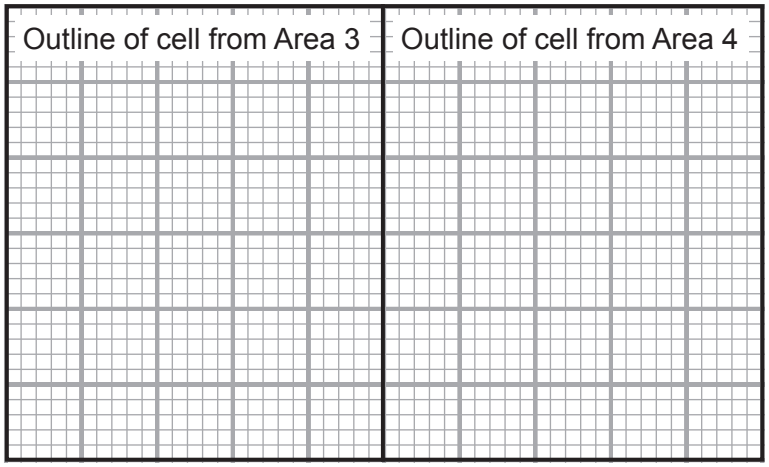
The outline of a cell from Area 1 has been drawn below.

Use the flow diagram opposite and the diagram above to help draw the outlines of cells from Areas 2, 3 and 4 on the grids.

At start



After two days



[3]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 **(a)** **(i)** What is an enzyme?

_____

_____

_____ [2]

Protease is an enzyme found in the digestive system. It breaks down protein in the stomach.

(ii) Name another organ of the digestive system where protease is produced.

_____ [1]

(b) Why is digestion necessary?

_____

_____

_____

_____ [2]

(c) **Diagram 1** below shows the shape of a stomach protease molecule in acid and in alkali.

The shape of albumin which is a protein molecule is also shown.

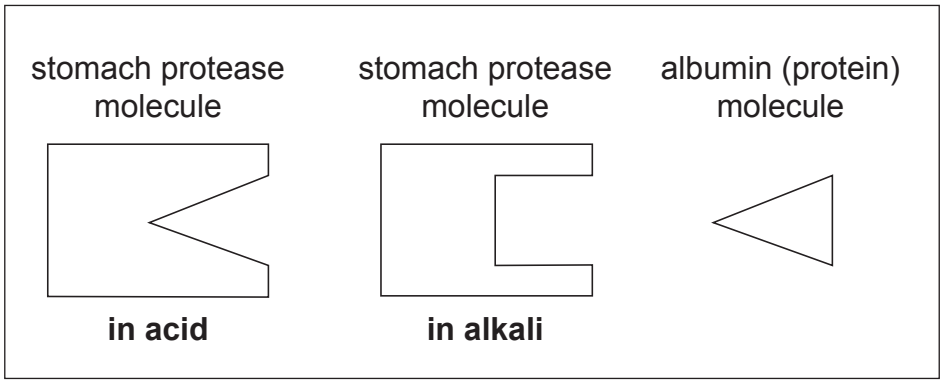


Diagram 1

When albumin is added to water it makes a cloudy solution. If the albumin in the solution is broken down by stomach protease, the cloudy solution goes clear.

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David tested the effect of adding stomach protease to albumin in **acid** and in **alkali**.

Diagram 2 below shows the results of his experiment.

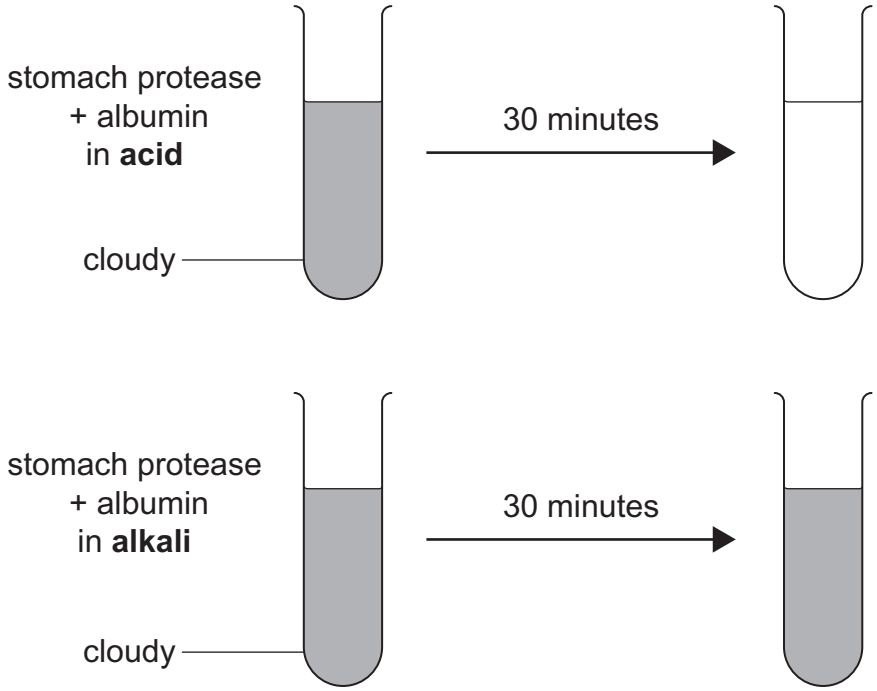


Diagram 2

(i) Use the information in **Diagram 2** to describe the results of David's experiment.

_____

_____ [1]

(ii) Use the information in **Diagrams 1 and 2** and your knowledge of enzyme action to explain the results of David's experiment in **acidic** conditions.

_____

_____

_____ [2]

(iii) Use the information in **Diagrams 1 and 2** and your knowledge of enzyme action to explain the results of David's experiment in **alkaline** conditions.

_____

_____

_____ [2]

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Marks	Remark

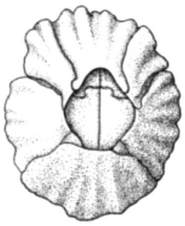
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Examiner Only	
Marks	Remark

4 Barnacles are small animals that live inside shells attached to rocks on shores.

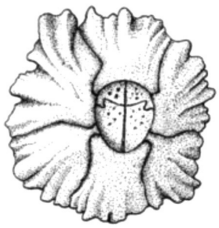
A scientist investigated the distribution of two different species of barnacle, **A** and **B**, on a rocky shore.

The drawings show the two species of barnacle.
The photograph shows the rocky shore he sampled.



Species **A**

© Rocky Shore Animals, Nature in Shetland. http://www.nature-shetland.co.uk/brc/rocky.htm



Species **B**

© Rocky Shore Animals, Nature in Shetland. http://www.nature-shetland.co.uk/brc/rocky.htm



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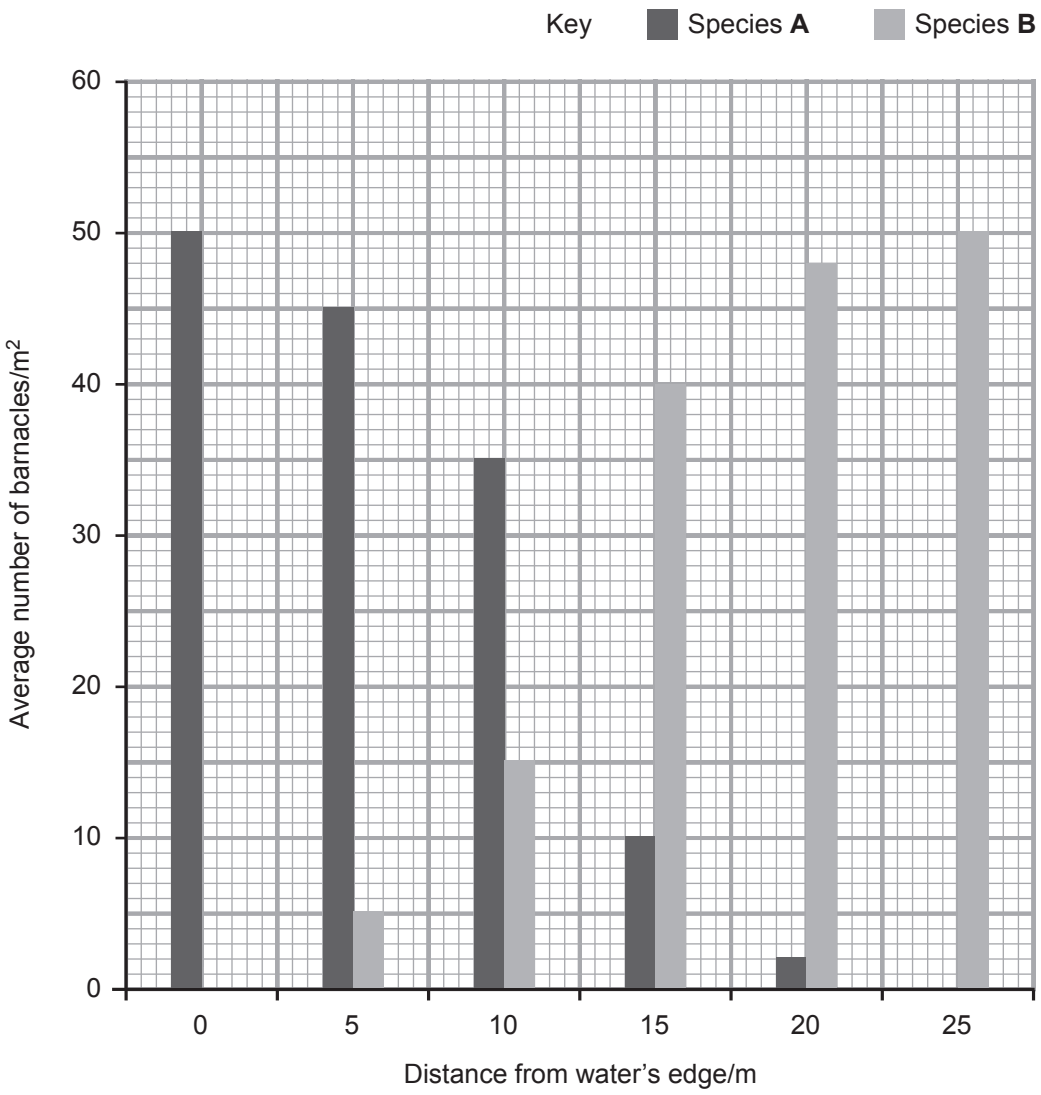
(a) Describe how the scientist sampled the rocky shore.

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

Examiner Only	
Marks	Remark

[6]

(b) The bar chart shows his results.



(i) The scientist had predicted that the numbers of species **A** would decrease with increasing distance from the water's edge.

Give **two** pieces of data from the bar chart that support this prediction.

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

Using the data from his bar chart, the scientist calculated the **percentage** of barnacles belonging to each species at each distance from the water's edge.

The table shows these percentages.

Distance from water's edge/m	Percentage of barnacles present	
	Species A/%	Species B/%
0	100	0
5	90	10
10	70	30
15	20	80
20		
25	0	100

(ii) Complete the table by using data from the bar chart to calculate the **percentage** of barnacles of species **A** and species **B** at 20 metres from the water's edge.

Show your working.

[3]

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Marks	Remark

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Examiner Only	
Marks	Remark

(c) A food chain containing barnacles is shown.

phytoplankton ⟶ barnacles ⟶ dog whelks ⟶ herring gulls

(i) What do the arrows in the food chain represent?

_____ [1]

(ii) Explain why more energy would be available to herring gulls if they fed on barnacles rather than dog whelks.

_____

_____

_____

_____ [2]

(d) Chicken farmers can use intensive farming methods or free range farming methods.

The photographs show both types of farming.

Intensive chicken farming



© Tony Camacho / Science Photo Library

Free range chicken farming



© Seb Oliver / Cultura / Science Photo Library

Use the photographs and your knowledge to suggest why a chicken farmer might decide to use the intensive farming method rather than the free range farming method.

_____

_____

_____

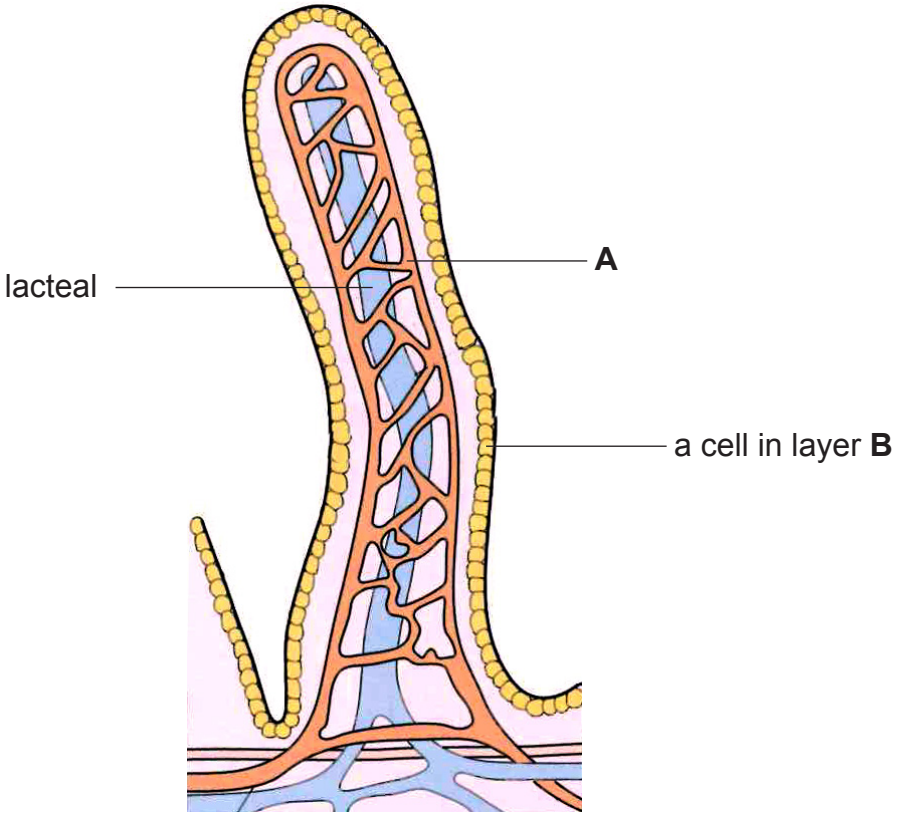
_____

_____

Examiner Only	
Marks	Remark

[3]

5 The diagram shows a structure found in the small intestine.



© GCSE Biology for CCEA by Rose McIlwaine and James Napier. Published by Hodder Education in 2003. ISBN: 978030858257. Reproduced by permission of Hodder Education

(a) (i) Name the structure shown in the diagram.

_____ [1]

(ii) Name part **A**.

_____ [1]

(iii) Name **one** product of digestion that is transported in part **A**.

_____ [1]

(iv) Name **one** product of digestion that is transported in the lacteal.

_____ [1]

Examiner Only

Marks	Remark

(b) Give **one** way layer **B** in the diagram is adapted for the efficient absorption of digested food molecules.

_____

_____

_____ [1]

Examiner Only	
Marks	Remark

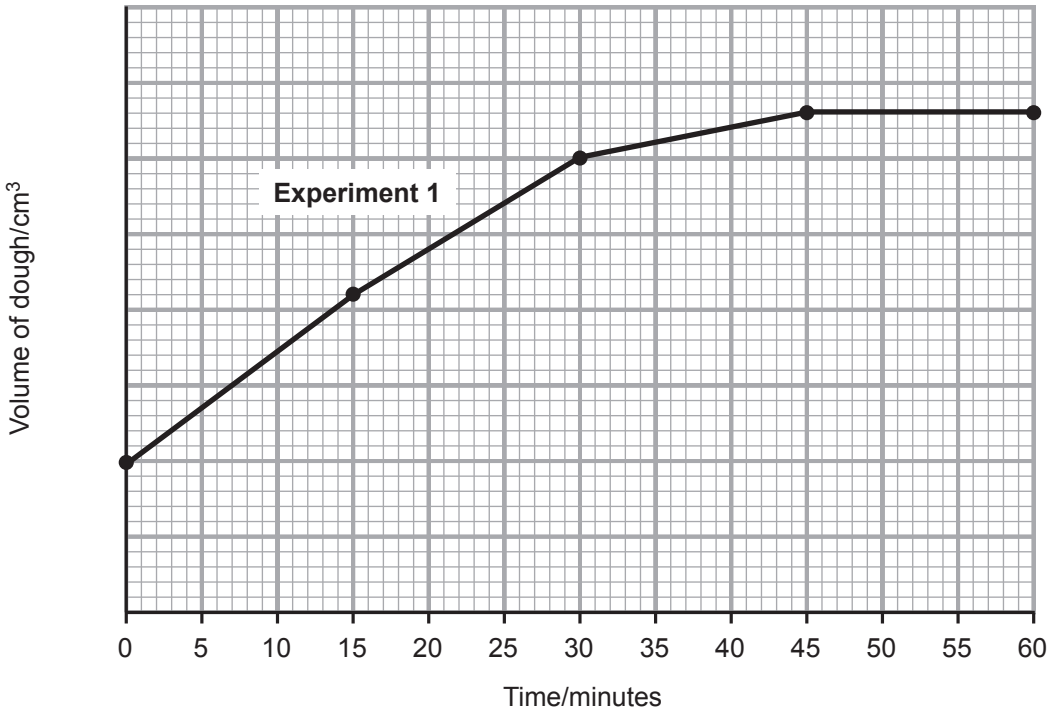
6 Bread dough is made by mixing wheat flour with water and yeast.
The dough rises because bubbles of gas are produced and trapped in the dough.

Louise carried out an investigation into the effect of adding glucose to the dough.
She added 1 gram of glucose to 20 cm^3 of dough, and kept it at a temperature of 20 °C. The volume of the dough was measured every 15 minutes for one hour (**Experiment 1**).
She repeated the experiment with a second sample of 20 cm^3 of dough to which glucose had **not** been added (**Experiment 2**).

The table shows the results of the two experiments.

Time/minutes	Volume of dough/cm^3	
	Experiment 1 with glucose	Experiment 2 without glucose
0	20	20
15	42	28
30	60	36
45	66	40
60	66	40

(a) (i) The results for Experiment 1 have been plotted to produce the graph shown on the grid below.
Add the scale on the y axis.
Draw a graph for Experiment 2 on the grid.



[4]

Examiner Only
Marks | Remark

(ii) Use data from the graph to calculate the **percentage increase** in the volume of the dough in **Experiment 1** from 0 to 30 minutes.

Show your working.

_____ % [3]

(iii) Describe and explain the effect that adding glucose has had on the dough mixture.

Describe _____

_____

Explain _____

_____

_____

_____ [3]

(iv) The wheat flour used in both experiments contained starch. Louise repeated **Experiment 2**. She added 1 gram of amylase to the dough mixture.

What effect did the amylase have on the starch in the wheat flour?

_____

_____ [1]

Examiner Only

Marks	Remark

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(b) When muscle cells of mammals respire aerobically, they use oxygen. When they respire anaerobically, they do not use oxygen.

Give **two other** differences between aerobic and anaerobic respiration in muscle cells of mammals.

1. _____

_____

_____

2. _____

_____

_____ [2]

Examiner Only	
Marks	Remark

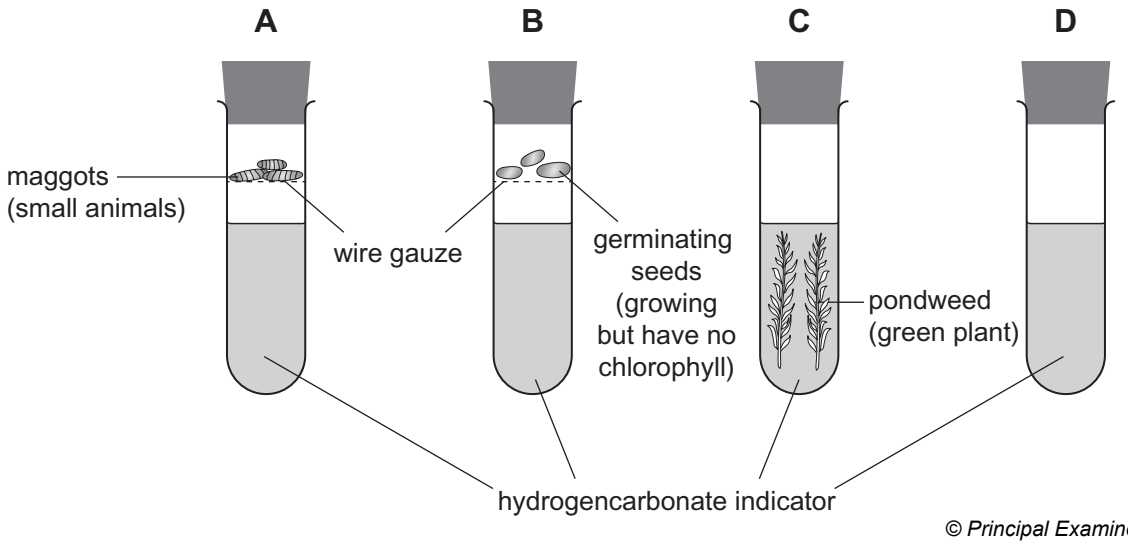
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(Questions continue overleaf)

Examiner Only	
Marks	Remark

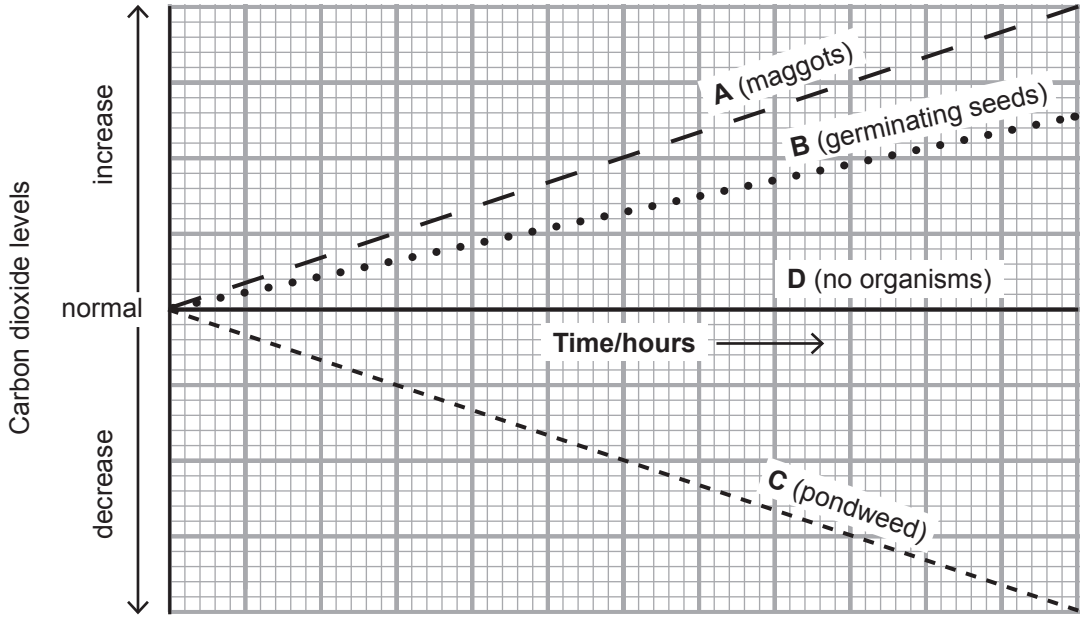
7 Andy investigated the changes in hydrogencarbonate indicator caused by different organisms.

The diagram shows how Andy set up his investigation.



© Principal Examiner

The graph shows how the carbon dioxide levels changed in each of the test tubes A, B, C and D over 12 hours in bright light.



(a) Use the information from the graph and your knowledge to complete the table.

Test tube	Colour of hydrogencarbonate indicator after 12 hours in bright light
A	
B	
C	
D	Red

[3]

(b) Germinating seeds are growing but have no chlorophyll. Pondweed contains chlorophyll.

Explain the difference in the colour of the hydrogencarbonate indicator for the germinating seeds and the pondweed after 12 hours in bright light.

[3]

(c) What does the result for test tube **D** suggest about any colour changes which may have occurred in the other three test tubes?

[1]

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Marks	Remark

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8 Carbon compounds are present in all living organisms.
Fossil fuels contain carbon and the atmosphere contains carbon dioxide.
The way in which carbon is recycled in nature is known as the carbon cycle.

Describe the various processes involved in the carbon cycle.
Start your answer with carbon dioxide in the atmosphere.

[5]

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Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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113166

Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

WEDNESDAY 24 FEBRUARY 2016, MORNING

MARK SCHEME

STEMUP.CO.UK

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**: glucose/sugar **B**: starch **C**: protein	[3]	
	(b) (i)	Boiling/heat; in a water bath/beaker of water	[2]	
	(ii)	Blue to brick red (orange/yellow/green)	[1]	6
2	(a) (i)	Phototropism/tropism	[1]	
	(ii)	Auxin	[1]	
	(iii)	More light; for more photosynthesis (more must be once)	[2]	
	(b)	Area 2: same as cell in Area 1 (exactly same) Area 3: longer Area 4: longer or same as cell in Area 1 but not as long as cell in Area 3	[3]	7
3	(a) (i)	Any **two** from: Biological catalyst; speeds up the rate of a reaction; protein	[2]	
	(ii)	Small intestine/ileum/pancreas	[1]	
	(b)	– Small molecules/soluble molecules; – Into the bloodstream/blood/capillary	[2]	
	(c) (i)	Alkali tube stayed/remained cloudy	[1]	
	(ii)	Any **two** from: – Albumin is broken down/digested; – Enzyme active site is the correct shape/complementary (to substrate)/ albumin fits into the enzyme/lock and key/optimum pH/best pH	[2]	
	(iii)	– Albumin not broken down/digested/no reaction; – Enzyme changes shape/denatured/damaged/incorrect shape/ albumin will not fit enzyme/lock and key doesn't work/ not at optimum pH	[2]	10

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AVAILABLE MARKS

4 (a) Indicative content

Use a quadrat;
Placed in a line/along belt/transect random placement;
Move quadrat/place at different distances;
Use a key/identification book to identify barnacle species;
For each quadrat estimate the percentage cover/count the number of barnacles of **each** species (leave in number of species);
Record results/data;
Repeat/replicate whole experiment [6]

Response	Marks
Candidates use appropriate terms throughout in describing the sampling method. This must include 5–6 points from the indicative content. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5]–[6]
Candidates use appropriate terms throughout in describing the sampling method. This must include 3–4 points from the indicative content. They use satisfactory spelling, punctuation and grammar skills. Form and style are of a satisfactory standard.	[3]–[4]
Candidates include 1–2 points from the indicative content when describing the sampling process. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

(b) (i) 50 species **A** present at 0 m; (at water's edge);
No species **A** at 25 m/only 2 at 20 m/none at furthest point [2]
Any **two** correct pieces of evidence

(ii) 2 and 48; [1] for reading graph correctly
4; 96; [1] each for doubling
4 and 96 [3] [3]

(c) (i) Flow of energy/energy transfer [1]

(ii) Less trophic levels/shorter food chain;
less energy lost/less energy wasted [2]

(d) Any **three** from:
– less energy lost;
– through respiration/movement/keeping warm;
– more energy available for growth/grows fast/more eggs;
– more profit/makes more money;
– can control food intake/amount/type traceability of food;
– less land used/land can be used for other things/fit in more birds/in garden;
– protects from predators;
– easier to find/collect eggs;
– easier to look after chickens/stops them from straying [3]

17

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					AVAILABLE MARKS
5	(a)	(i)	Villus	[1]	
		(ii)	Capillary/bloodstream/blood	[1]	
		(iii)	Glucose/amino acids	[1]	
		(iv)	Fatty acids/glycerol	[1]	
	(b)		Thin single layer of cells/microvilli/permeable/thin/large S A/thin walls/ layer **B** one cell thick (walls)	[1]	5
6	(a)	(i)	Scale [1]; 5 points correct [2]/4 or 3 points correct [1]; line [1]	[4]	
		(ii)	At 0 min, 20 cm^3 and at 30 mins, 60 cm^3; [(60 – 20)/20];×100 = 200%	[3]	
		(iii)	Dough rises higher/more/faster/increases in volume; Glucose **respired** by yeast/quicker respiration; More **carbon dioxide** or gas given off	[3]	
		(iv)	Amylase breaks down starch/more glucose produced	[1]	
	(b)		Any **two** from: Aerobic releases more energy; Carbon dioxide produced in aerobic/not in anaerobic, Lactic acid produced in anaerobic/not in aerobic; Or converse	[2]	13
7	(a)		**A** – yellow; **B** – yellow; **C** – purple;	[3]	
	(b)		Seeds don't photosynthesise/only respire; Pondweed photosynthesises; At a faster rate than it respires;	[3]	
	(c)		Any changes are as a result of the organisms in the other test tubes	[1]	7

		AVAILABLE MARKS
8	Any **five** – need process and explanation for each mark – Plants use CO_2 for **photosynthesis**/to make glucose or starch/ **photosynthesis** takes in CO_2/**photosynthesis** decreases CO_2/ plants use CO_2 to make glucose/starch; – Animals **feed/eat** plants/animals; – **Egestion/excretion** (**not** of food); – **Decay/decomposition** of dead organisms by **decomposers**; – **Respiration** releases CO_2 from organisms (**not** breathing); – **Fossilisation**/formation of **fossil fuels** from dead organisms (**not** CO_2 into fossil fuels); – **Combustion/burning** of fossil fuels releases CO_2; – **Global warming/greenhouse** effect from burning **fossil fuels**/as a result of increased CO_2 in the atmosphere; – **Deforestation** increases CO_2 levels/less CO_2 taken up by trees [5]	5
	Total	**70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

TUESDAY 12 MAY 2015, AFTERNOON

TIME

1 hour.

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 seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 Question **3(a)**.

9640

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1 Shags and cormorants are birds that nest on the same cliffs and feed on prey in the same waters.

(a) (i) What does the term habitat mean?

_____

_____ [1]

(ii) What is the habitat of the shags and cormorants?

_____ [1]

(b) The table shows the results from a study of the birds' feeding habits over a two week period.

Region in water where prey live	Type of prey eaten	Numbers of prey eaten/day by the different types of bird	
		Shag	Cormorant
Surface dwelling	Sand eels	33	0
	Herring	49	0
Bottom dwelling	Flatfish	0	26
	Shrimps	0	33

© Advanced Biology: Principles & Applications by C.J Clegg with D.G Mackean. Published by John Murray 1994. ISBN: 0719550785. Reproduced by permission of Dr C.J. Clegg.

Use the information in the table and your knowledge to answer the following questions.

(i) Describe and explain how the shags and cormorants can live together in the same area.

_____

_____

_____ [2]

(ii) A change in currents in the water causes less sand eels and herring to arrive near these cliffs.

Describe and explain what effect this would have on the shag and cormorant populations.

[4]

[Turn over

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2 **(a)** What are enzymes?

_____

_____

_____ [2]

(b) Biological washing powders contain enzymes that break down stains on clothes.

One brand of biological washing powder contains the enzymes lipase and protease. These enzymes work best at 40 °C.

Use this information and your knowledge to answer the following questions.

(i) This brand of washing powder was used on clothes that had **only** protein stains.

Name the breakdown product found in the resulting waste water.

_____ [1]

(ii) What type of stain would be broken down by the lipase enzyme?

_____ [1]

(iii) Suggest **one** reason why it is important to follow the manufacturer's guidelines on the amount of powder to add to each wash.

_____

_____ [1]

(iv) What is the advantage to the **environment** of using a washing powder that works best at 40 °C rather than at a higher temperature?

_____ [1]

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(v) Non-biological washing powders do **not** contain enzymes.

Why can non-biological washing powders be used at higher temperatures than biological washing powders?

_____

_____ [1]

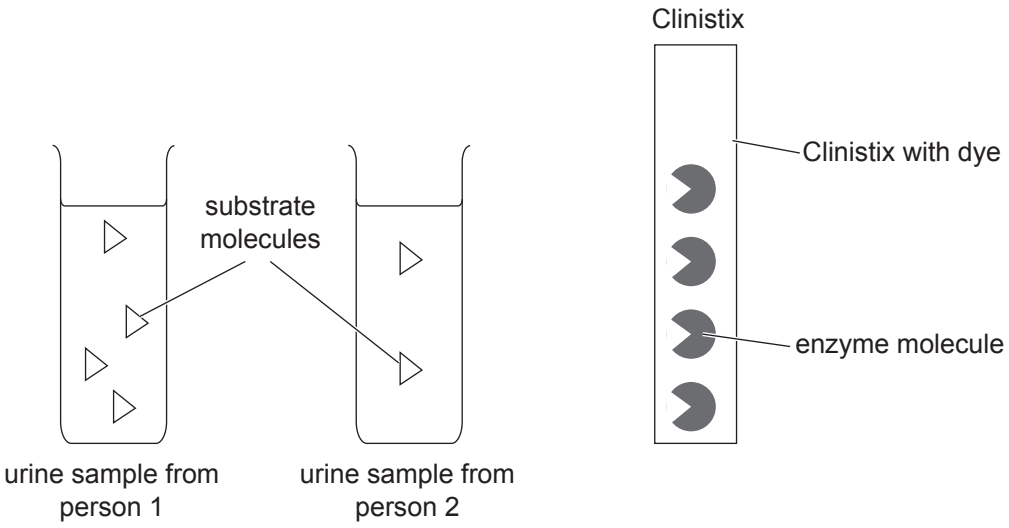
[Turn over

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(c) A Clinistix is a small paper strip containing one type of enzyme and a dye. It is used to test urine to find out if someone has diabetes.

When **each** enzyme molecule on the Clinistix joins with a substrate molecule, it produces a small change in the colour of the dye.

The diagram shows urine samples from two people with untreated diabetes and a Clinistix.



Source: Principal Examiner

Use this information, the diagram and your knowledge to answer the following questions.

(i) What substance if found in the urine of a person indicates that they may have diabetes?

_____ [1]

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(ii) Separate Clinistix were placed in the urine samples of person 1 and person 2.

Describe and explain the difference you would expect to see in the two Clinistix test results.

[2]

(iii) Explain why the Clinistix will **not** react to the presence of other molecules in the urine.

[1]

(d) Some people with diabetes have to inject a hormone into their bloodstream.

(i) Name this hormone.

[1]

(ii) Where in the body is this hormone produced?

[1]

(iii) Describe and explain the action of this hormone.

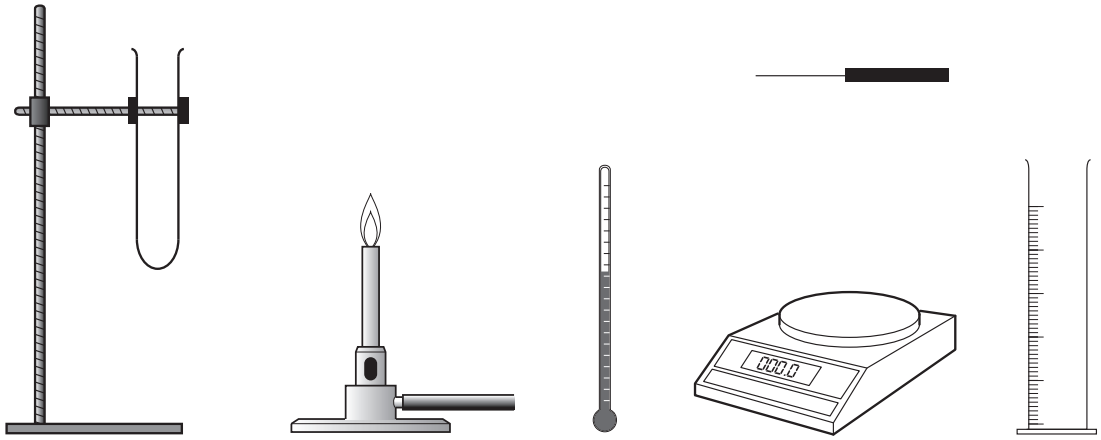
[3]

[Turn over

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3 **(a)** A student wants to find out the energy content of 1 gram of cheese.

The diagram shows the apparatus that she needs.



Source: Principal Examiner

Describe how the student would carry out this experiment.

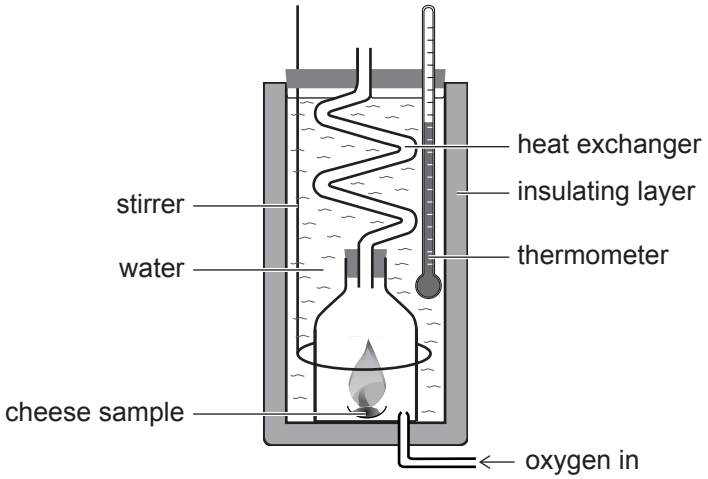
State any measurements she would need to take when using this apparatus.

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

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[6]

(b) The diagram shows apparatus that a manufacturer would use to check the energy content of 1 gram of cheese.



Source: Examining Team

This apparatus will give more accurate values compared to the student's apparatus.

Give **three** reasons why.

1. _____

2. _____

3. _____

[3]

[Turn over

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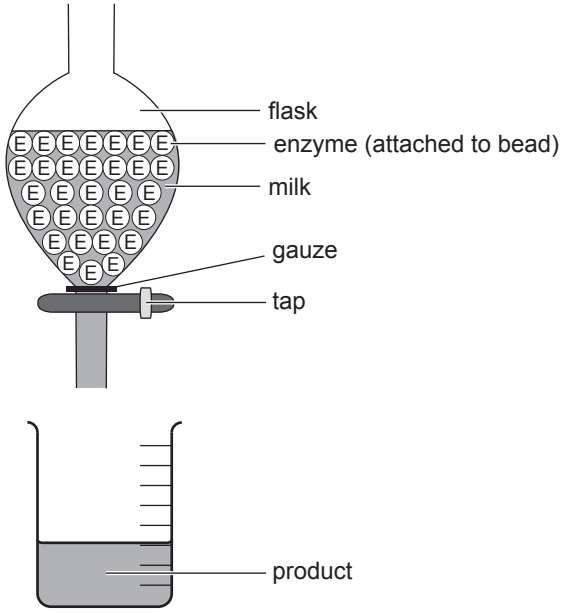
4 Lactose is the sugar present in milk. Lactose is made up of two other sugars, glucose and galactose joined together.

Some people cannot digest lactose because they do not have the enzyme to break it down. This causes them to have digestive problems.

Milk that is suitable for these people can be commercially produced by treating it with an enzyme that breaks down the lactose.

All the enzyme molecules are permanently attached to beads.

The diagram shows the type of apparatus used during this process.



Source: Principal Examiner

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

(a) Suggest why the tap is kept closed for one hour after the milk is added to the flask.

_____

_____

_____ [1]

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(b) **(i)** Name a substance present in the milk at the start that is absent in the product.

_____ [1]

(ii) Name a substance present in the product that was **not** present in the milk at the start.

_____ [1]

(c) Suggest an advantage of using enzyme molecules attached to the beads rather than using the enzyme in solution.

_____

_____

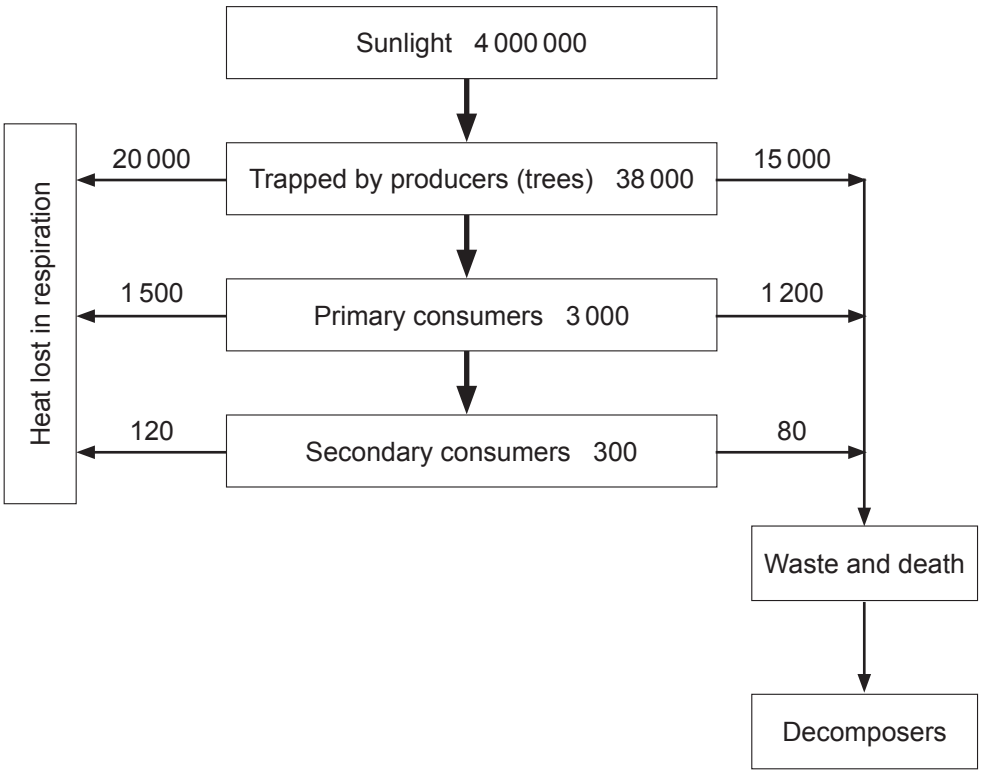
_____ [1]

[Turn over

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5 The diagram shows energy flow through a forest.

The figures give the energy flow in kJ/m^2/year.



Source: Principal Examiner

Use the diagram and your knowledge to answer the following questions.

(a) Only a small amount of the sunlight that reaches the forest is trapped by producers in photosynthesis. Suggest why.

_____

_____ [1]

(b) Give **two** ways plants use glucose produced in photosynthesis.

1. _____

2. _____ [2]

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(c) At what trophic level do secondary consumers feed?

_____ [1]

(d) **(i)** Calculate the amount of energy that is left in the secondary consumers that could be transferred to the next trophic level.

Show your working.

_____ kJ/m^2/year [2]

(ii) Suggest why there may **not** be another trophic level in this food chain.

_____

_____

_____ [1]

[Turn over

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20GSD1213

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DO NOT WRITE ON THIS PAGE

6 **(a)** Nitrates are needed for plant growth.
In the nitrogen cycle there are two types of bacteria that help **increase** the nitrate content of soils.

Name these **two** types of bacteria and describe their functions in the nitrogen cycle.

Bacteria 1 _____

Function _____

_____

Bacteria 2 _____

Function _____

_____ [4]

(b) Root hair cells absorb nitrates from soil.

(i) Describe how these cells are adapted to absorb nitrates from the soil.

_____

_____ [1]

(ii) Name and explain the process by which root hair cells absorb nitrates.

_____

_____

_____

_____

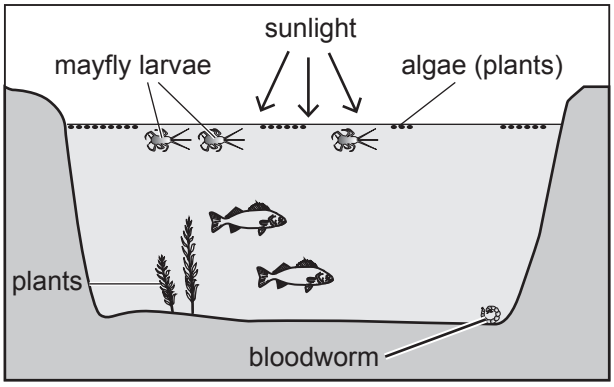
_____ [3]

[Turn over

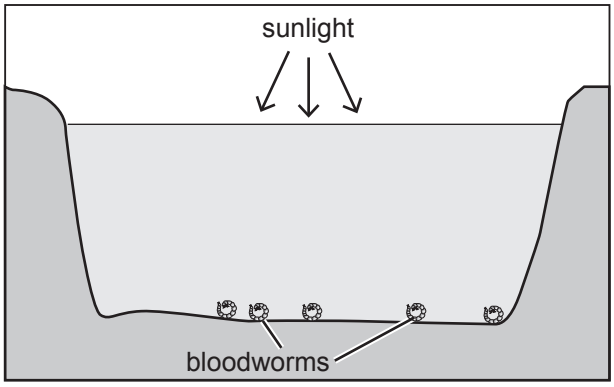
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(c) The diagrams, **A** and **B**, show a river before and after **excess nitrates** have run off from the fields into the same area of the river.

A – Before excess run off



B – After excess run off



Source: Principal Examiner

(i) The excess nitrate run off has caused changes in the river.

Use the diagrams and your knowledge to explain the sequence of events that has caused the fish to die.

[4]

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(ii) Suggest **one** reason why nitrate levels would have decreased 2 km further down the river.

[1]

(iii) Biological oxygen demand (BOD) is one way of measuring pollution.

The **higher** the BOD value, the **lower** the oxygen level is in the water.

Compare the BOD levels you would expect to find in water samples from **A** and **B**.

[1]

(iv) Indicator species can be used to monitor pollution.

Bloodworms and mayfly larvae are indicator species.

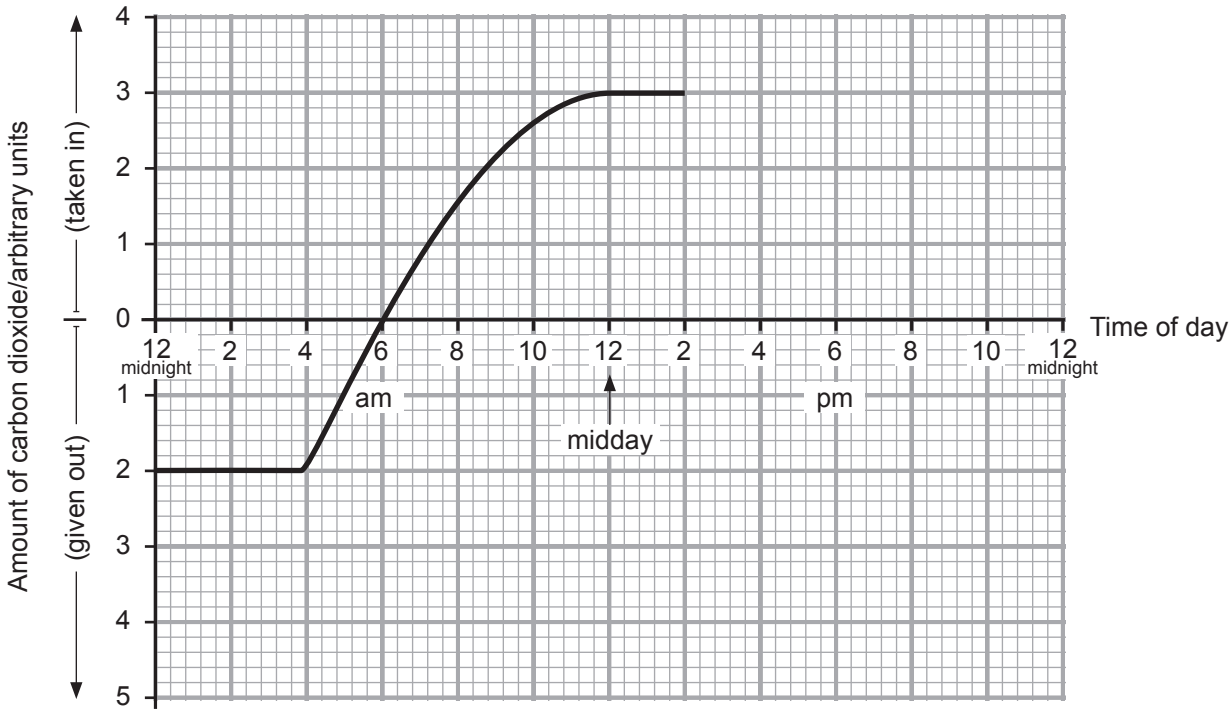
Describe and explain the changes in numbers of each indicator species in the river between **A** and **B**.

[2]

[Turn over

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7 The graph shows the amount of carbon dioxide taken in and given out by a plant at different times during a summer's day.



Source: Principal Examiner

(a) Use the graph and your knowledge of photosynthesis and respiration to **explain** the amount of carbon dioxide taken in or given out at the following times.

(i) midnight to 4 am

[2]

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(ii) 6 am

[2]

(iii) 12 (midday) to 2 pm

[2]

(b) Complete the graph by drawing a line to show what you would expect to happen to the amount of carbon dioxide between 2 pm and midnight. [2]

(c) Some plants are adapted to grow in shade. They are able to absorb **more** of the available light at **lower** light levels than normal plants.

What is the advantage to plants of this adaptation to shade?

[2]

THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 12 MAY 2015, 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)	(i)	the place where an organism lives	[1]	
		(ii)	cliffs	[1]	
	(b)	(i)	Shags eat surface swimming prey/fish/sand eels and herrings and cormorants eat bottom swimming prey/fish/flatfish and shrimps; They are not competing for the same food/prey/fish/different types of food eaten/don't eat each other's food	[2]	
		(ii)	decline in shag population; – due to lack of food; **or** shags relocate; to get food cormorants stay the same; cormorants still have food/don't eat surface dwelling species **or** cormorants increase; more space for nests	[4]	8

				AVAILABLE MARKS
2	(a)	Any **two** from: • (biological) catalysts • proteins • speed up reactions	[2]	
	(b) (i)	amino acids	[1]	
	(ii)	fat/lipid/oil/grease	[1]	
	(iii)	use **too much** – is a waste/uneconomic/ends up in the waste water **don't use enough** – stains not removed/substrate not fully digested	[1]	
	(iv)	less energy is used/less electricity used/less fossil fuels burned/ less greenhouse gases/less CO_2 produced/less global warming	[1]	
	(v)	there are no enzymes that would be broken down at higher temperatures	[1]	
	(c) (i)	glucose	[1]	
	(ii)	more glucose/substrate in urine of person 1 or converse; greater intensity of dye or greater degree of colour change in person 1 or converse	[2]	
	(iii)	enzyme is specific to glucose/shape of enzyme only fits with glucose/ it is specific/'lock and key'	[1]	
	(d) (i)	insulin	[1]	
	(ii)	pancreas	[1]	
	(iii)	Any **three** from: lowers blood glucose/sugar; by converting glucose to glycogen; **increasing** rate of respiration; in the liver; uptake of more glucose; converting glucose to fat/stores it as fat	[3]	16

AVAILABLE MARKS

3 (a) Indicative content

- 1. weigh cheese sample/using top pan balance/scales;
- 2. put cheese sample onto mounted needle;
- 3. (measure water) into measuring cylinder;
- 4. add water to the test tube;
- 5. record initial temperature of the water;
- 6. set fire to cheese;
- 7. place burning cheese under test tube;
- 8. completely burn the cheese;
- 9. stir the water before recording temperature;
- 10. record final temperature of the water/measure (calculate) temperature change = 1 mark [6]

Response	Marks
Candidates use appropriate terms throughout to give at least five points about how to carry out the experiment. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5]–[6]
Candidates use appropriate terms throughout to give at least three or four points on how to carry out the experiment. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3]–[4]
Candidates use appropriate terms throughout to give one or two points about how to carry out the experiment. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

(b) Any **three** from:
stirrer gives more even distribution of heat;
food more completely burned/more oxygen for burning of food;
energy not lost to surrounding air/more insulation/no heat can escape;
coiled glass tube means more heat transfer to water;
no cheese can fall off [3] 9

4 (a) allow time for reaction/allows time for the lactose to be broken down [1]

(b) (i) Lactose [1]

(ii) Glucose/galactose [1]

(c) The product is not contaminated with the enzyme/don't have to separate the enzyme from the product/enzymes won't be denatured/thermostable [1] 4

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				AVAILABLE MARKS
5	(a)	some light reflected from leaves/some light passes through leaves/ some light is the wrong wavelength/light hits bare ground	[1]	
	(b)	Any **two** from: • active transport/active uptake • respiration/energy • proteins/amino acids • oils/lipids • starch • cellulose • reproduction/seeds/fruit/nectar	[2]	
	(c)	Trophic level 3	[1]	
	(d) (i)	120 + 80 = 200; 300 – 200 = 100 (100 = 2 marks)	[2]	
	(ii)	not enough energy left for another level	[1]	7
6	(a)	Nitrogen-fixing bacteria: turn nitrogen gas into ammonia/nitrates Nitrifying bacteria: turn ammonia/ammonium into nitrates (either order)	[4]	
	(b) (i)	Extension/increased surface area	[1]	
	(ii)	active uptake; requires energy; to move nitrate against a concentration gradient	[3]	
	(c) (i)	Any **four** from: (nitrates cause) algal growth/bloom/plant growth; algae die/plants die; due to shading; bacteria decompose algae/plants; bacteria use up oxygen;	[4]	
	(ii)	diluted	[1]	
	(iii)	A has a low BOD **and** B has a high BOD	[1]	
	(iv)	Between A and B mayfly larvae decrease (3 → 0) and bloodworms increase (1 → 5); mayfly larvae only survive in clean water/mayfly larvae cannot survive in polluted water/bloodworms will tolerate polluted water	[2]	16

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				AVAILABLE MARKS
7	(a)	(i)	• 12 – 4am respiration **only**/respiration no photosynthesis • no light for photosynthesis; [2]	
		(ii)	• 6am – photosynthesis and respiration both occur/at the same rate; • CO_2 in same as CO_2 out/no net gas exchange/compensation point; [2]	
		(iii)	• 12 midday – 2pm maximum rate **of photosynthesis**; • some other factor is limiting photosynthesis (other than light)/ named factor is limiting photosynthesis • more CO_2 absorbed than produced [2]	
	(b)		down to **–2** between 8pm and 12 midnight [2]	
	(c)		more photosynthesis/more glucose; photosynthesis at lower light levels/earlier in the day/ goes on longer in evening/ or can get enough light even when light blocked by other plants/ photosynthesise more in winter/ don't have to compete with other plants for light [2]	10
			Total	**70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Biology

GSD12

Unit B1
Higher Tier

[GSD12]

TUESDAY 24 FEBRUARY 2015, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **7**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 The drawing shows a corncrake.



© Sheila Terry / Science Photo Library

Read the following passage.

Line

The world population of corncrakes has been estimated to be between 2–3 million **pairs**. 1

Corncrakes spend the winter in Africa. They migrate northwards to arrive on their breeding grounds in Europe from early April onwards. 3
They live and lay their eggs in long grass in open fields. 5

Adults and young birds return to Africa in August and September.

The bird was once common in Ireland, but in 2005 only 164 singing males were heard in the country. The fall in corncrake numbers in Ireland is mainly due to the earlier cutting of grass fields by farmers. 7 9
Grass fields are now often cut for the first time in May. Large machines attached to tractors are used to cut the grass. 11

Grass fields are usually cut from the outer edges towards the centre of the field. In some areas in Ireland where corncrakes nest, 13
government grants have been given to farmers to cut their fields starting from the centre going to the outer edges. 15

Use the information in the passage and your knowledge to answer the following questions.

Examiner Only	
Marks	Remark

(a) What is the **maximum** estimated number of **individual** corncrakes in the world? (lines 1–2)

_____ million birds [1]

(b) Explain why the corncrake is a rarely seen bird (line 5).

_____ [1]

(c) Suggest two reasons why the earlier cutting of grass fields leads to a fall in corncrake numbers (lines 7–11).

1. _____

2. _____ [2]

(d) Suggest why the numbers of corncrakes increase if farmers cut their grass fields from the centre outwards (lines 12–15).

_____

_____ [1]

(e) The corncrake is a chordate.
Give **one** feature of chordates.

_____ [1]

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Examiner Only	
Marks	Remark

2 The digestive enzyme amylase is present in the mouth and small intestine.

(a) (i) Name the large food molecule that amylase breaks down to glucose.

_____ [1]

(ii) The small intestine is adapted to absorb glucose.
Give two ways it is adapted.

1. _____

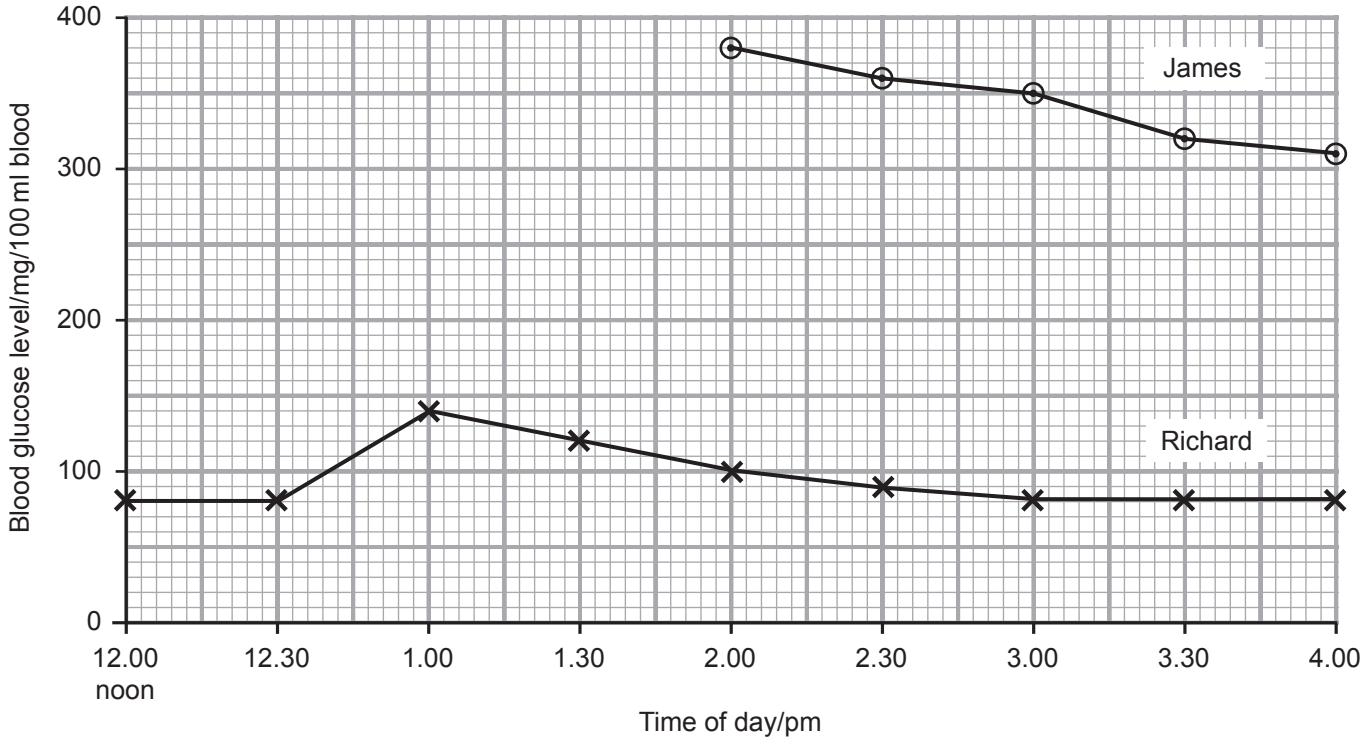
2. _____ [2]

The table shows the blood glucose levels for James and Richard before and after eating a meal containing mostly carbohydrates.
The meal was eaten at 12.30 pm.

Time of day/pm	Blood glucose level/mg/100 ml blood	
	James	Richard
12.00 (noon)	190	80
12.30 (meal eaten)	180	80
1.00	250	140
1.30	390	120
2.00	380	100
2.30	360	90
3.00	350	80
3.30	320	80
4.00	310	80

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(b) (i) Use the information in the table to complete the line graph for James on the grid below.



[2]

Examiner Only	
Marks	Remark

(ii) Use the graphs to state two ways that the trend for James is different from the trend for Richard.

1. _____

2. _____ [2]

(iii) Explain how Richard's blood glucose returns to its normal level.

_____

_____

_____

_____ [3]

(iv) James has diabetes.
Give two possible long term effects of diabetes.

1. _____

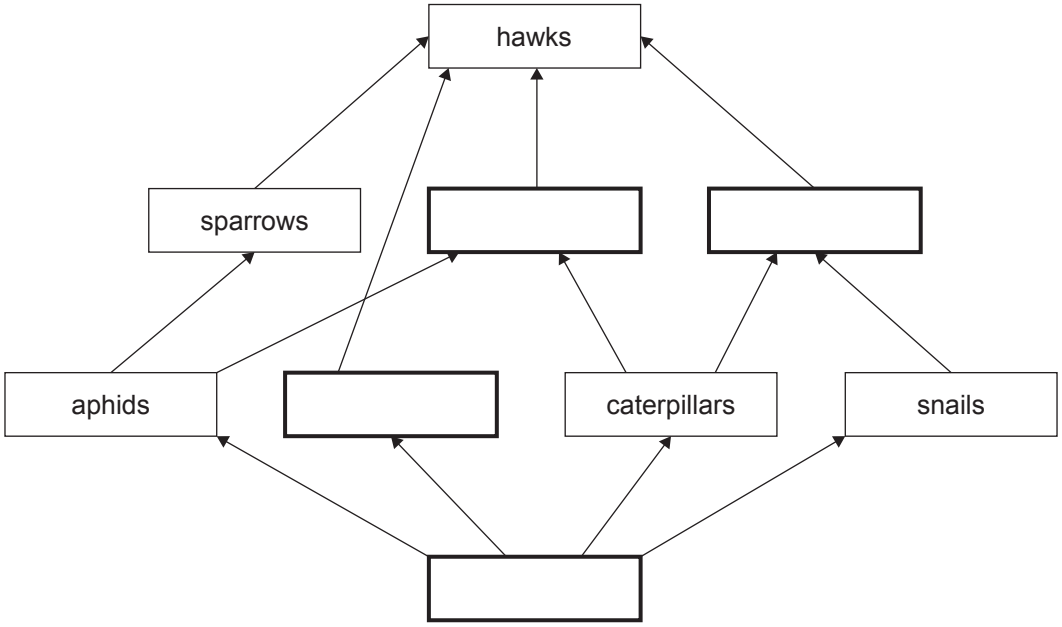
2. _____ [2]

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3 The table shows the diets of some animals in a grassland.

Aphids, rabbits, caterpillars and snails **eat** plants
Sparrows **eat** aphids
Thrushes **eat** caterpillars and snails
Blue tits **eat** aphids and caterpillars
Hawks **eat** sparrows, rabbits, blue tits and thrushes

(a) Use the information in the table to fill in the boxes in the food web.



[3]

(b) (i) Name a producer.

_____ [1]

(ii) Name an animal that is feeding at two trophic levels.

_____ [1]

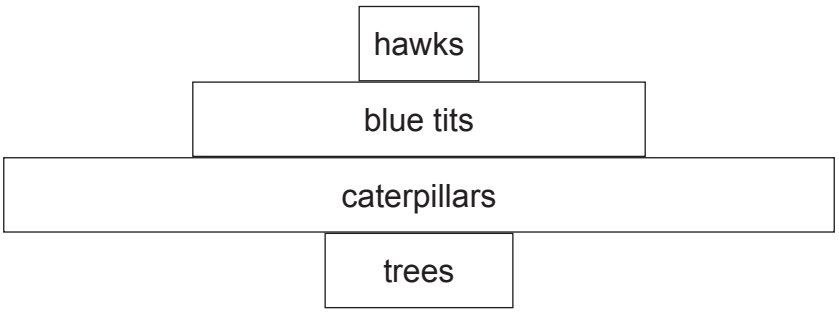
Examiner Only

Marks	Remark

(c) Give **one** way that energy is lost between the sparrows and the hawks.

_____ [1]

(d) A pyramid of numbers for a woodland is shown.



Use this information to draw and label the pyramid of biomass for this woodland in the space.

[2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 Benedict's reagent is used to test for the presence of sugar (glucose) in food.

The intensity (strength) of the colour of Benedict's reagent at the end of the test indicates the amount of sugar (glucose) present.

Paula planned an investigation to compare the **amount** of sugar (glucose) in two types of biscuit.

- Describe the method Paula used to carry out her investigation.
- State two variables she would have controlled.
- Describe the results she would expect if one biscuit contained more sugar (glucose) than the other biscuit.

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

[6]

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5 In 1990, carbon dioxide emissions in Britain were 770 million tonnes.

In 2013, carbon dioxide emissions in Britain were 572 million tonnes.

(a) Use the information given to calculate the percentage reduction in carbon dioxide emissions from 1990 to 2013.

Show your working.

_____ % [3]

(b) Britain has reduced its carbon dioxide emissions, but global levels of this gas continue to rise.

Suggest why the levels continue to rise.

_____

_____ [1]

The government set a target to reduce carbon dioxide emissions by 50% by the year 2030.

(c) For Britain to reach this target, there must be an increase in ways of producing electricity that reduce carbon dioxide emissions.

Suggest two ways of producing electricity that reduce carbon dioxide emissions.

1. _____

2. _____ [2]

(d) State two effects of high levels of carbon dioxide on the environment.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

6 Plants take up nitrates from the soil using root hair cells.

(a) Give **one** use of nitrates in plants.

_____ [1]

(b) Describe and explain how the structure of a root hair cell is adapted for the uptake of nitrates.

_____

_____

_____ [2]

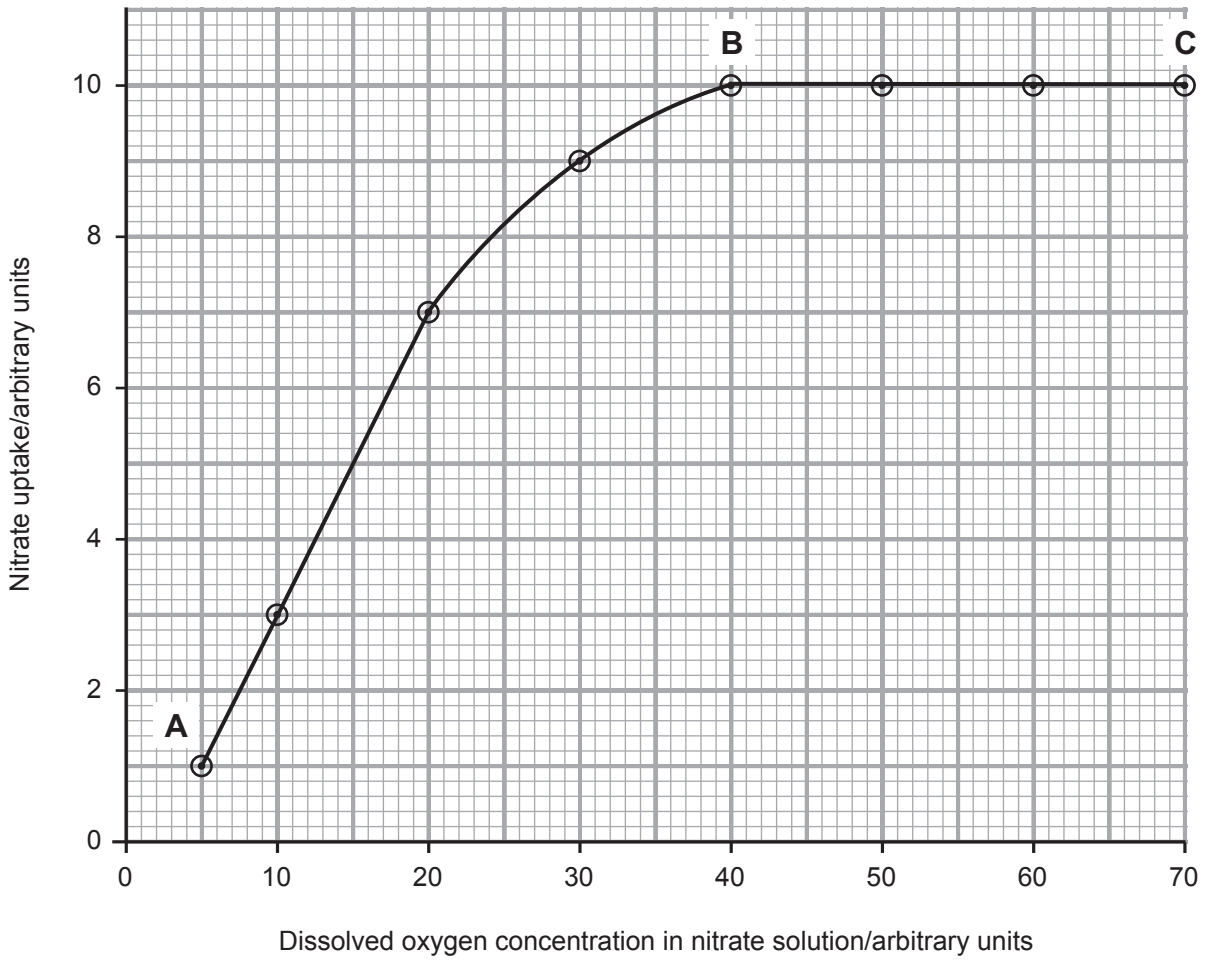
Barley seedlings were grown in test tubes containing nitrate solution.

(c) An experiment was set up to investigate the effect of dissolved oxygen on the uptake of nitrates by these seedlings.

Oxygen was bubbled through the nitrate solution.

The amount of nitrate taken up by the barley seedlings was measured.

The results of the investigation are shown in the graph.



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(i) State two variables that should be controlled in the experiment.

1. _____

2. _____ [2]

(ii) Describe and explain the change in nitrate uptake between points **A** and **B**.

_____

_____

_____

_____

_____

_____

_____ [4]

(iii) Explain why the nitrate uptake levels off between points **B** and **C**.

_____

_____ [1]

Examiner Only	
Marks	Remark

7 Earthworms burrow through the soil creating air spaces. They eat leaves and farmyard manure. They pass out undigested material into the soil. This forms humus which is broken down by decomposers into ammonium compounds.

Use this information and your knowledge of the nitrogen cycle to explain how earthworms increase nitrate levels in the soil.

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

[6]

Examiner Only

Marks	Remark

8 A farmer set up an experiment to find the effect of increasing the number of carrot seedlings/m^2 on carrot growth.

The table shows the results after four months growth.

Number of carrot seedlings/m^2	Average carrot mass/g
100	40
200	21
300	13

(a) Describe the effect of increasing the number of carrot seedlings/m^2 on average carrot mass.

_____

_____ [1]

(b) Explain the results of this experiment.

_____

_____

_____

_____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** A plant shoot bends towards the light when light shines on it from one side only.

This response is called phototropism.

Explain how this response occurs.

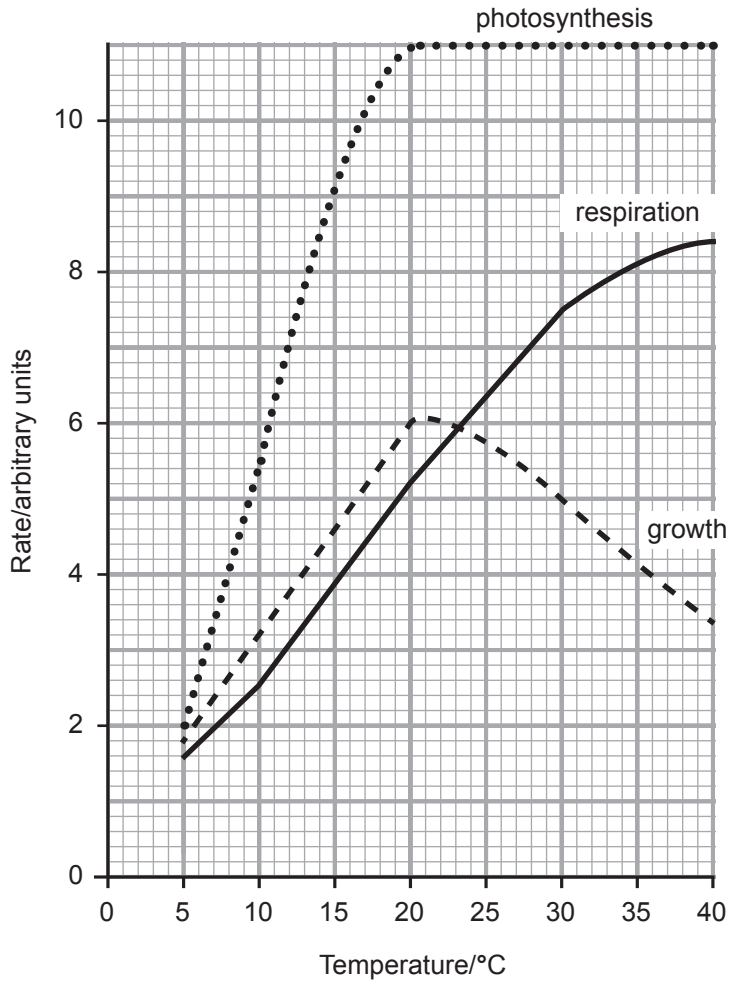
_____

_____

_____

_____ [3]

The graph shows the effect of temperature on the rates of photosynthesis, respiration and growth in plants.



(b) Use the graph and your knowledge of photosynthesis and respiration to explain why the rate of growth decreases above 20 °C.

Examiner Only

Marks	Remark

_____

_____

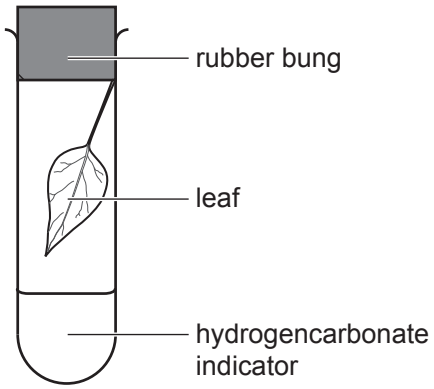
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_____

_____

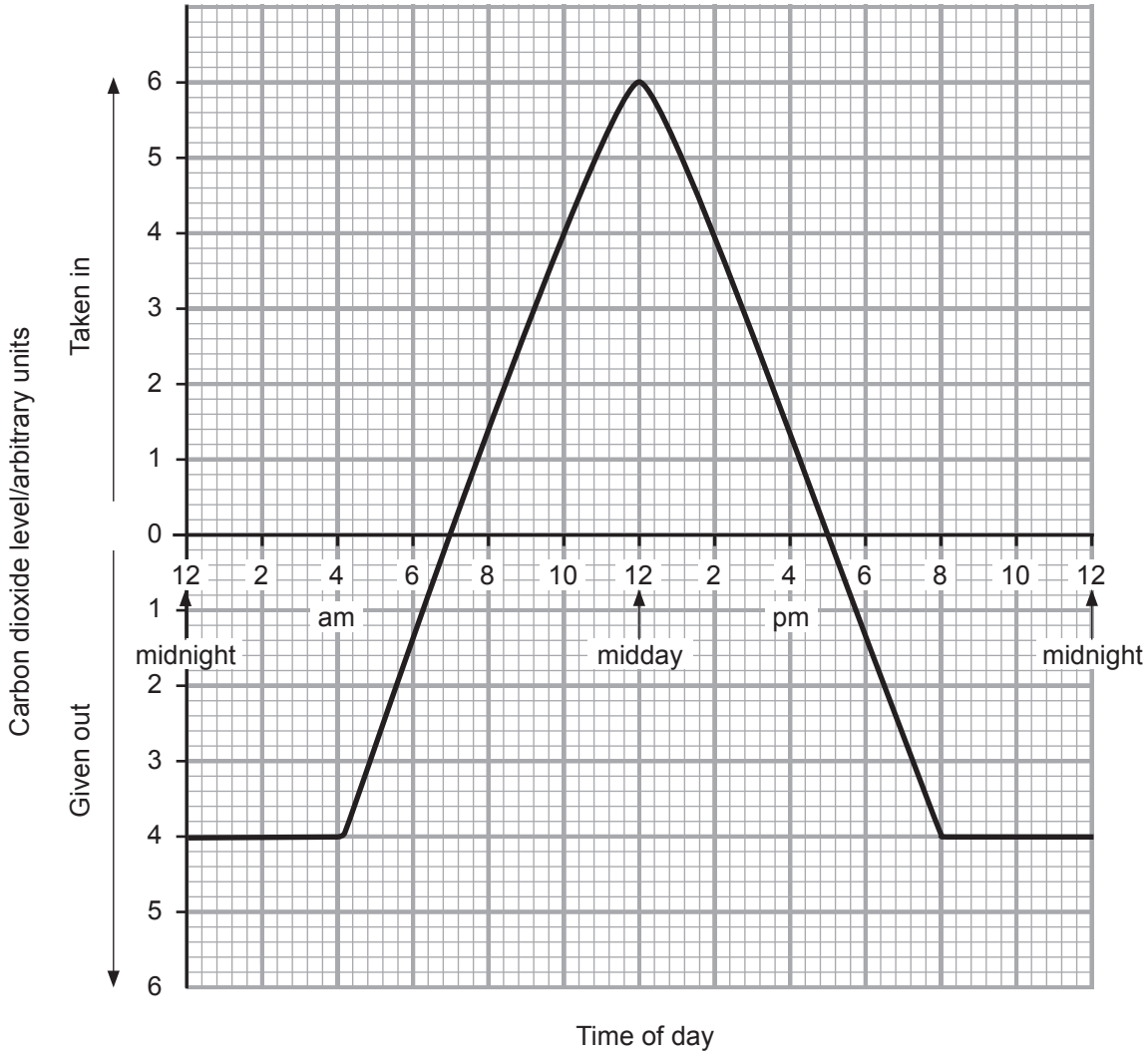
_____ [3]

(c) The diagram shows a leaf placed in a sealed test tube containing hydrogencarbonate indicator.



Source: Chief Examiner

The graph shows the carbon dioxide taken in and given out by this leaf during a summer's day.



Examiner Only

Marks	Remark

Use the graph and your knowledge of photosynthesis and respiration to complete the table.

- Give the colour of the hydrogencarbonate indicator at midday
- Give a reason to explain the colour of the indicator at each time.

Time	Colour of hydrogen carbonate indicator	Reason to explain colour of hydrogencarbonate indicator
2 am	Yellow	
12 midday		
5 pm	Red	

[4]

Examiner Only

Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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113166

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 24 FEBRUARY 2015, 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.

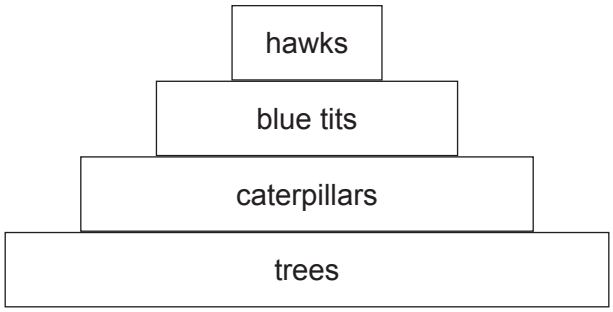
The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends 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)**	6 (million) [1]	
(b)	They live/nest in long grass [1]	
(c)	Any **two** from: • nests/eggs are destroyed • chicks are killed • adults are killed • destroys food • will leave • nowhere to hide • ruining habitat • eaten by predators • nowhere to lay eggs [2]	
(d)	This allows the chicks/adults to escape (into other fields)/lays eggs at edges/ move habitat/birds not killed by machines [1]	
(e)	Have a backbone [1]	
2 **(a)** **(i)**	Starch [1]	6
(ii)	Any **two** from: • large surface area • villi/microvilli • long/folds • good blood supply/diffusion gradient • lacteal • (villus) wall one cell thick/thin wall • permeable [2]	
(b) **(i)**	3 or 4 points correctly plotted; Points joined by straight lines [2]	
(ii)	Any **two** from: • James up to 390, Richard 140 • James's level continues to rise for longer • James's blood glucose level is (always) higher • James's blood glucose takes longer to return to normal • James has a steeper increase • Times of peak (James 1.30, Richard 1) [2]	
(iii)	Any **three** from: • insulin is produced • in the pancreas • this hormone acts in the liver • and converts glucose into glycogen/stored as glycogen • and increases respiration of glucose [3]	
(iv)	Any **two** from: • eye damage/blindness • kidney failure/damage • heart disease/CHD/attack • stroke [2]	12

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			AVAILABLE MARKS
3	**(a)** From bottom up and clockwise Plants, rabbits, blue tits, thrushes 4 correct – 3 marks 2/3 correct – 2 marks 1 correct – 1 mark	[3]	
	(b) **(i)** Plants	[1]	
	(ii) Hawk	[1]	
	(c) Heat (from respiration)/movement/excretion/egestion/uneaten materials, e.g. feathers and bones	[1]	
	(d)  Symmetrical shape; Labels in correct order	[2]	8

4 Indicative content

Method:

- Crush/crumble biscuit
- Add biscuit to test tube
- Heat in a **water bath** (or described)
- Add Benedict's (to biscuit)

Controlled variables:

- Equal masses of the two biscuits
- Biscuits crumbled to same extent
- Same volume of Benedict's
- Heated for same length of time

Conclusion:

- Brick red precipitate
- Biscuit sample that gives the **more** intense brick red colour contains more sugar

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout using at least five of the above points (must include one controlled variable and one conclusion) to describe how they would carry out this experiment and draw conclusions. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates must use some appropriate specialist terms throughout using three or four of the above points to describe how they would carry out this experiment and draw conclusions. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe how the experiment is carried out or draw conclusions using one or two of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

AVAILABLE MARKS

6

			AVAILABLE MARKS
5	(a)	770 – 572 = 198; 198 ÷ 770 x 100; = 25.71/25.7/26% Accept: 26%/25.7%/25.71% [3]	
	(b)	**Other countries** are producing more carbon dioxide/**other countries** burning a lot of fossil fuels/economic development in **other countries**/ deforestation/air travel ↑/population increase/more cars etc in **other countries**/**other countries** are not ↓ emissions [1]	
	(c)	Any **two** from: • wind • wave • tidal • geothermal • solar/solar panels • biomass • hydroelectric power • nuclear • renewable energy [2]	
	(d)	Any **two** from: • global warming/temp ↑/higher temps • climate change; drought; more rainfall; severe storms/unpredictable weather/severe weather • melting (polar) ice • sea levels rising • increased flooding; mudslides • loss of habitats/species extinction/plant death/trees die/↓ biodiversity • increased desertification [2]	8
6	(a)	To make amino acids/proteins [1]	
	(b)	Cell has extension; increases surface area [2]	
	(c)	(i) Any **two** from: • (initial) concentration/volume (amount) of nitrate (in each test-tube) • temperature • pH • time • type/variety/size of barley seedlings/number of seedlings • light intensity [2]	
		(ii) Any **four** from: • data for description (5, 1) to (40, 10) ↑ by 9/(with more oxygen) more uptake up nitrate • oxygen used in respiration/energy • for active uptake/active transport • from low concentration of nitrate to a high concentration/against the concentration gradient [4]	

(iii) oxygen is no longer the limiting factor/seedlings taking up nitrate as fast as they can/some other factor limits nitrate uptake/no more nitrate left in test-tube to be taken up [1]

AVAILABLE MARKS

10

7 Indicative content

- air spaces provide oxygen or more O_2/soil aerobic
- decomposers need oxygen for respiration/release of energy
- aids active transport (or description of AT)

- convert ammonium into nitrate
- by nitrifying bacteria/nitrification

- also (oxygen) for converting nitrogen gas to nitrate
- by nitrogen-fixing bacteria/nitrogen fixation

- so less conversion of nitrate to nitrogen gas
- by denitrifying bacteria/denitrification

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout using at least five of the above points to describe how the actions of earthworms lead to an increase in soil fertility through the nitrogen cycle. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates must use some appropriate specialist terms throughout using three or four of the above points to describe how the actions of earthworms lead to an increase in soil fertility through the nitrogen cycle. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe how the actions of earthworms lead to an increase in soil fertility using one or two of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

6

		AVAILABLE MARKS
8	**(a)** the average mass of the carrots decreases [1]	
	(b) there is increased competition among plants Any **two** from: • for light/sunlight • for minerals/named mineral/N/Ca etc. • for space • for water/moisture • O_2 • CO_2 • each plant photosynthesises less [3]	4
9	**(a)** Any **three** from: • auxin (produced) • in the shoot **tip** • (light from one side causes) auxin (hormone) to accumulate on the **shaded side**/side away from light • causes more **cell elongation** on the shaded side [3]	
	(b) Any **three** from: • photosynthesis levels off after 20 °C • respiration still increasing after 20 °C • less difference between photosynthesis and respiration after 20 °C • glucose used in respiration not available for plant growth • glucose not available for plant growth [3]	
	(c)	

Time	Colour of hydrogen carbonate indicator	Reason to explain colour of hydrogencarbonate indicator
2 am		Only respiration occurs Resp with no P/S or no light for P/S
12 noon	Purple	Photosynthesis is greater than respiration (both P/S + resp)
6 pm		Photosynthesis equals respiration/compensation point/rates same or CO_2 in = CO_2 out

[4] 10

Total **70**

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

WEDNESDAY 12 NOVEMBER 2014, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **3(d)** and **7**.

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

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Examiner Only	
Marks	Remark

1 **(a)** A man trips on a footpath. He is immediately aware that he has tripped. About three seconds later his heart rate increases and he feels the shock of nearly falling.

(i) Name the organ system which is responsible for the man's **immediate** awareness of nearly falling.

_____ [1]

(ii) A chemical messenger, called adrenaline, causes his heart rate to increase.

What type of chemical is adrenaline?

_____ [1]

(iii) Suggest how adrenaline is transported around the body.

_____ [1]

(b) Insulin is a chemical messenger used to control blood glucose levels.

(i) Where is insulin made in the body?

_____ [1]

(ii) Describe how insulin lowers blood glucose levels.

_____

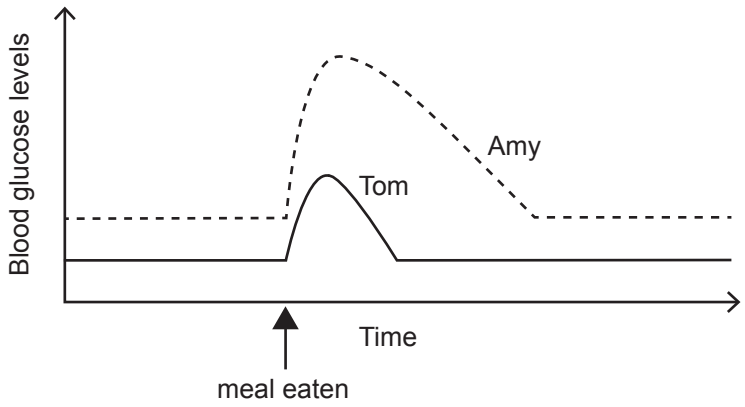
_____

_____ [2]

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(c) Diabetes is a condition in which the blood glucose control mechanism fails.

The graph shows how blood glucose levels change for Tom and Amy, after they have eaten an identical meal.
Tom does not have diabetes.



Give **two** pieces of evidence from the graph which suggest Amy may have diabetes.

1. _____

_____

2. _____

_____ [2]

Examiner Only

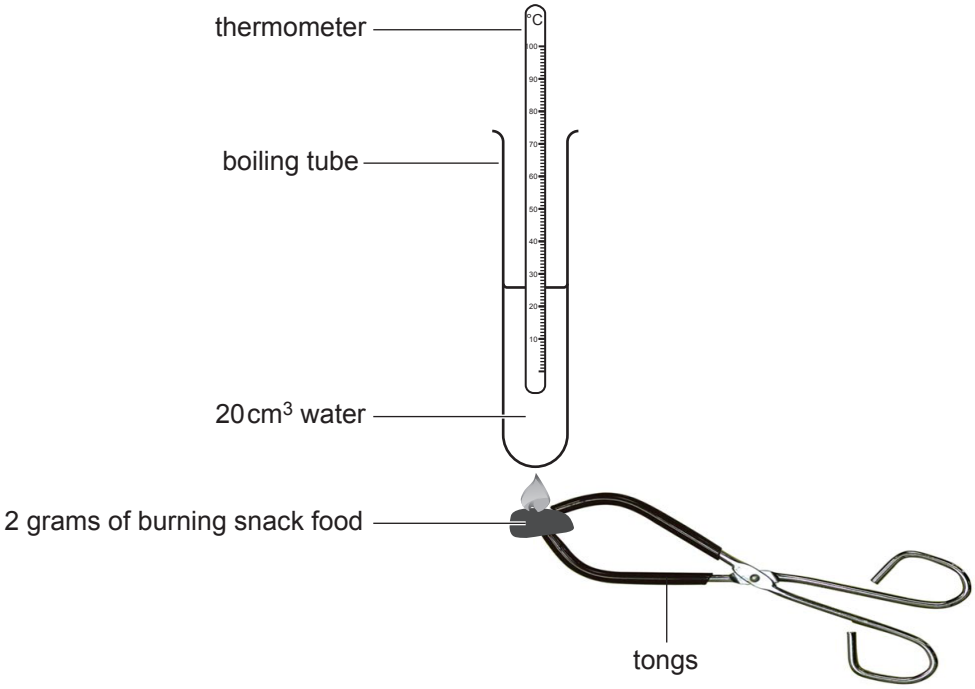
Marks	Remark

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Examiner Only	
Marks	Remark

2 Harry and James investigated the energy content of four different snack foods.

The diagram shows how they carried out their investigation.



They measured the temperature of 20 cm^3 of water before and after **completely** burning **2 grams** of each snack food. They calculated the rise in temperature for each snack food.

The table shows the results obtained.

Snack food	Temperature of 20 cm^3 of water/°C		Rise in Temperature/°C
	Before burning	After burning	
Cheesy crackers	19	47	28
Potato crisps	19	40	21
Plain biscuit	19	37	
Chocolate biscuit	19	54	35

(a) (i) Complete the table to show the rise in water temperature for the plain biscuit. [1]

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(ii) The equation below is used to calculate how much energy 1 gram of each snack food contains.

$$\text{Energy in food /J per gram} = \frac{\text{Rise in water temperature/°C} \times \text{Volume of water/cm}^3 \times 4.2}{\text{Mass of food burned in grams}}$$

Use this equation to calculate the energy content in **1 gram of the potato crisps.**

Show your working.

_____ J [3]

(iii) Before Harry and James calculated the energy content of the snack foods, Harry looked at the table of results and said "I think the chocolate biscuit has the highest energy content."

What information from the table of results supports Harry's statement?

_____

_____ [1]

(iv) James suggested repeating the chocolate biscuit experiment three times.

What is the advantage of doing this?

_____

_____ [1]

(b) The energy content of 1 gram of potato crisps is much higher than the value calculated by Harry and James.

Suggest a reason why the experimental result is lower.

_____

_____ [1]

(c) Give **one** health problem that could result from eating too many snack foods.

_____ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 A student carried out an experiment to find out which food groups are in a cheese sandwich.

(a) Complete the table by writing in the missing colours for the two food tests shown.

Food group	Test reagent	Colour of test reagent at start	Colour of test reagent if food group present
Starch	Iodine solution	Yellow/brown	
Protein	Biuret solution		Purple

[2]

(b) Describe how the student would test for fat in a sample of the cheese sandwich. Give the positive result for a fat test.

_____

_____

_____

_____ [3]

(c) Amylase is the enzyme that breaks down starch.

Another student investigated how pH affects the breakdown of starch.

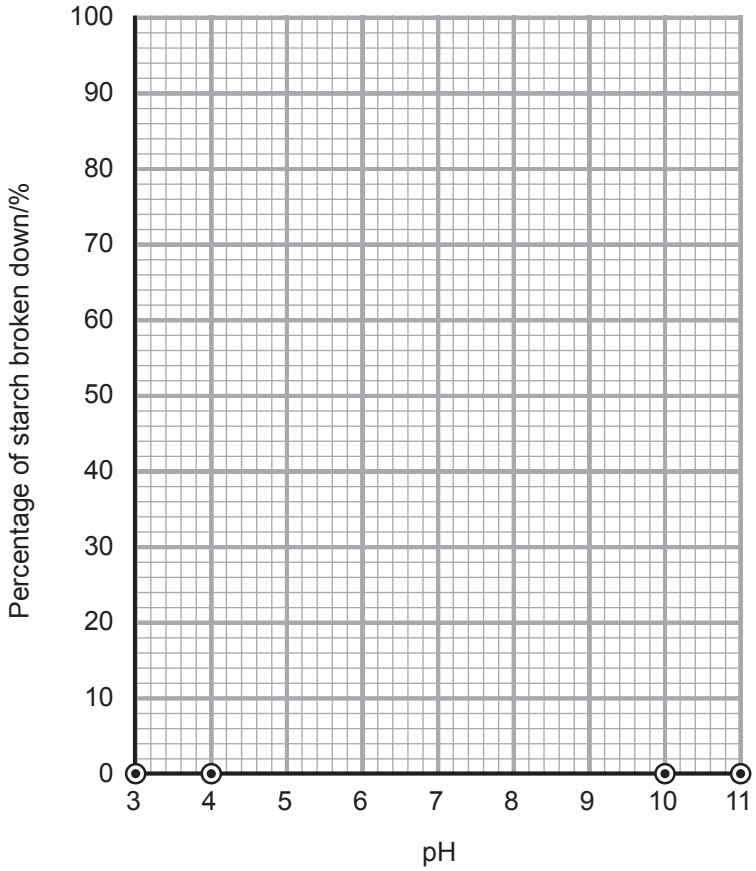
The table shows the results of this investigation.

pH	Percentage of starch broken down/%
3	0
4	0
5	10
6	64
7	96
8	68
9	12
10	0
11	0

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(i) Plot a line graph on the grid, using the data in the table opposite.

Four plots have been done for you.



[3]

(ii) What is the best pH for amylase to break down starch?

_____ [1]

(iii) Use **data** from the graph to describe the trend shown.

_____

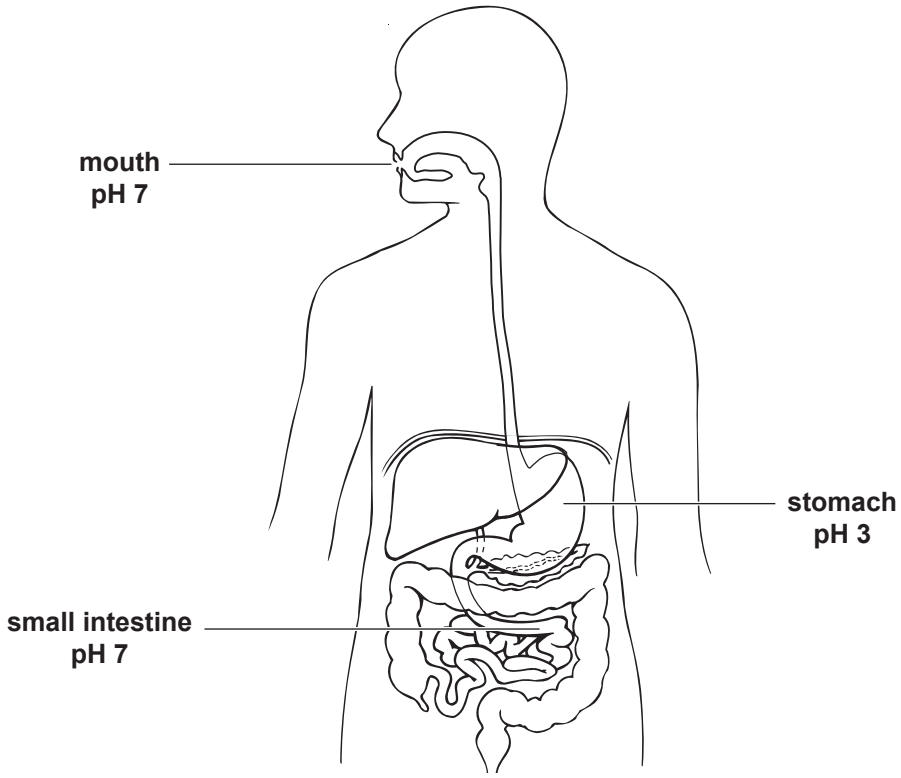
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

(d) The diagram shows part of the human digestive system.
The pH of some parts is shown.
Food stays only a very short time in the mouth.



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Use the graph on page 7, the diagram above and your knowledge of enzymes to:

- Describe the activity of amylase in the
  - mouth
  - stomach
  - small intestine

- Explain why it is important that amylase is made in the small intestine as well as in the mouth.

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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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Examiner Only	
Marks	Remark

4 **(a)** The photograph shows an oak tree.



© Cheryl Davis/iStock/Thinkstock

Read the following passage.

	Line
Scientists in North America are concerned that mature oak trees are not being replaced by oak seedlings but by seedlings of other types of trees.	1 3
One reason suggested for this is competition from the seedlings of other types of trees. These seedlings are better adapted than the oak seedlings to grow in the shady conditions on the forest floor.	5
Another suggestion is that oak seedling roots are eaten by voles, which are small animals living in the forest.	7
Any decrease in the size of oak forests will cause a problem for the timber industry, which uses the oak wood. It will also affect biodiversity, as a large wildlife population lives in oak forests.	9 11

(i) Read lines 1–6 of the passage.

Use **only** the information in the passage to suggest what the oak seedlings and seedlings of other types of tree are competing for.

_____ [1]

(ii) Read lines 7–8 of the passage.

What trophic level are the voles feeding at?

_____ [1]

(iii) Read lines 9–11 of the passage.

Name **one** economic problem and **one** environmental problem which would result from the oak seedlings not growing into oak trees.

Economic _____

_____

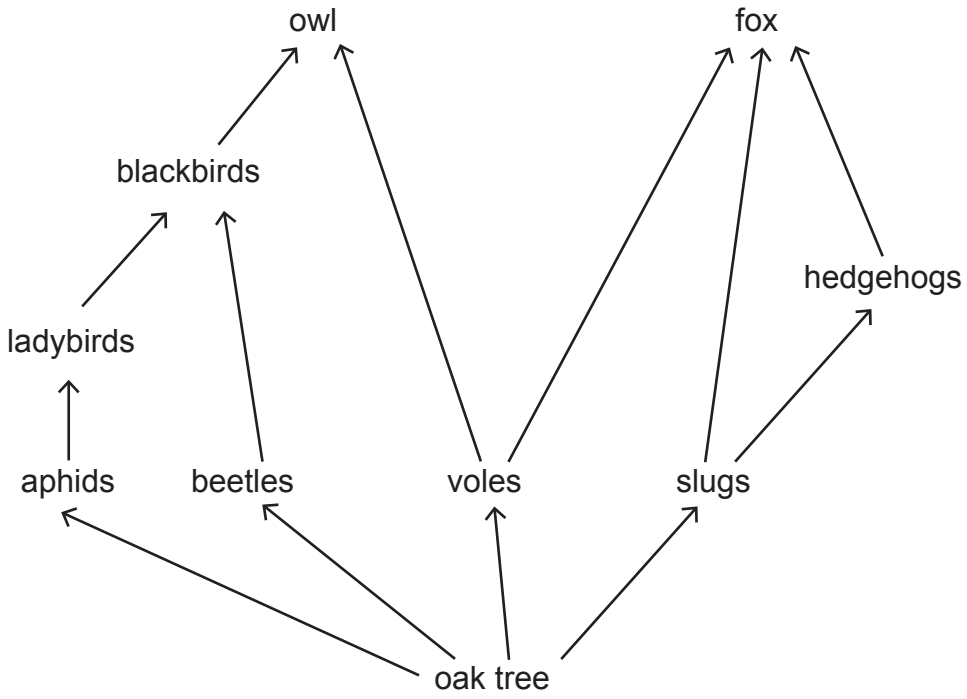
Environmental _____

_____ [2]

Examiner Only	
Marks	Remark

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(b) The diagram shows part of a food web in a forest.



(i) Use the food web to draw and label a pyramid of **numbers** for the **only** food chain that has five trophic levels.

[3]

(ii) More energy is available to the fox if it eats slugs rather than hedgehogs.

Explain why.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

(c) Owls eat many types of small mammal.
A number of hours after feeding, the owl expels a pellet from its mouth containing all the indigestible parts of its prey, e.g. bones, fur and teeth.
The photographs show owl pellets.



Owl pellets lying on the forest floor

© Edward Kinsman/Science Photo Library



An owl pellet pulled apart to show indigestible body parts of prey

© Dr Morley Read/Science Photo Library

In one evening's hunting, an owl eats three voles.
Each vole has a mass of 30 grams.
Each gram of vole eaten contains 8 kJ of energy.

(i) Calculate the amount of energy in the **three** voles.

Show your working.

_____ kJ [2]

(ii) 25% of the energy in the owl's meal is expelled in the pellet.
Calculate how much energy is in this pellet.

Show your working.

_____ kJ [2]

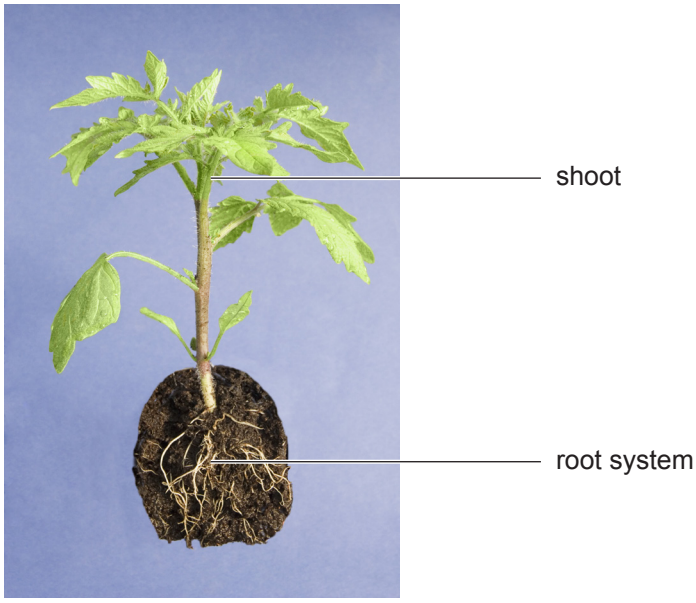
(iii) Name **one** way, other than indigestible body parts, that energy can be lost between trophic levels in a food chain.

_____ [1]

Examiner Only	
Marks	Remark

5 **(a)** A market gardener grows tomato plants in a glasshouse. He is able to control the conditions inside the glasshouse to obtain the best rate of photosynthesis.

The photograph shows a tomato plant.



© Sheila Terry/Science Photo Library

The market gardener adds fertiliser to increase mineral levels in the soil. The tomato plants absorb the minerals and this improves growth.

(i) Name the cells in plants which increase the surface area for absorption of minerals.

_____ [1]

(ii) Name and describe the process which is used by plants to absorb minerals from the soil.

_____

_____

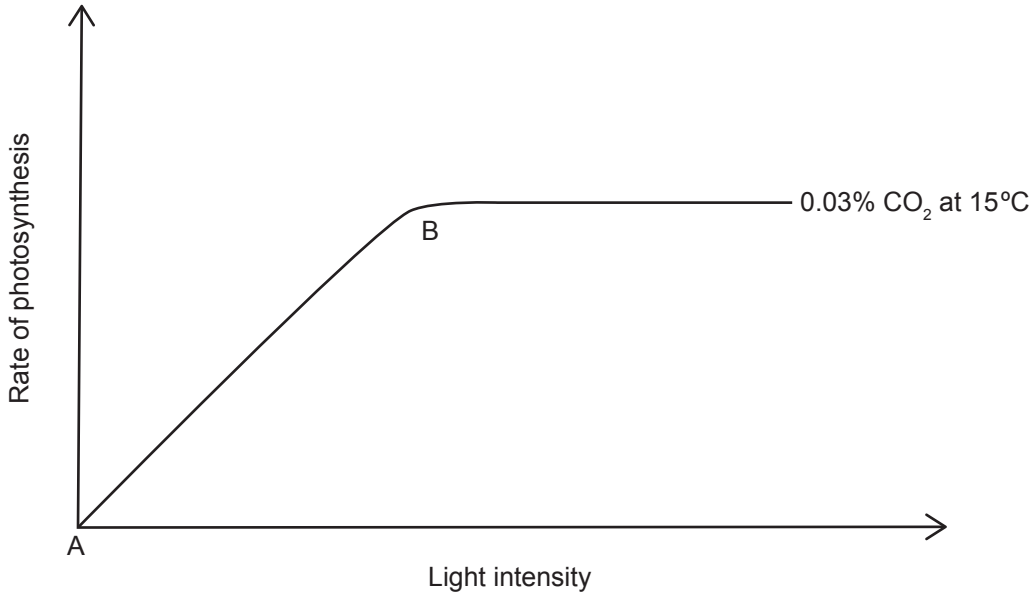
_____

_____

_____ [3]

(b) The rate of photosynthesis in a plant can be limited by environmental factors.

The graph shows the effect of increasing light intensity on the rate of photosynthesis in **0.03%** carbon dioxide (CO_2) at 15°C.



(i) Name the environmental factor that is limiting the rate of photosynthesis between points A–B.

_____ [1]

(ii) Sketch a line on the graph to show the rate of photosynthesis in the same plant in **0.13%** CO_2 at 15°C. [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

(c) Geothermal energy is used in Iceland to heat water underground.

This water can be piped into glasshouses. Some market gardeners in Iceland use this hot water to heat their glasshouses.

Geothermal energy is non-polluting.

The photograph shows some of these glasshouses in Iceland.



© Martin Bond/Science photo Library

(i) Suggest **one** economic benefit to market gardeners in Iceland who use geothermal energy to heat their glasshouses.

_____ [1]

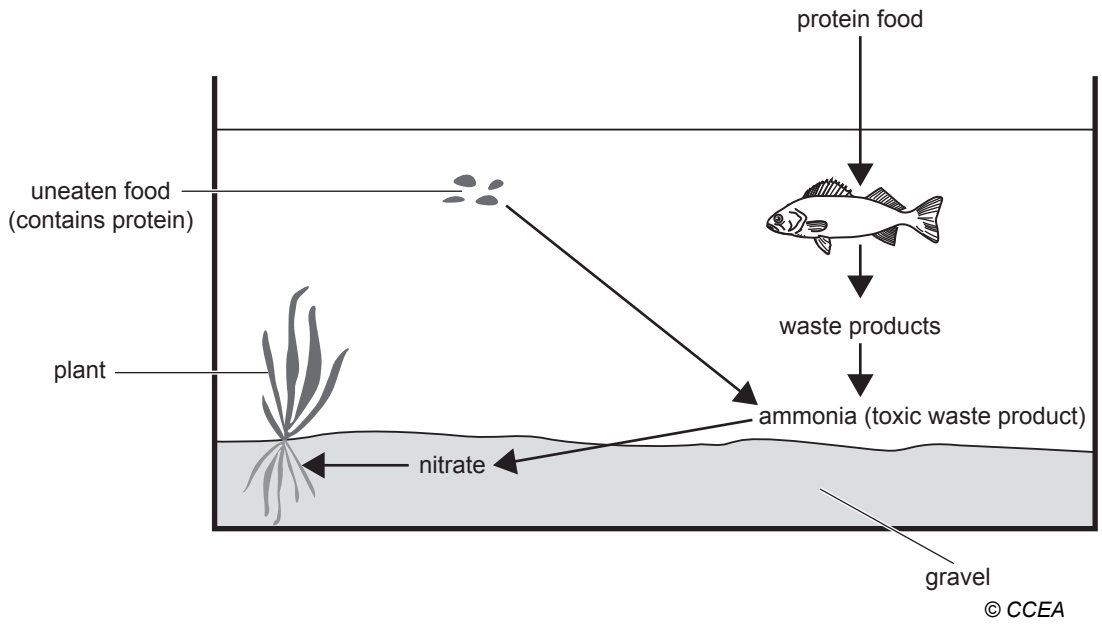
(ii) Suggest how using this form of heating in glasshouses helps Iceland meet international treaty requirements on pollution.

_____

_____

_____ [2]

6 The diagram shows part of the nitrogen cycle taking place in a fish tank.



(a) Name the type of bacteria that converts ammonia into nitrate.

_____ [1]

(b) Fish food contains protein.

When fish are given too much of this food some of it will remain uneaten in the tank.

Use the diagram to explain how this may lead to the death of fish in the tank.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

(c) An increase in nitrate levels in rivers can cause eutrophication.

Fish living in rivers affected by eutrophication may eventually die.

The photograph shows a river affected by eutrophication.

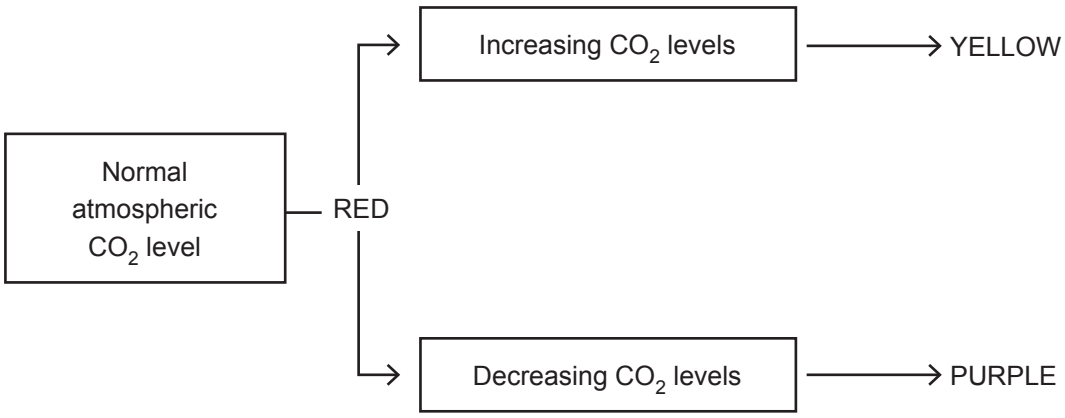


© Robert Brook/Science photo Library

Explain how an increase in nitrate levels in this river leads to the death of fish.

[4]

7 Hydrogencarbonate indicator changes colour as carbon dioxide (CO_2) levels change. These colour changes are shown in the diagram below.



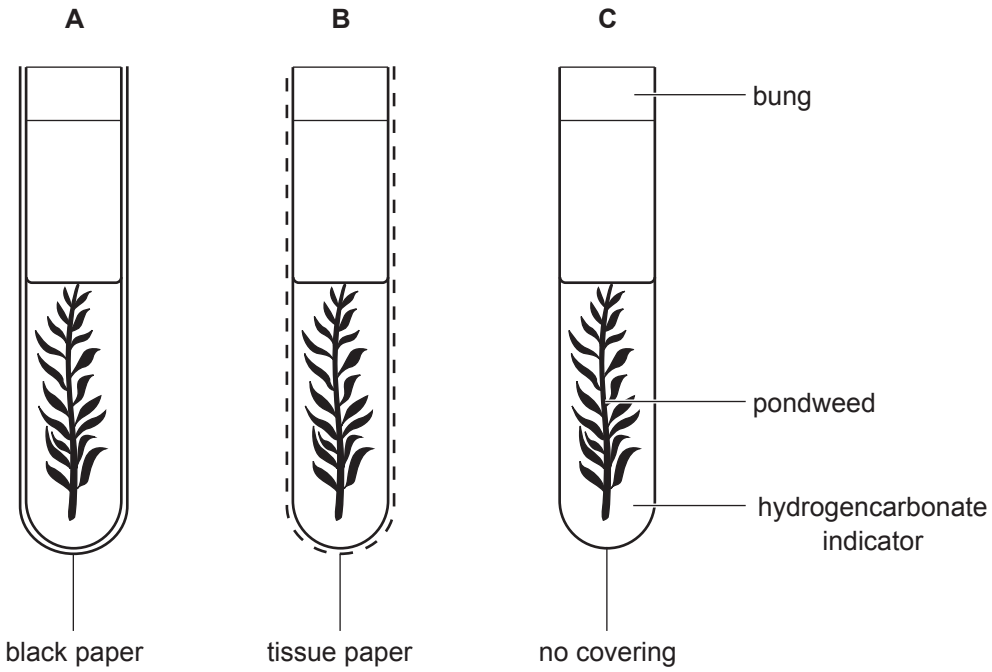
A student investigated gas exchange in pondweed in different light conditions.

Three test tubes were set up, each containing the same amount of pondweed and the same volume of hydrogencarbonate indicator.

The test tubes were set up to give different light conditions.

The three test tubes were left for 6 hours. The colour of the hydrogencarbonate indicator was recorded at the start of the investigation and after 6 hours.

The diagram below shows how the test tubes were set up.



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The table below shows the results of the investigation.

Test tube	Test tube covering	Colour of hydrogencarbonate indicator at start	Colour of hydrogencarbonate indicator after 6 hours
A	Black paper	red	yellow
B	Tissue paper	red	red
C	None	red	purple

Explain the colour changes in the hydrogencarbonate indicator after 6 hours, in **each** of the test tubes.

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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113166

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

WEDNESDAY 12 NOVEMBER 2014, MORNING

MARK SCHEME

STEMUP.CO.UK

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)	(i)	Nervous/nerve system	[1]	
		(ii)	Hormone	[1]	
		(iii)	By the circulatory system/in blood/plasma	[1]	
	(b)	(i)	Pancreas	[1]	
		(ii)	• More/greater/increased respiration; • (Conversion of) glucose to glycogen/turns into or stores as glycogen.	[2]	
	(c)		Any **two** from: Amy's blood glucose was higher before the meal/resting/normally; After eating, Amy's blood glucose rises to a higher level; **or** Amy's blood glucose is higher; Amy's blood glucose takes a longer time to return to normal/fall/decrease; Amy's blood glucose rises faster after eating.	[2]	8
2	(a)	(i)	18	[1]	
		(ii)	(21 × 20 × 4.2); ÷ 2 =; 882 J 3 marks on own 2 marks: 18 → 756; 28 → 1176; 35 → 1470; must show working	[3]	
		(iii)	Raised water temperature the most/temp goes highest	[1]	
		(iv)	Reliability/calculate average	[1]	
	(b)		Heat energy lost to surroundings/environment/tongs/glass tube in classroom experiment/or converse/fat drips off nothing to stop heat escaping (to environment)	[1]	
	(c)		Obesity/CHD/diabetes/stroke/high blood pressure/high cholesterol/ overweight/heart attack	[1]	8
3	(a)		Starch: Blue/black **or** Black; Protein: Blue	[2]	

AVAILABLE MARKS

(b) Any 2 from 3 of first three points
1st 2 marks:
Make a suspension of food sample/mix some sandwich in water/add H_2O/ make solution;
Add ethanol/alcohol;
Mix/shake;
3rd mark:
Observe a **white emulsion** (nothing else) if fat is present [3]

(c) **(i)** All 5 points plotted correctly for 2 marks (3 correct for 1 mark)
Straight line from point to point drawn/smooth curve acceptable [3]

(ii) pH 7 [1]

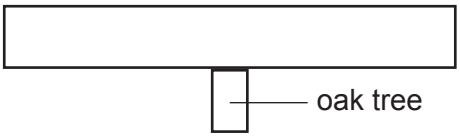
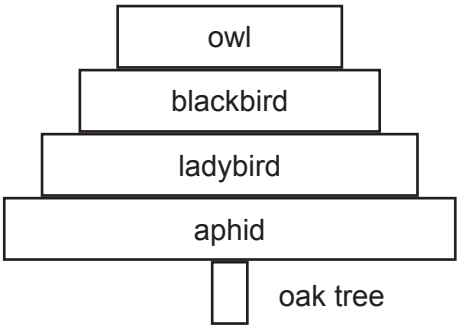
(iii) Activity increases from pH 4–7;
from pH 7–10, activity decreases;
- higher as goes to neutral = 1 mark
  lower as it goes away from neutral = 1 mark
- increases then decreases with no data = 1 mark
- goes up to max. 96% = 1 mark
  goes back down to zero = 1 mark [2]

(d) Indicative content – Any 6 points
- Amylase works in the mouth
- Amylase does not work in stomach
- Amylase works in the small intestine
- Starch digestion incomplete in the mouth
- Amylase is destroyed in the stomach (by acid conditions)
- So amylase needs to work again in the small intestine/by pancreas to complete the digestion of starch
- Amylase digests starch into glucose

Band	Response	Mark
A	Candidates use appropriate terms throughout to explain the activity of amylase in the various regions of the intestine using **five to six** points from the indicative content. They use good spelling, punctuation and grammar. Form and style are of a high standard.	[5–6]
B	Candidates use appropriate terms throughout to explain the activity of amylase in the various regions of the intestine using **three to four** points from the indicative content. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3–4]
C	Candidates use **one to two** points from the indicative content to explain the activity of amylase in the intestine. They use limited spelling, punctuation and grammar. They make limited use of specialist science terms.	[1–2]
D	Response not worthy of credit.	[0]

[6]

17

					AVAILABLE MARKS
4	(a)	(i)	Light	[1]	
		(ii)	Trophic Level 2	[1]	
		(iii)	Economic: Timber industry will lose its supply of oak Environmental: Biodiversity reduced	[2]	
	(b)	(i)	 1st mark: oak smaller than next level and labelled oak		
			 2nd mark: top 4 boxes symmetrical and decreasing in size (labels not needed for this mark)		
			 owl blackbird ladybird aphid 3rd mark: labels in order above	[3]	
		(ii)	Less energy lost; as there are less steps in the food chain/less trophic levels	[2]	
	(c)	(i)	$3 \times 30\,g = 90\,g$; $90 \times 8 = 720\,kJ$ **or** $30 \times 8 = 240$ $240 \times 3 = 720$	[2]	
		(ii)	$720 \times \frac{25}{100}$; 180kJ	[2]	
		(iii)	Reproduction/respiration/excretion/egestion/faeces/movement/heat/mating	[1]	14

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					AVAILABLE MARKS
5	**(a)**	**(i)**	Root hair cells/root hair	[1]	
		(ii)	Active uptake/transport; Movement of minerals from area of low to high concentration/against concentration gradient; Respiration/Energy needed	[3]	
	(b)	**(i)**	Light/sunlight	[1]	
		(ii)	1st mark: from zero and extension of incline line from B/from zero with steeper incline; 2nd mark: line plateau above current line	[2]	
	(c)	**(i)**	No need to pay for heating fuel less electricity needed	[1]	
		(ii)	Any **two** from: • Geothermal heating does not produce CO_2/less CO_2 produced/ doesn't contribute to GW/doesn't produce GH gases • Helps Iceland meet treaty <u>targets</u> **or** conserves fossil fuels **or** is renewable/no more energy than 1990	[2]	10
6	**(a)**		Nitrifying bacteria/nitrifying	[1]	
	(b)		Any **two** from: The food/protein is converted to ammonia/more ammonia produced; which is toxic/poisonous	[2]	
	(c)		Any **four** from: Increase in algae/plants/algal bloom; or described shading; causes plants/algae to die; bacteria decompose plants/decomposers/algae; bacteria use up oxygen	[4]	7

7 Indicative content

A CO_2 increases
A respiration only or respiration with no photosynthesis

B rate of respiration = rate of photosynthesis
compensation point in B
CO_2 in/absorbed equals CO_2 out/produced
no net movement CO_2

C photosynthesis greater/more/faster than respiration
C CO_2 decreases or more CO_2 in than out [6]

Band	Response	Mark
A	Candidates give at least 5 indicative points. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5–6]
B	Candidates give at least 3 indicative points. They use satisfactory spelling, punctuation and grammar skills. Form and style are of a satisfactory standard.	[3–4]
C	Candidates give at least 1 indicative point. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1–2]
D	Response not worthy of credit.	[0]

Total

AVAILABLE MARKS

6

70

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

TUESDAY 13 MAY 2014, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **3(b)** and **8**.

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

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Marks	Remark

1 A grower investigated the effects of carbon dioxide and light intensity on the yield of his tomato crops.

He set up an investigation using four glasshouses of similar size **A**, **B**, **C** and **D**, each containing the same number of tomato plants.

Over a period of several months, April–July, the tomatoes produced were collected and weighed.

The grower recorded the yield (total weight) in kilograms (kg), of tomatoes produced from each glasshouse.

The table below shows the results.

Glasshouse	Conditions	Yield/kg	Increase in yield in kilograms compared to A
A (control)	• normal carbon dioxide • normal light	117	0
B	• increased carbon dioxide • normal light	137	20
C	• normal carbon dioxide • increased light	137	20
D	• increased carbon dioxide • increased light	177	

(a) (i) Complete the table by calculating the increase in yield of tomatoes grown in glasshouse **D** compared to glasshouse **A**. [1]

(ii) What is the percentage change in yield for glasshouse **D** compared to glasshouse **A**?

Show your working.

_____ % [2]

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(b) Explain the results for glasshouse **D**.

_____

_____

_____

_____ [2]

(c) Give **one** other factor that should be kept constant in the glasshouses during this investigation.

_____ [1]

(d) Give **one** economic factor that the grower would need to consider if he was going to make a profit when growing tomatoes.

_____

_____ [1]

Examiner Only	
Marks	Remark

2 Read the passage below carefully and answer the questions that follow.

Line

Coral reefs protect shallow coastal regions and provide livelihoods for hundreds of millions of people. They are the most biodiverse regions of the ocean. 1 3

Corals are animals and it is their skeletons that form the structure of the reef. **Corals feed on plankton** (tiny floating plants). The corals also have algae that live inside them. These algae carry out photosynthesis and the corals benefit from this by gaining sugar and oxygen. This enables the corals to make their skeletons and grow. 5 7



© Georgette Douwma/Science Photo Library

There are several factors that can affect coral reefs. 9

Increasing sea temperatures destroy the algae in the corals. The corals then die. 11

In some places the numbers of starfish which eat the corals have gone up due to overfishing of the Triton fish that eat the starfish. 13

This has resulted in the starfish killing large sections of the reefs.

(a) What is meant by biodiversity?

_____ [1]

(b) Give the abiotic factor named in the passage. (line 10)

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(c) **(i)** Using the information in the passage, complete the food chain below.

_____ corals _____ _____ _____

[2]

(ii) Draw a pyramid of biomass for this food chain. Label the organisms on the pyramid.

[3]

(d) **(i)** Explain how increasing sea temperatures damage corals.

_____

_____

_____ [2]

(ii) Suggest **one** reason why it is important to protect coral reefs.

_____ [1]

(iii) Other than those mentioned in the passage, suggest **one** other cause of coral reef damage.

_____ [1]

(iv) What name is given to a species that is used to monitor the state of an ecosystem?

_____ [1]

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(e) (i) What apparatus would scientists use to measure water temperatures on the reef?

_____ [1]

(ii) Explain why these measurements would need to be repeated several times in each location.

_____ [1]

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Marks	Remark

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

3 Digestion is carried out by enzymes.

(a) **(i)** Explain why food needs to be digested.

_____

_____ [2]

(ii) Name the digestive enzyme found in the small intestine that breaks down proteins and give the product of the breakdown.

Enzyme _____

Product _____ [2]

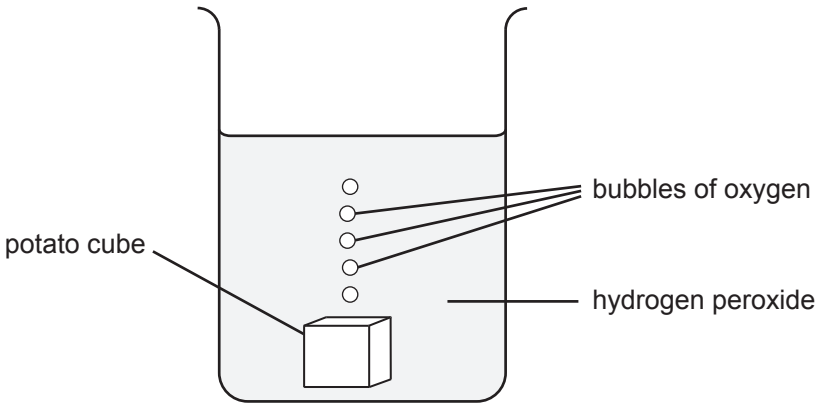
(iii) Give two ways the small intestine is adapted for its function.

1. _____

2. _____ [2]

(b) Hydrogen peroxide is a waste product formed by cells. It is harmful to all cells, including skin cells. The enzyme catalase works very quickly to break down the hydrogen peroxide into water and oxygen. It is found in many types of living tissue.

The bubbles of oxygen produced can be seen coming off the cells if the tissue is placed in a beaker containing hydrogen peroxide solution.



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Describe how you would carry out an experiment to compare the **rate** of catalase action in potato and liver tissues.

Your account should include:

- how you would measure the rate of catalase action
- one variable that you would keep constant
- one safety precaution you should take when carrying out the experiment.

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

[6]

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Marks	Remark

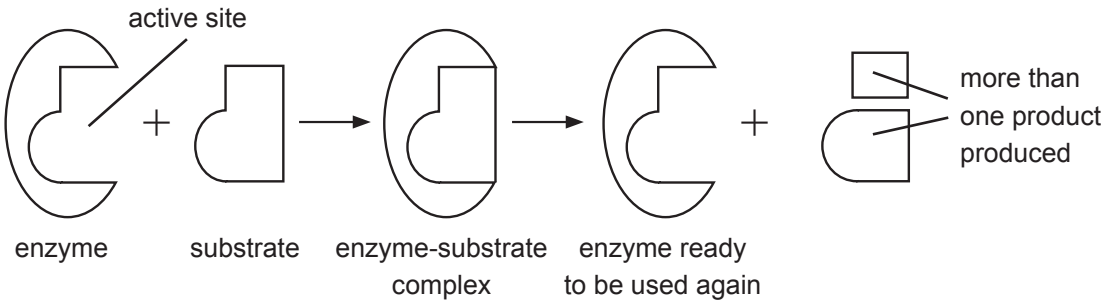
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Marks	Remark

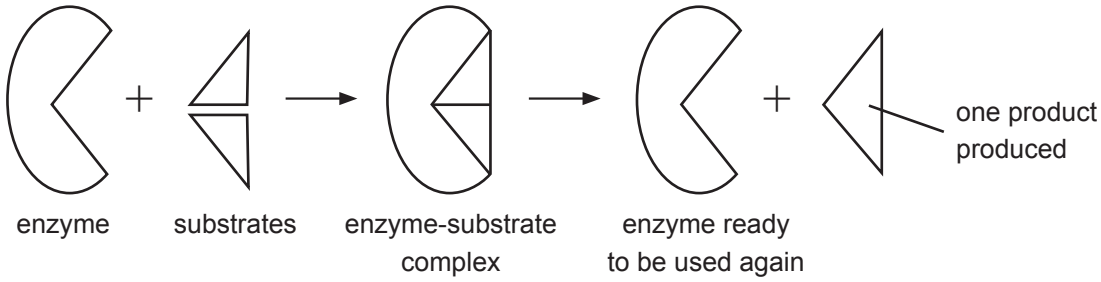
(c) Enzymes are biological catalysts. Two types of reaction are catalysed by enzymes.

These two types of reaction are shown in the diagrams below.

Reaction Type A



Reaction Type B



(i) Describe what has happened to the substrates in the two types of reaction, **A** and **B**.

A _____

_____

B _____

_____ [2]

(ii) Using the diagram and your knowledge, explain how you know that the enzyme lipase carries out reactions of **Type A**.

_____ [1]

(iii) Name the model of enzyme action shown for both types of reaction in the diagrams.

_____ [1]

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Marks	Remark

4 Animals respond to stimuli using both their nervous and hormonal systems.

(a) Complete the table to compare the features of the nervous and hormonal systems in animals.

Feature	Nervous system	Hormonal system
how the 'message' travels	along nerve cells (neurones)	
where the 'message' goes		
speed of response		

[4]

Plants respond to stimuli using hormones only.

(b) (i) Name the hormone produced in the tip of a plant shoot.

_____ [1]

(ii) The tip of a plant shoot will grow towards light coming from one direction.
Name this process.

_____ [1]

(iii) Give the advantage to the plant of this response.

_____ [1]

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Examiner Only	
Marks	Remark

5 An experiment was carried out to study the effect of different oxygen concentrations on the uptake of minerals by seedlings.

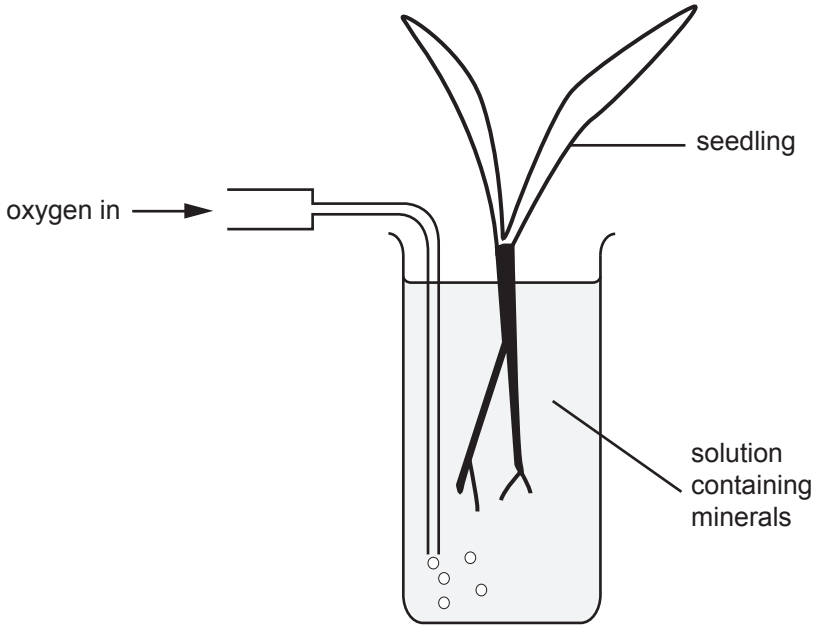
Seedlings of the same mass were placed in six beakers, one in each beaker.

The six beakers were labelled **A** to **F**.

The beakers each contained a solution with the same concentration of minerals.

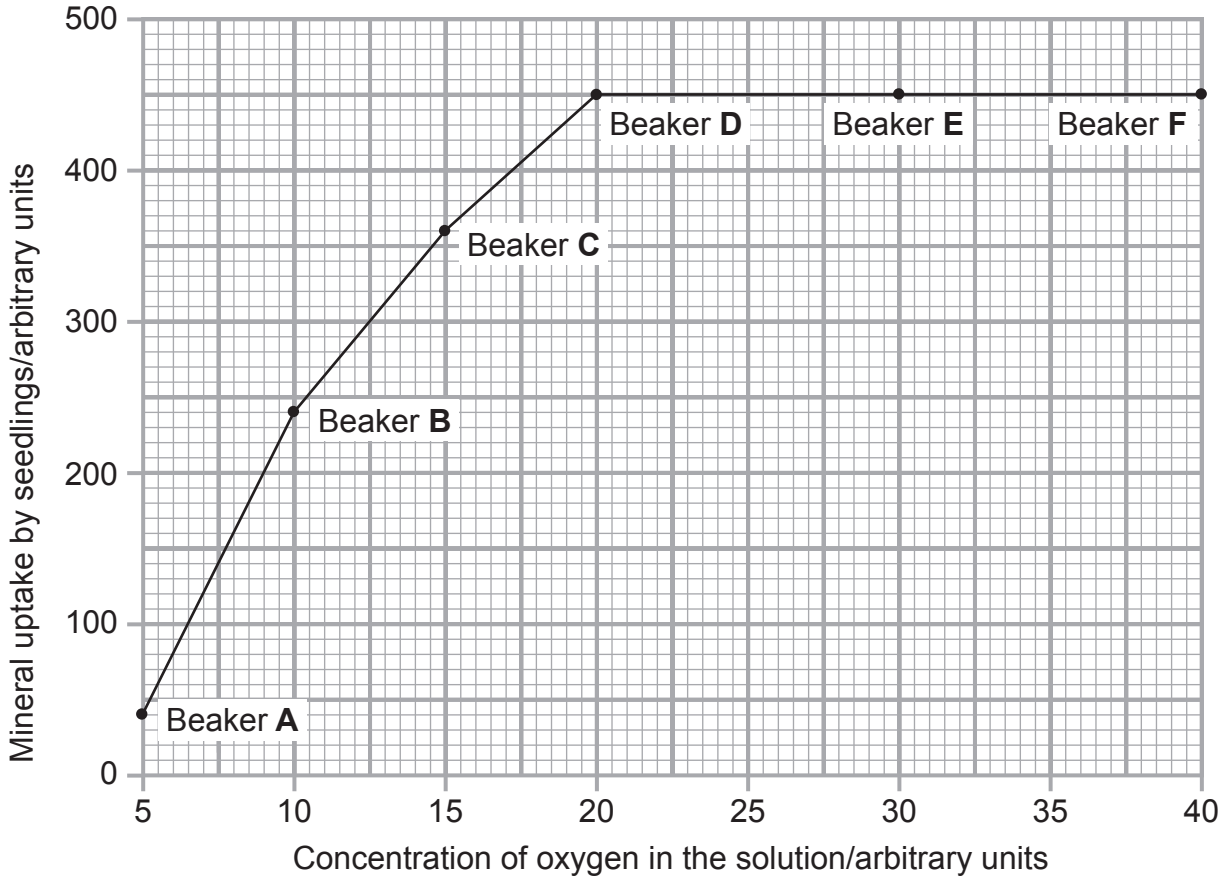
Each solution had a different amount of oxygen bubbled through it. The diagram below shows the set-up of one of the beakers.

The seedlings were then grown under the same conditions.



© CCEA

The uptake of the minerals by each seedling at the different oxygen concentrations is shown in the graph.



Examiner Only	
Marks	Remark

Using the graph and your knowledge, answer the following questions.

(a) Explain the difference in mineral uptake by the seedlings in Beaker **C** and Beaker **A**.

_____

_____

_____

_____ [3]

(b) Describe and suggest an explanation for the results for Beakers **D**, **E** and **F**.

_____

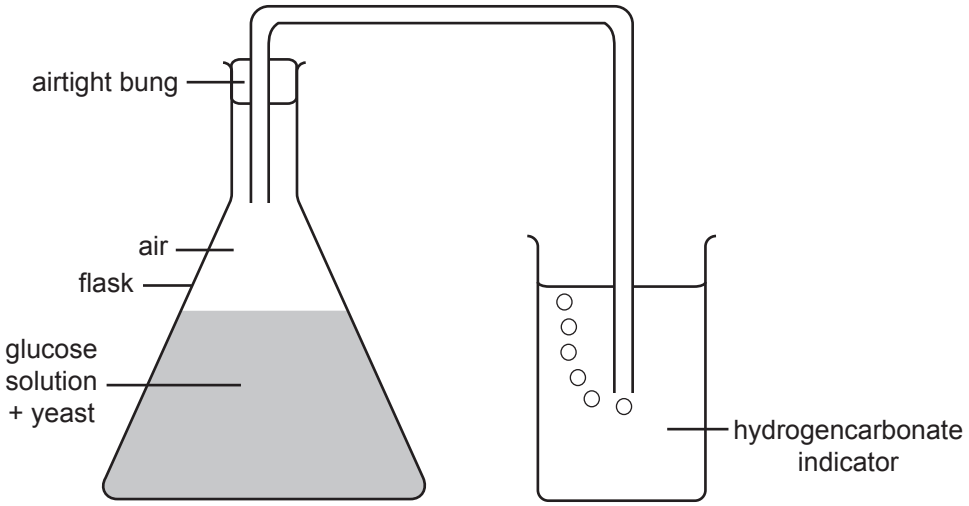
_____

_____ [2]

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Examiner Only	
Marks	Remark

6 The diagram shows apparatus used to investigate respiration in yeast cells.
Yeast cells can respire both aerobically and anaerobically.



(a) Explain why the yeast cells respired aerobically at the start of the experiment.

_____ [1]

(b) What is the benefit to the yeast cells of respiring aerobically rather than anaerobically?

_____ [1]

(c) Give the colour change in the hydrogencarbonate indicator as the experiment progresses.

_____ to _____ [1]

(d) The experiment continued for three days.

Suggest two changes that will occur to the contents of the **flask** during this period.

1. _____

2. _____ [2]

(e) If the experiment was repeated, describe the steps you would take to ensure the yeast respired **anaerobically** instead of **aerobically** from the start of the experiment.

_____

_____

_____

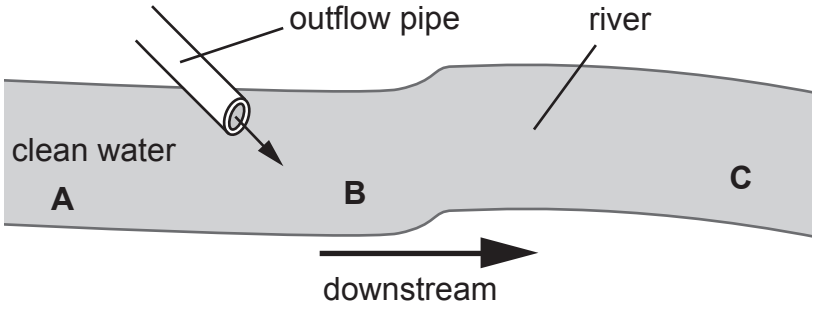
_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 As part of a field study, pupils investigated if there was pollution entering a local river from an outflow pipe.

The diagram shows the river with an outflow pipe.



They collected water samples at three points **A**, **B**, and **C** as shown in the diagram.

They took these water samples back to the school laboratory to carry out pollution tests.

(a) Suggest **one** safety precaution the pupils should have taken when collecting samples from the river.

_____ [1]

(b) In the laboratory the pupils carried out two chemical tests on their samples.

The first test was for nitrates. The test reagent is a very pale yellow colour in clean water but becomes dark yellow if excess nitrates are present.

In the second test the test reagent used gives a value of the amount of **oxygen used** by aerobic microorganisms. The higher the levels of oxygen used, the more aerobic microorganisms there are in the water sample.

The results are shown in the table.

	Results for water samples		
Test	**A**	**B**	**C**
1 (nitrate)	very pale yellow	dark yellow	pale yellow
2 (**oxygen used**) mg/l	8	400	200

(i) Explain the results for test 1.

_____

_____

_____

_____

_____ [3]

(ii) Using the results for test 2, describe and explain the results for the **oxygen used** at point B.

_____

_____

_____

_____

_____

_____ [3]

(c) Suggest the advantage of using two different tests to monitor water pollution.

_____

_____ [1]

Examiner Only

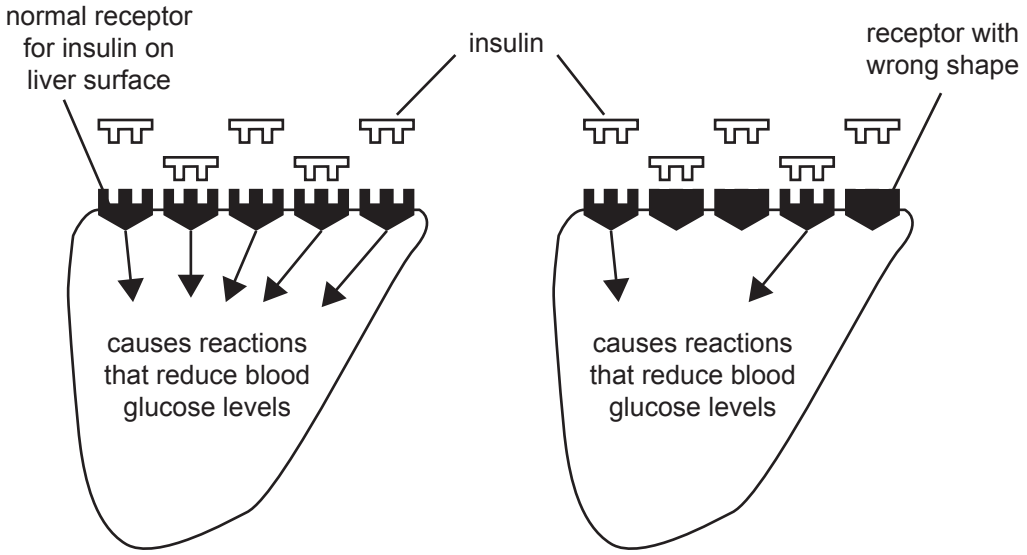
Marks	Remark

8 The liver has receptors for insulin on its surface.

Insulin will only combine with receptors that have a complementary shape.

Once this combination occurs it causes reactions in the liver which bring about a lowering of blood glucose levels.

The diagram shows a normal liver from a 25-year-old man and a liver from a 65-year-old man who has developed diabetes.



Normal liver from 25-year-old man

Liver from 65-year-old man who has developed diabetes

Using the diagrams and your knowledge:

- describe and explain why this older man has difficulty lowering his blood glucose level.
- suggest why this older man's doctor has advised him to lower his sugar (glucose) intake.

Examiner Only

Marks	Remark

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

Examiner Only	
Marks	Remark

[6]

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 13 MAY 2014, 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)	(i)	177 – 117 = **60**	[1]	
		(ii)	60/117; (× 100) = 51.28%/51.3%/51%	[2]	
	(b)		highest rate of photosynthesis/maximum yield/ as **both light and carbon dioxide** were increased	[2]	
	(c)		temperature/water/minerals/named mineral/soil pH	[1]	
	(d)		cost of increased CO_2 /cost of lighting/cost of other named factor	[1]	7
2	(a)		(all) different/types of living organisms/types of animals and plants/ variety of living organisms/number of species	[1]	
	(b)		temperature	[1]	
	(c)	(i)	plankton → (corals) → starfish → triton (in correct places); arrows correct	[2]	
		(ii)	 1 shape and symmetrical + largest bar at bottom; 1 plankton at bottom + largest; 1 coral, starfish and triton/fish in correct order	[3]	
	(d)	(i)	no photosynthesis/algae die; less O_2 **dissolved** in water; reduced sugar or oxygen so cannot make skeletons/cannot grow/ cannot respire	[2]	
		(ii)	species diversity/livelihood for people/fishing/protects land/ conservation/recreation/tourism/habitat for organisms/ as a food source/biodiversity/prevents extinction	[1]	
		(iii)	(water) pollution/sewage/silage/fertiliser/fishing/boats/industrial waste/ oil/divers/tourists/coral being collected/fishing/eutrophication	[1]	
		(iv)	indicator	[1]	
	(e)	(i)	temperature probe/thermometer	[1]	
		(ii)	increase reliability/obtain average	[1]	14

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AVAILABLE MARKS

3 **(a)** **(i)** Any two from:
so that molecules are soluble;
so that the molecules are small;
to be absorbed (into the blood)/pass **into blood** [2]

(ii) protease
amino acids [2]

(iii) Any two from
- long;
- large surface area;
- villi/folds/microvilli;
- thin (epithelial layer);
- good blood supply/**lots** of capillaries;
- lacteal;
- permeable [2]

(b) **Indicative content**
- carry out with both (each) tissues/carry out with potato and liver;
- count bubbles/collect gas/measure foam or described/volume of gas;
- in a given time;
- repeat for reliability/to get averages;
- same weight/mass/amount of tissue in each/add same volume of H_2O_2/ same pH/same temperature/same concentration of H_2O_2;
- wear goggles/wear gloves [6]

Response	**Marks**
Candidates use appropriate terms throughout to give at least three points about how to carry out the experiment giving one variable to be controlled and one safety point about how to carry out the experiment. They use good spelling, punctation and grammar. Form and style are of a high standard.	5–6
Candidates use appropriate terms throughout to give at least three or four points from the indicative content. They use satisfactory spelling, punctation and grammar. Form and style are of a satisfactory standard.	3–4
Candidates use appropriate terms throughout to give one or two points from the indicative content. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	1–2
Response not worthy of credit.	0

(c) **(i)** breaking down/split apart;
building up/described [2]

(ii) produces two different **types** of products (fatty acid, glycerol) [1]

(iii) lock and key [1]

16

					AVAILABLE MARKS
4	**(a)**	**(i)**	in the blood; gland/muscle/effector to the brain/spinal cord/CNS; to target organ; fast **and** slow (need both) [4]		
	(b)	**(i)**	auxin; [1]		
		(ii)	phototropism; [1]		
		(iii)	**more** photosynthesis [1]		7
5	**(a)**		more O_2 in beaker C; for more energy/respiration; for active transport/moving minerals against conc gradient [3]		
	(b)		• mineral uptake steady/plateau; • cannot absorb any more minerals/some other factor limiting (or named)/ O_2 is **not** the limiting factor/no more minerals left to absorb [2]		5
6	**(a)**		**oxygen** present/available [1]		
	(b)		**more** energy [1]		
	(c)		red to yellow [1]		
	(d)		Any two from: • less glucose; • bubbles of CO_2 produced; • alcohol produced; • **(**more) cloudy/**more** yeast; • increased temperature. [2]		
	(e)		Any two from: boil solution; cool before adding yeast; add layer of oil [2]		7
7	**(a)**		use gloves/safety on river bank [1]		
	(b)	**(i)**	clean water at A/no nitrates/no pollution at A; nitrates entered before B/**high** concentration nitrates/pollution; nitrates diluted/used up by C/lower concentration nitrates/ **less** pollution [3]		
		(ii)	• 400mg//a lot of oxygen used up; Any two: • algal blooms/plants grow/eutrophication; • algae die/plants die; • decomposed (by micro-organisms)/decayed [3]		
	(c)		one reinforces the other/more sure of result [1]		8

8 Indicative content

- some receptor molecules have different shape/less receptor molecules/ wrong shape;
- less insulin attaches/insulin won't fit/won't work;
- **less** glucose converted to glycogen;
- **less** glucose respired;

- less insulin needed/receptor molecules may be enough to regulate glucose;
- 2 health implications – eye damage/kidney failure/CHD/strokes

Response	Marks
Candidates use appropriate terms throughout to describe and explain at least 3/4 points about how a diabetic's liver is different and give at least 1/2 points about why the 65 year old man is advised to lower his glucose intake. They use good spelling, punctation and grammar. Form and style are of a high standard.	5–6
Candidates use appropriate terms throughout to describe and explain at least 1/2 points about how a diabetic's liver is different and give at least 1/2 points about why the 65 year old man is advised to lower his glucose intake. They use satisfactory spelling, punctation and grammar. Form and style are of a satisfactory standard.	3–4
Candidates use appropriate terms throughout to describe and explain at least 1/2 points about how a diabetic's liver is different or why the 65 year old man is advised to lower his glucose intake. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	1–2
Response not worthy of credit.	0

[6] 6

Total **70**

AVAILABLE MARKS

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

MONDAY 24 FEBRUARY 2014, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **2(c)** and **7(a)**.

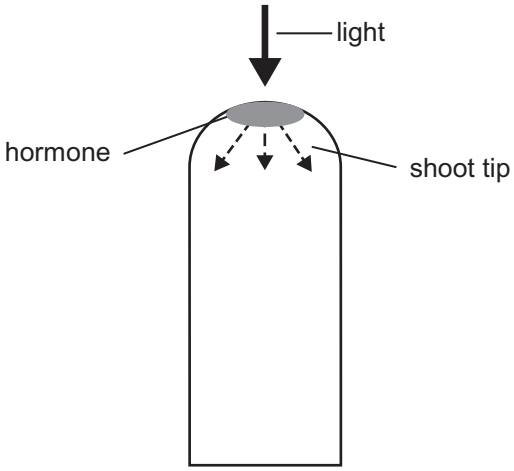
For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

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Examiner Only	
Marks	Remark

1 A hormone is produced in the shoot tip of a plant, as shown in the diagram below.

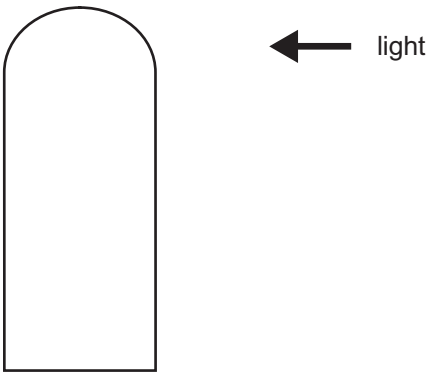
The hormone travels down the shoot tip as shown by the arrows when the light is shone from above.



(a) Name the hormone produced in the shoot tip.

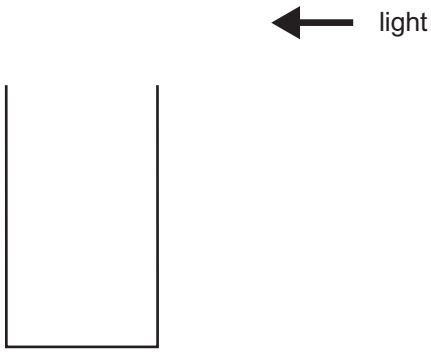
_____ [1]

(b) Draw an arrow on the diagram below, to give the direction the hormone moves in the shoot tip when light shines from the direction shown.



[1]

(c) Complete the diagram below to show the growth of the shoot tip in part **(b)** after a few days.



[1]

(d) Explain how the hormone brings about this growth response in the shoot tip.

_____

_____ [1]

(e) Explain the advantage to the plant of this growth response.

_____

_____ [1]

Examiner Only

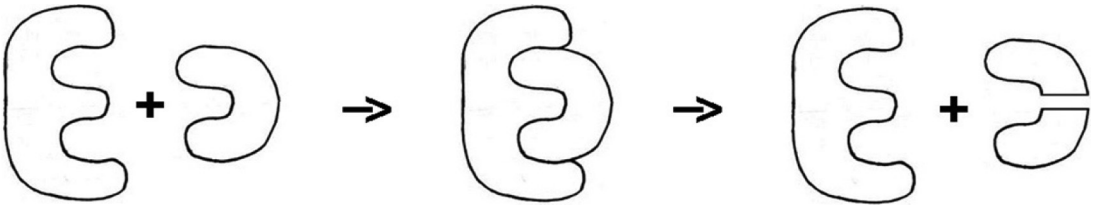
Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** Enzymes speed up chemical reactions in the body. The diagram below shows how an enzyme works.

(i) Label the diagram with the letter:

- E for the enzyme molecule
- S for the substrate molecule
- P for a product molecule



Source: Principal Examiner

[3]

(ii) Name the model of enzyme action shown by the diagram.

_____ [1]

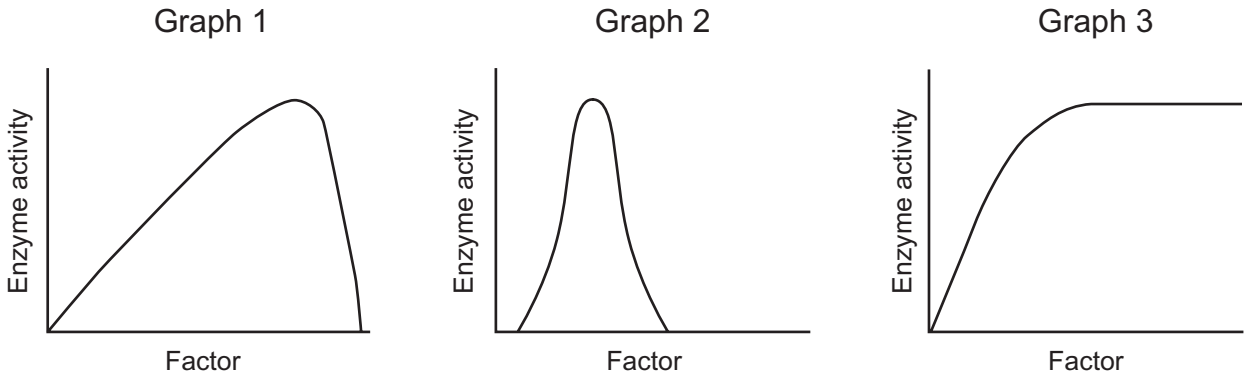
(iii) Using the information in the diagram, describe what happens to the substrate molecule during the reaction.

_____ [1]

(iv) How would this enzyme differ from one with a different specificity?

_____ [1]

(b) The graphs show how enzyme activity in stomach protease varies with three different factors.



Source: Principal Examiner

Examiner Only	
Marks	Remark

(i) Match each graph to the correct factor from the list below.

pH : enzyme concentration : temperature

Graph 1 _____

Graph 2 _____

Graph 3 _____ [2]

(ii) Name the substrate for protease.

_____ [1]

(iii) Apart from the stomach, where else in the digestive system would protease be found?

_____ [1]

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(c) The lining of the small intestine in mammals is adapted for absorption of digested food molecules by having villi.

A disease in cows causes the lining of the small intestine to become smooth and flat. Cows with this disease lose weight and die.

Describe how villi are adapted for their role and explain why cows with this disease die.

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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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

3 It is thought that the barn owl, once a common bird in Northern Ireland, is now reduced to fewer than 50 breeding pairs.



© Linda Wright/Science Photo Library

The following passage is from a news article written by a reporter who visited a farm where barn owls were nesting in an old barn.

'Soon the bird appeared, and what a bird! With its silent flight we never heard it arrive. The owl turns its head so that its sensitive ears can find the faint sounds we make. This is one way the owl finds its prey but also explains why it has difficulty hunting in snow or heavy rain. Grasping old beams with its large talons, it turns its very large eyes on us, eyes that are perfect for night time hunting of rodents, e.g. mice.'

Using the information given and your knowledge, answer the following questions.

(a) Apart from having very large eyes, describe and explain two ways in which the barn owl is adapted for hunting.

1. _____

_____

2. _____

_____ [4]

(b) Suggest why the barn owl has difficulty hunting in snow or heavy rain.

_____ [1]

Many farmers use poisons to limit rodent numbers. The owls eat these poisoned rodents and then die themselves. To give owls a chance of increasing their numbers there are now schemes run by the government to encourage farmers to:

1. leave old barns standing.
2. use cage traps to limit the number of rodents.
3. plant crops such as canola near the edges of woodland. This encourages the rodents that eat the canola to come out into areas where they are clearly visible.

(c) Suggest how **each** of the three measures described above could help increase the barn owl population.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

(d) **(i)** Using the above information, draw a food chain that includes the barn owl.

[2]

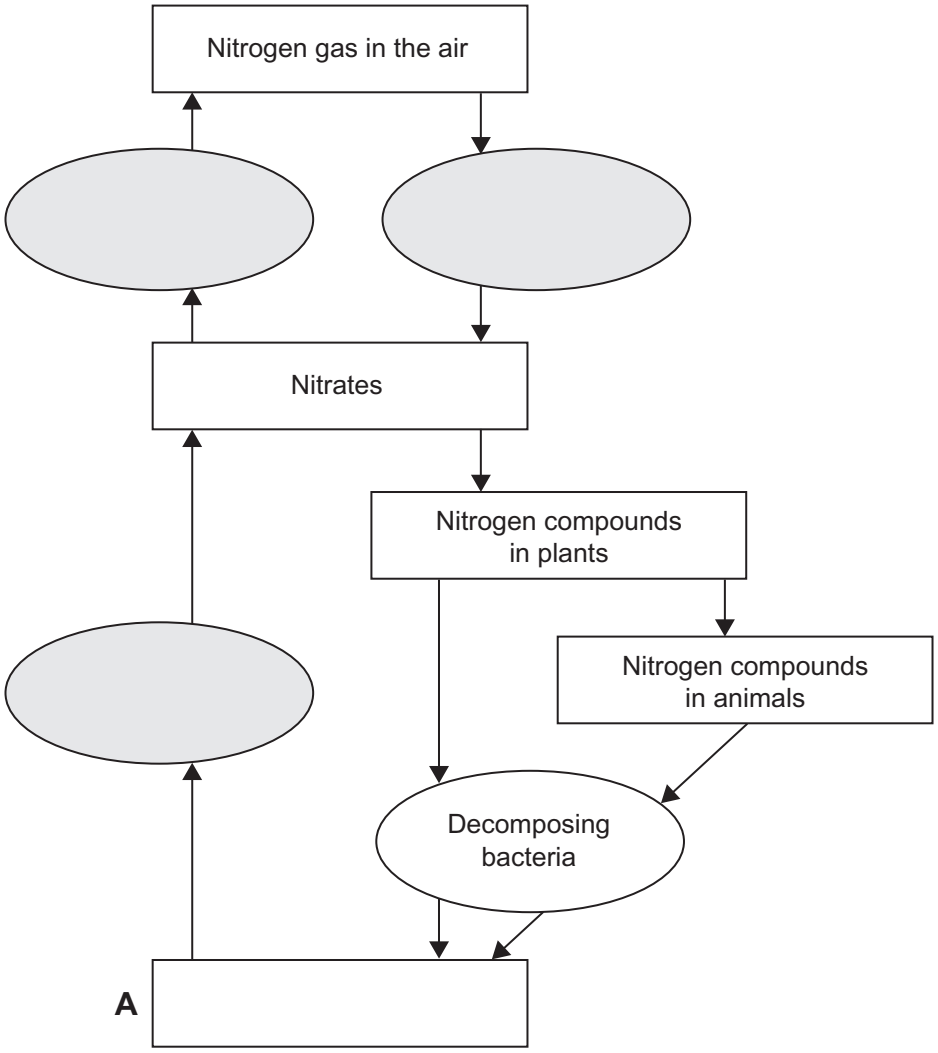
(ii) In the space below, sketch a pyramid of biomass for the food chain you have drawn. Label your sketch with the names of the organisms.

[2]

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Marks	Remark

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4 The diagram shows an outline of the nitrogen cycle.



(a) (i) Write the name, in box **A**, of the substance produced by decomposing bacteria in the soil when they break down nitrogen compounds in plants and animals. [1]

(ii) Complete the diagram of the nitrogen cycle by writing the names of the three types of bacteria inside the shaded areas. [3]

Examiner Only

Marks	Remark

(b) (i) Name the process by which plants absorb nitrates from the soil.

_____ [1]

(ii) Name the cells in the plant that absorb nitrates from the soil.

_____ [1]

(iii) Describe and explain how the structure of these cells is adapted for the absorption of minerals.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** One communication system in animals is the nervous system.

(i) Name the two parts that make up the Central Nervous System (CNS).

_____ and _____ [1]

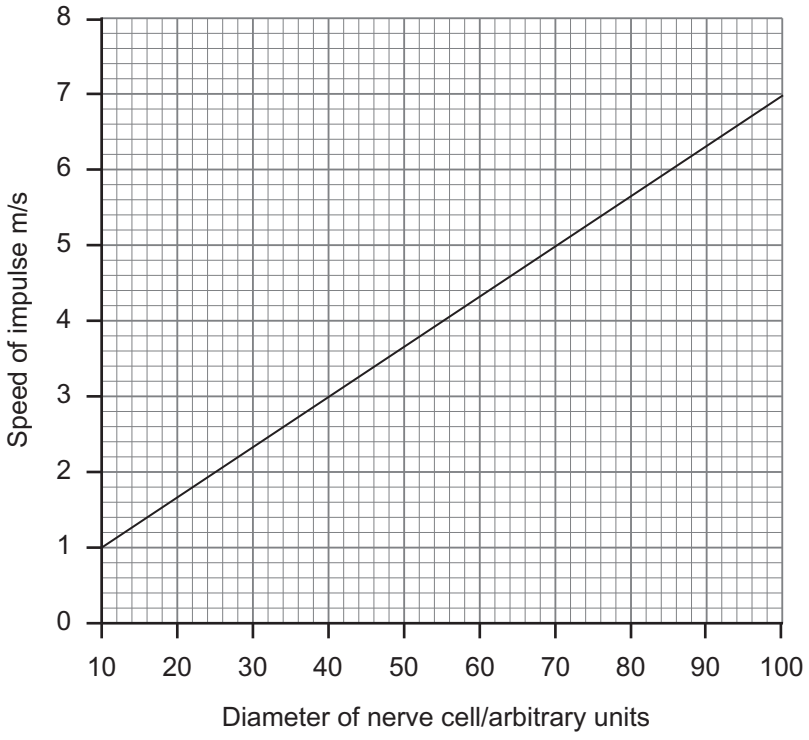
(ii) The CNS controls and coordinates actions between receptors and other structures which bring about responses in the body.

Name the structures that bring about responses.

_____ [1]

(b) An investigation was carried out into how the diameter of nerve cells (neurones) affects the speed of nerve impulses in different animals.

The results are shown in the graph.



Source: Principal Examiner

(i) Using the graph, describe the relationship between the diameter of nerve cells and the speed of nerve impulses.

_____

_____ [1]

Animal A has nerve cells that have a speed of impulse of 3 m/s.

Animal B has nerve cells that have a speed of impulse of 4.6 m/s.

(ii) Using this information and the graph, calculate the difference in diameter of the nerve cells in the two animals.

Show your working.

_____ arbitrary units [2]

(c) The other communication system in animals is the hormonal system.

How does the speed of the hormonal response compare with the speed of nerve impulses?

_____ [1]

Examiner Only

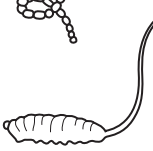
Marks	Remark

Examiner Only	
Marks	Remark

6 After heavy rain, slurry (animal waste) containing nitrates was found to have entered a river. An investigation to find out the effect on the river was carried out by taking water samples at two points along the river.

Sampling point **A** was 10 metres downstream from where the slurry entered the river. Sampling point **B** was 5 kilometres further downstream.

The table shows the types of invertebrates found, the nitrate levels and the dissolved oxygen levels found in the two water samples.

	Sampling point A	**Sampling point B**
Types of invertebrates found in the water samples	Bloodworm  Sludgeworm  Rat-tailed maggot 	Stonefly  Limpet  Shrimp  Flatworm  Mayfly  Caddis fly larva 
Nitrate level	High	Low
Dissolved oxygen level	Low	High

(a) What do the results show about the biodiversity at sampling point **A** compared to sampling point **B**?

_____ [1]

(b) What term is used to describe species such as bloodworms that are used to monitor water pollution?

_____ [1]

(c) Suggest **one** advantage of using a species such as bloodworms to monitor pollution compared to the chemical analysis of water samples.

_____

_____ [1]

(d) Explain how the high nitrate level in the slurry leads to a low dissolved oxygen level at sampling point **A**.

_____

_____

_____

_____

_____

_____

_____ [4]

(e) Suggest two reasons to explain why there is a low nitrate level at sampling point **B**.

1. _____

2. _____ [2]

(f) Name **one** other substance that could cause the same effect as slurry if it entered a river.

_____ [1]

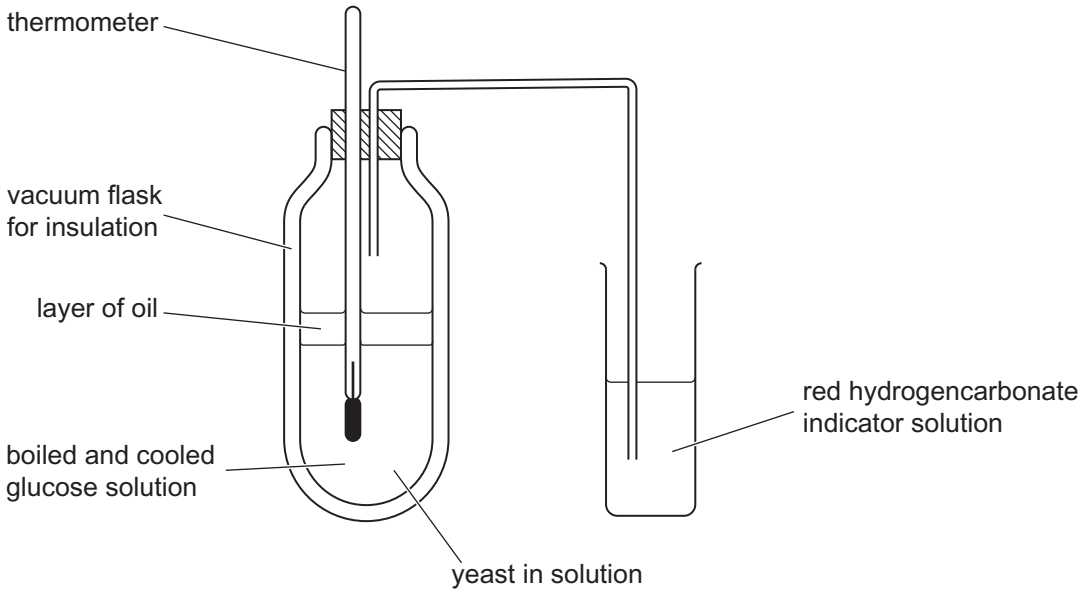
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** Yeast can carry out respiration without using oxygen. This is known as anaerobic respiration.

A student carried out an investigation into anaerobic respiration in yeast.

The diagram shows the apparatus she used at the start of the investigation.



Source: Principal Examiner

Describe and explain how the investigation could demonstrate anaerobic respiration.

In your answer you should:

- explain the reasons for using a layer of oil and using glucose solution which has been boiled and then cooled before adding the yeast;
- describe and explain any colour changes you would expect in the red hydrogencarbonate indicator solution after two hours.

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

[6]

(b) State the equation for anaerobic respiration in **muscles**.

[2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 **(a)** The table shows results from an investigation into respiration and photosynthesis in a plant.

The amount of carbon dioxide (CO_2) taken up in the light and the amount of carbon dioxide released in the dark were measured at different temperatures.

Temperature/°C	Amount of carbon dioxide/arbitrary units	
	Taken in from the air in the light	Released into the air in the dark
5	1.1	0.2
10	2.2	0.5
15	2.8	0.8
20	3.4	1.1
25	2.8	1.6
30	2.0	2.4

(i) Describe how **respiration** varies with temperature.

_____

_____ [1]

In the light, all the carbon dioxide produced by respiration is used by the plant in photosynthesis.

(ii) Assume that the rate of respiration in the light is the same as in the dark at each temperature.

Calculate the actual amount of carbon dioxide used by the plant in photosynthesis at 30 °C.

Show your working.

_____ arbitrary units [2]

(b) State the temperature that will give most growth in this plant. Explain your answer.

Temperature _____ °C

Explanation _____

_____ [2]

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

MONDAY 24 FEBRUARY 2014, MORNING

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)** auxin	[1]	
	(b) arrow starting in shoot tip and to left	[1]	
	(c) tip bent towards the light	[1]	
	(d) more auxin causes cell elongation on left side	[1]	
	(e) more light for photosynthesis	[1]	5

2 **(a)** **(i)** 1 for enzyme
1 for substrate
1 for product molecule [3]

(ii) lock and key [1]

(iii) broken down [1]

(iv) different shape (at active site) [1]

(b) **(i)** Graph 1 – temperature
Graph 2 – pH
Graph 3 – enzyme concentration
All three correct – 2 marks one correct – 1 mark [2]

(ii) protein [1]

(iii) small intestine/ileum/pancreas [1]

(c) Indicative content

- villi give a large surface area;
- villi have a good blood supply/capillary presence;
- cows with disease have no villi;
- less surface area in these cows' intestines;
- less absorption of food in these cows' intestines;
- cows with the disease starve/malnutrition/use up stores of energy or glycogen;
- presence of microvilli;
- wall is one cell thick/thin wall;
- permeable;
- lacteals.

For 5 or 6 marks (top band) must have one reference to cows

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Response	Mark
Candidates use appropriate terms throughout to describe at least 5 or 6 points from the indicative content. At least 1 point must be about the cows. They use good spelling, punctuation and grammar. Form and style are of a high standard.	[5–6]
Candidates use appropriate terms throughout to describe at least 3 or 4 points from the indicative content. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3–4]
Candidates describe 1 or 2 points from the indicative content. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1–2]
Response not worthy of credit.	[0]

[6] 16

AVAILABLE MARKS

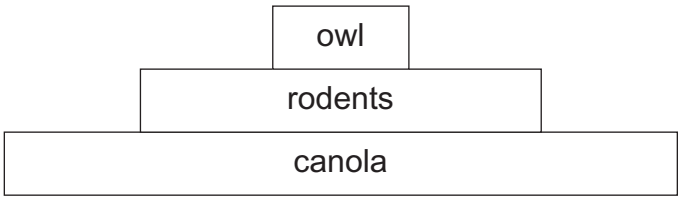
3 **(a)** Any two from:
- sensitive hearing; to hear prey or faint sounds;
- silent flight; so prey do not hear predator/owl;
- talons; for grasping/carrying prey/killing prey;
- turn head; to see prey. [4]

(b) cannot hear rodents/prey or prey stay hidden [1]

(c) 1. so that nesting sites/living areas are available/habitat;
2. birds not poisoned;
3. easier to hunt rodents/more rodents caught/help owls find food. [3]

(d) **(i)** canola → rodent → owl [2]

(ii)



1 for shape of pyramid with 3 levels and symmetrical with largest at base;
1 for labels in correct order from bottom to top [2] 12

					AVAILABLE MARKS
4	**(a)**	**(i)**	ammonia/ammonium/ammonium compounds [1]		
		(ii)	top left – denitrifying (bacteria); top right – nitrogen-fixing (bacteria); bottom left – nitrifying (bacteria) [3]		
	(b)	**(i)**	active transport/active uptake [1]		
		(ii)	**root hair** cells; [1]		
		(iii)	extension/long shape; large surface area [2]		8
5	**(a)**	**(i)**	brain and spinal cord [1]		
		(ii)	effector/muscles [1]		
	(b)	**(i)**	as diameter decreases, speed decreases [1]		
		(ii)	A − 40 m/s, B − 64 m/s; Difference = 24 arbitrary units [2]		
	(c)		hormones slower/nerves faster [1]		6
6	**(a)**		less biodiversity at A or more biodiversity at B [1]		
	(b)		indicator [1]		
	(c)		advantage – less equipment needed/quicker/cheaper/gives indication over time/can be carried out in the field [1]		
	(d)		Any four from: eutrophication occurs; more algal growth/algal bloom; shading effect; algae die/decompose; decomposition is by bacteria; **bacteria** use up oxygen/decomposers use up oxygen. [4]		
	(e)		● absorbed by plants/algae/used by plants; ● dilution; ● presence of denitrifying bacteria. [2]		
	(f)		sewage/silage/fertiliser/milk/farmyard manure/effluent [1]		10

AVAILABLE MARKS

7 **(a)** Indicative content

- oil – stops oxygen **entering**/maintains anaerobic conditions
- solution boiled to kill any other microorganisms/sterilise
- solution boiled to remove oxygen
- solution cooled – otherwise would kill yeast
- indicator turns yellow
- because carbon dioxide produced
- glucose is there so yeast can respire/as substrate for yeast

Response	Mark
Candidates use appropriate terms throughout to describe or explain at least 5 of the above points. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5–6]
Candidates use appropriate terms throughout to describe or explain 3 or 4 of the above points. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3–4]
Candidates use appropriate terms throughout to describe or explain 1 or 2 of the above points. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1–2]
Response not worthy of credit.	[0]

[6]

(b) Glucose; lactic (lactate) acid + energy [2] 8

8 **(a)** **(i)** With increasing temperature, respiration increases [1]

(ii) 2.0 + 2.4;
= 4.4 [2]

(b) 20 °C;
most uptake of carbon dioxide/most photosynthesis [2] 5

Total **70**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

WEDNESDAY 13 NOVEMBER 2013, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all seven** questions.

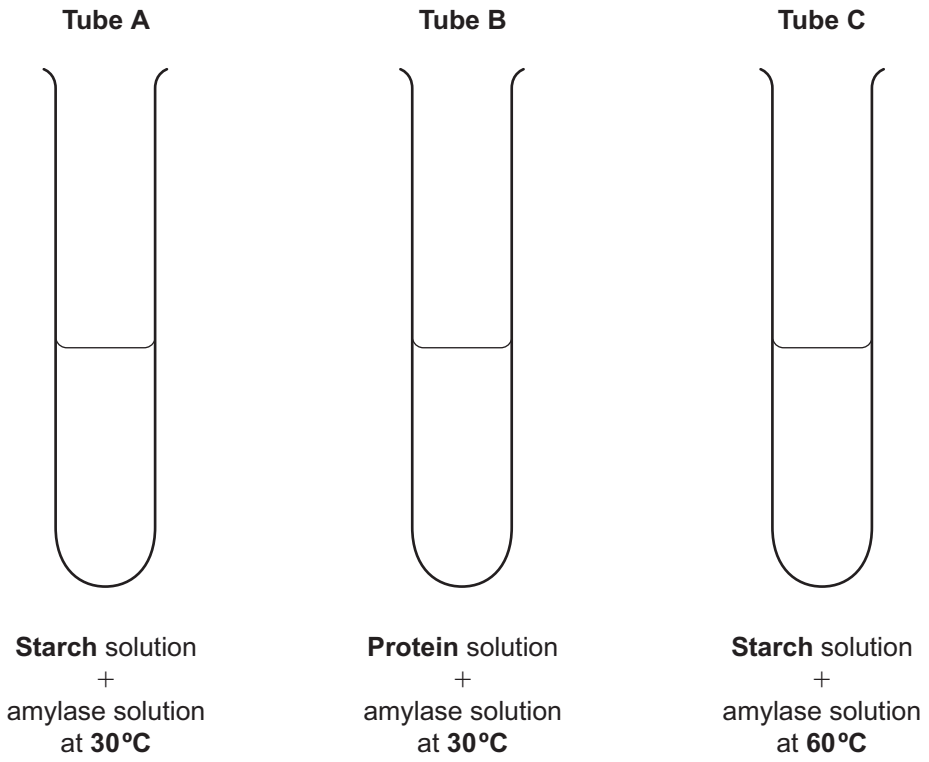
INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **3** and **6(c)**.

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

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1 The diagram below shows an investigation into the action of the enzyme amylase.



Samples were taken from the tubes at the start of the experiment and again after 60 minutes. The samples were tested with iodine solution.

Iodine solution is yellow-brown. It changes to blue-black in the presence of starch.

The table below shows the results of the tests on the samples.

Tube	Colour of tube contents	
	At start	After 60 minutes
A	Blue-black	Yellow-brown
B	Yellow-brown	Yellow-brown
C	Blue-black	Blue-black

(a) Explain why the iodine solution remained yellow-brown when added to tube **B** at the start.

_____ [1]

(b) Explain the difference between the results for tube **A** and tube **C** after 60 minutes.

_____

_____

_____

_____

_____

_____ [4]

(c) Name the model that explains how enzymes work.

_____ [1]

Examiner Only

Marks	Remark

2 (a) The diagram shows the instructions for carrying out a starch test on a leaf.

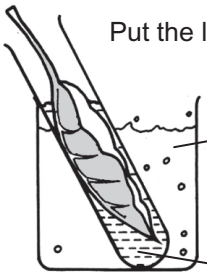


Remove a leaf from a plant kept in bright light for 24 hours.

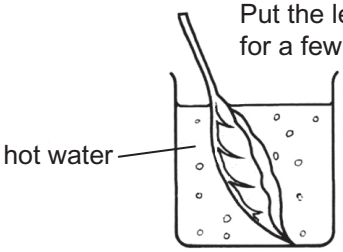
Step 1



Step 2

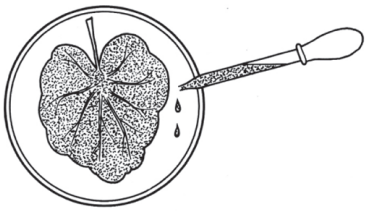


Step 3



Step 4

Add iodine solution to the leaf.



Step 5

Source: Principal Examiner

(i) Describe and explain what is happening at **Step 2**.

_____

_____ [2]

(ii) Give a reason for **Step 3**.

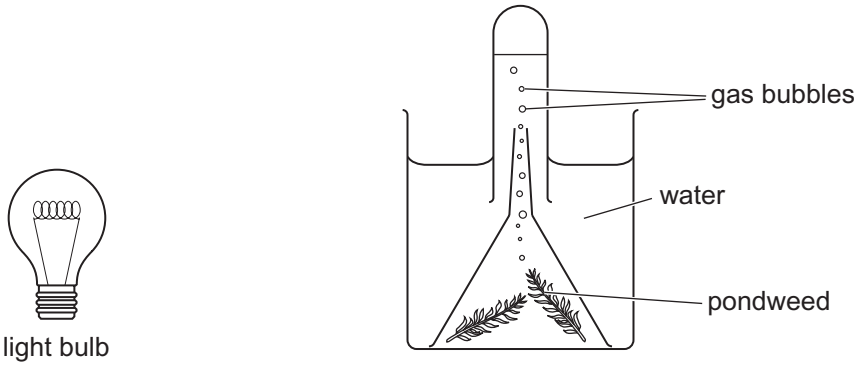
_____ [1]

(iii) When iodine solution was added at **Step 5**, the leaf turned blue-black, showing that starch was present.
Using the information in the diagram, explain why starch was present in the leaf.

_____ [1]

Examiner Only	
Marks	Remark

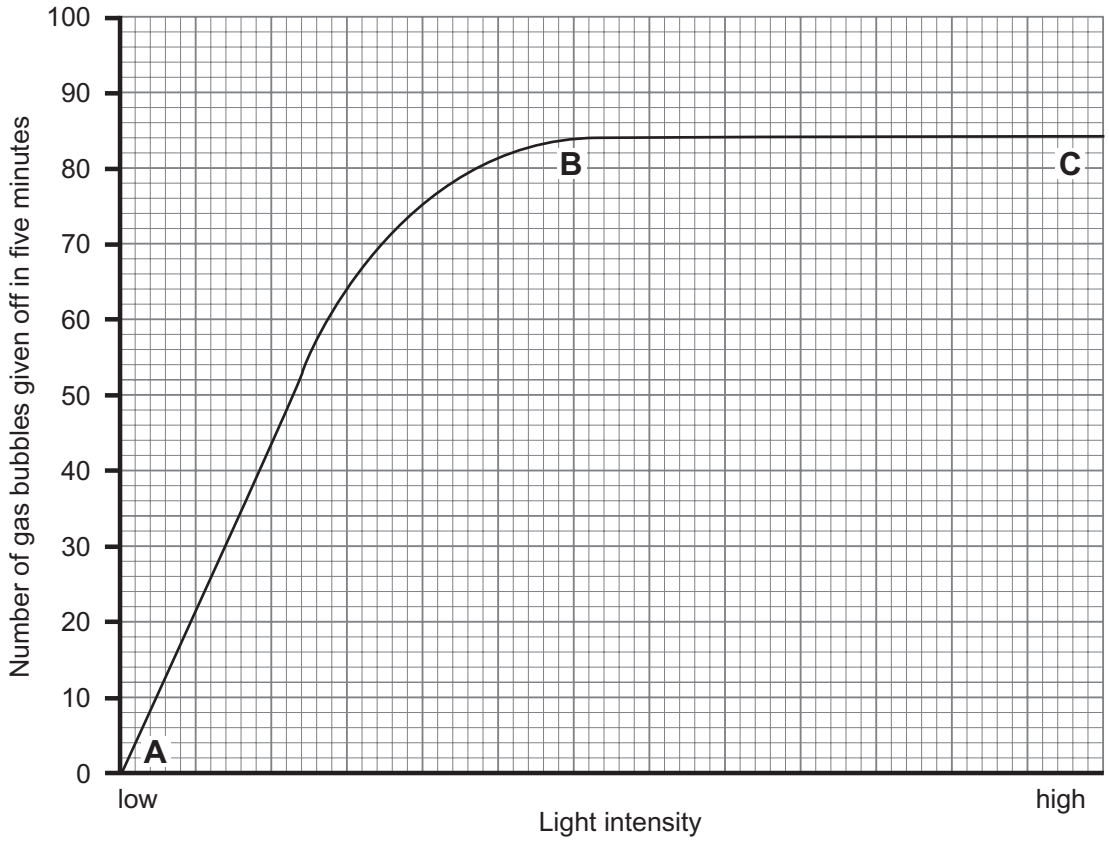
(b) The diagram below shows how a pupil set up an experiment to investigate the effect of light intensity on the rate of photosynthesis in pondweed.



Light intensity was changed by moving the light bulb closer to or further away from the pondweed.

The rate of photosynthesis was measured by counting the number of gas bubbles given off by the pondweed in a five minute period.

The results of the experiment are shown in the graph below.



(i) Name the gas given off by the pondweed.

_____ [1]

(ii) The number of gas bubbles given off did not increase between light intensities **B** and **C**. Explain why.

_____

_____

_____ [2]

(iii) How would the pupil have ensured that the results of this experiment were reliable?

_____ [1]

(iv) Suggest why, each time the position of the light bulb was changed, the pupil waited for two minutes before counting the number of gas bubbles.

_____ [1]

(c) Tomato plants can be grown in a glasshouse. Air can enter through small gaps around the windows and closed doors of a glasshouse.

A grower noticed that tomato plants near the edge of his glasshouse grew better than those in the centre.

Using the information given and your knowledge, suggest why the tomato plants near the edge of the glasshouse grew better than those in the centre.

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 The photograph shows an area of grassland with many plant species present.



© Gustoimages / Science Photo Library

Describe how you would sample this grassland to find the **average number** of plant species per square metre.

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

[6]

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(Questions continue overleaf)

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4 Lichens are organisms that are sensitive to the amount of sulfur dioxide (air pollution) in the air.

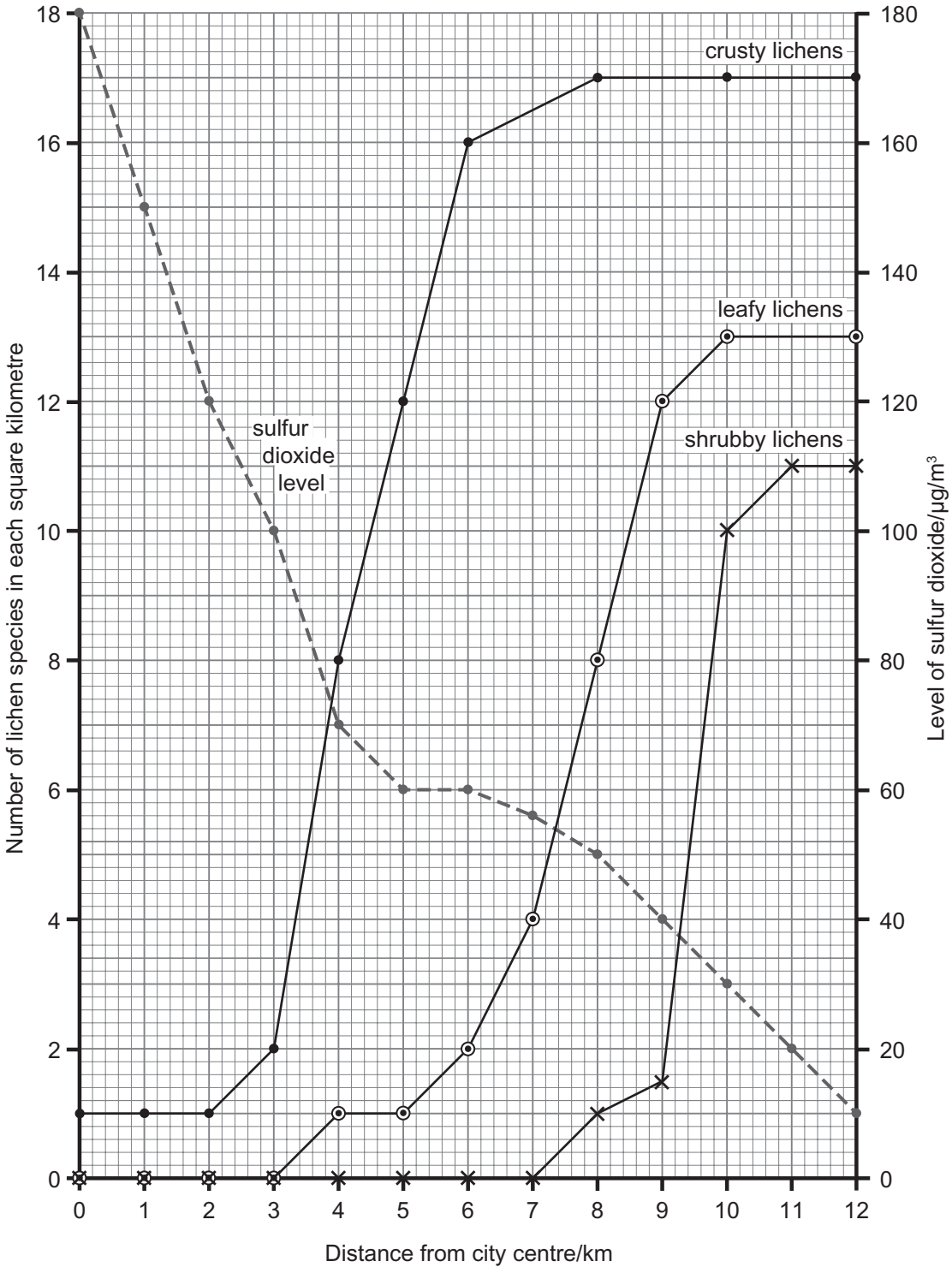
They are used as indicator species for air pollution.

Air pollution is generally higher in city centres than in the countryside.

Lichen species can be classified into three types, **crusty**, **leafy** or **shrubby**.

The graph shows the number of crusty, leafy and shrubby lichen species at different distances from a city centre.

The graph also shows the level of sulfur dioxide recorded at different distances from the city centre.



(a) (i) Using the graph, state how many **leafy** lichen species are present 8 km from the city centre.

_____ [1]

(ii) Using **data** from the graph, describe fully the trend for the **leafy** lichens.

_____

_____

_____

_____ [3]

(b) Using the graph, give the level of sulfur dioxide where shrubby lichens are first found growing.

_____ $\mu g/m^3$ [1]

(c) Sulfur dioxide levels are highest in the city centre.

Using this information and the graph, state and explain which one of the three types of lichen is **least** able to survive sulfur dioxide pollution.

Type _____

Explanation _____

_____ [2]

(d) The lichen *Xanthoria* was the only lichen found growing between 1 and 2 kilometres from the city centre.

Using the graph, state whether *Xanthoria* is a **crusty**, **shrubby** or **leafy** lichen.

_____ [1]

Examiner Only

Marks	Remark

(e) Sulfur dioxide is released into the air when some fuels are burned.

Since the 1970s, sulfur dioxide levels have been falling in UK city centres.

(i) Suggest **one** reason why sulfur dioxide levels have gone down since the 1970s.

_____ [1]

(ii) Suggest why some types of lichen are still not found in the city centres.

_____ [1]

(f) Lichen is the name given to an association between an algae (plant) and a fungus.

The chlorophyll in the lichen is destroyed by high concentrations of sulfur dioxide.

Using this information and your knowledge, suggest how high concentrations of sulfur dioxide in the air result in the death of lichens.

_____

_____

_____ [2]

(g) Suggest **one** reason why it is necessary to monitor the level of sulfur dioxide in the air.

_____ [1]

(h) Suggest **one** advantage of using indicator species like lichens to monitor environmental changes.

_____ [1]

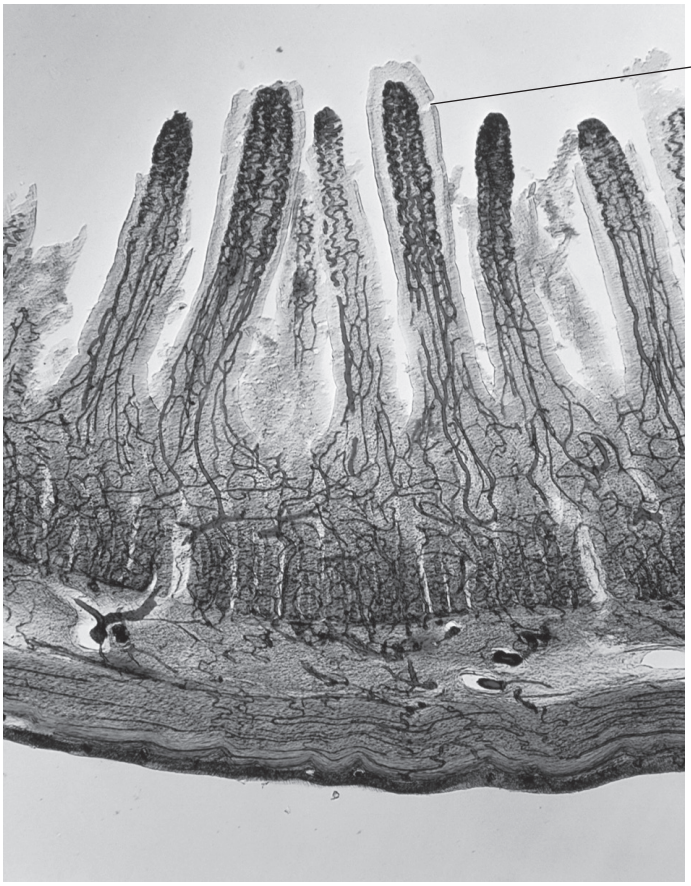
Examiner Only	
Marks	Remark

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(Questions continue overleaf)

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5 The photograph shows some villi found in the digestive system.



© Biophoto Associates / Science Photo Library

(a) Name the region of the digestive system where villi are found.

_____ [1]

(b) Using the photograph and your knowledge, give three ways villi are adapted for the absorption of digested food molecules.

1. _____

2. _____

3. _____ [3]

Examiner Only

Marks	Remark

(c) After eating a meal, the glucose level of the blood rises.

Describe how insulin brings the blood glucose level back to normal.

_____

_____

_____ [2]

(d) When oxygen is in short supply, muscles respire anaerobically.

Complete the word equation below for **anaerobic** respiration in muscle.



[2]

Examiner Only

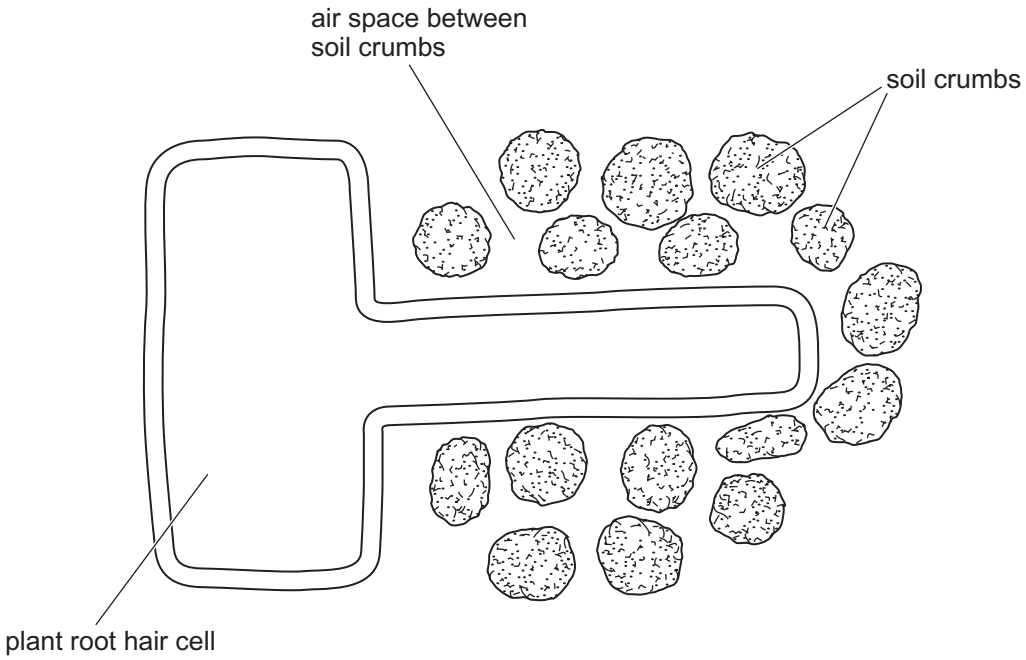
Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** Farmyard manure improves soil fertility and structure.

It acts as a glue, so that the soil particles, sand, silt and clay, are held together in structures called soil crumbs. This creates larger air spaces in the soil.

The diagram below shows soil crumbs around a plant root hair cell.



(i) Using the information given, explain how the addition of farmyard manure can lead to increased active uptake in plants.

_____

_____

_____

_____

_____

_____ [3]

(ii) Apart from improving soil fertility and structure, give two advantages to a farmer of using farmyard manure rather than artificial fertilisers.

1. _____

_____

2. _____

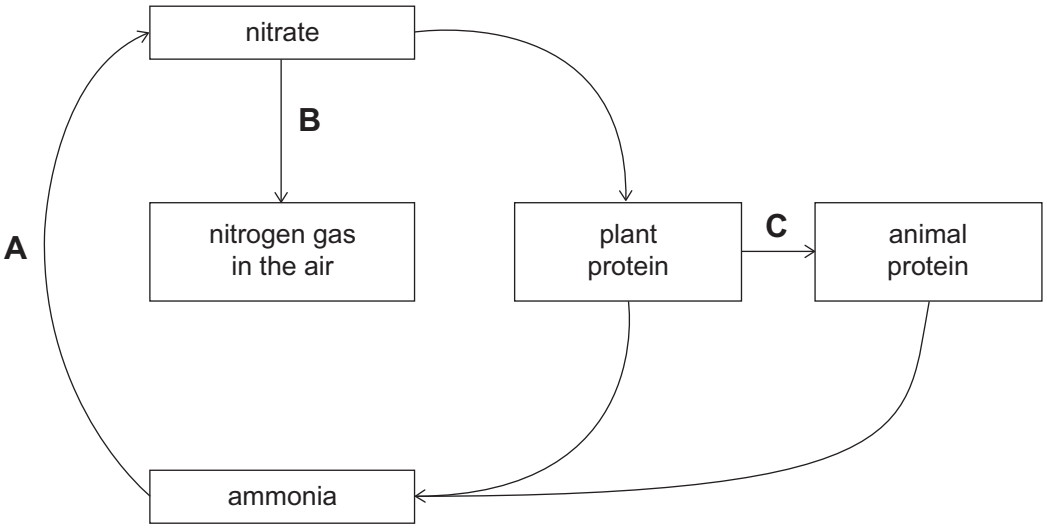
_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(b) The diagram below shows a simplified nitrogen cycle.

The bacteria that carry out process **A** are aerobic and the bacteria that carry out process **B** are anaerobic.



Using the diagram and your knowledge, answer the following questions.

(i) Name processes **A** and **C**.

A _____

C _____ [2]

When a soil becomes waterlogged, the spaces between the soil crumbs fill with water and the soil contains less air (anaerobic conditions).

(ii) Using the diagram and your knowledge explain why a waterlogged soil has reduced nitrate levels.

_____

_____

_____ [2]

(c) If excess nitrates enter a lake, they cause eutrophication.

Describe the stages of this process and the effect it has on the biodiversity of a lake.

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

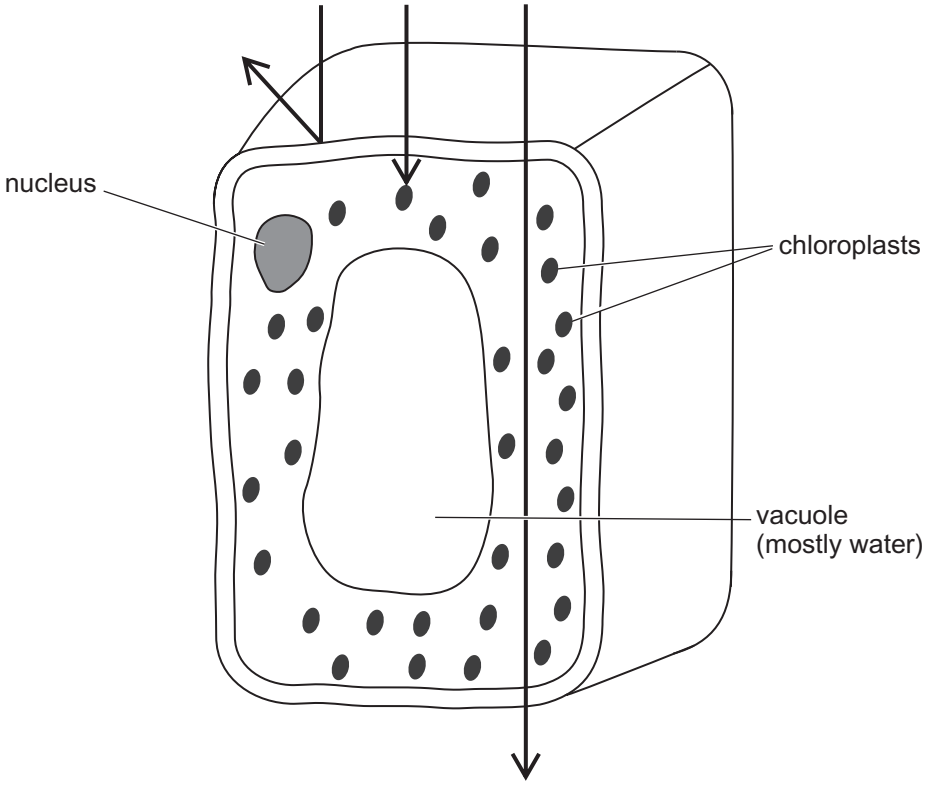
7 **(a)** What is meant by the term ecosystem?

_____

_____ [2]

(b) In an ecosystem, plants convert only a small percentage of sunlight into chemical energy.

The diagram below shows a cell from a leaf. The arrows show light rays from the Sun.



Using the information in the diagram, suggest two reasons why such a small percentage of sunlight is trapped by leaf cells.

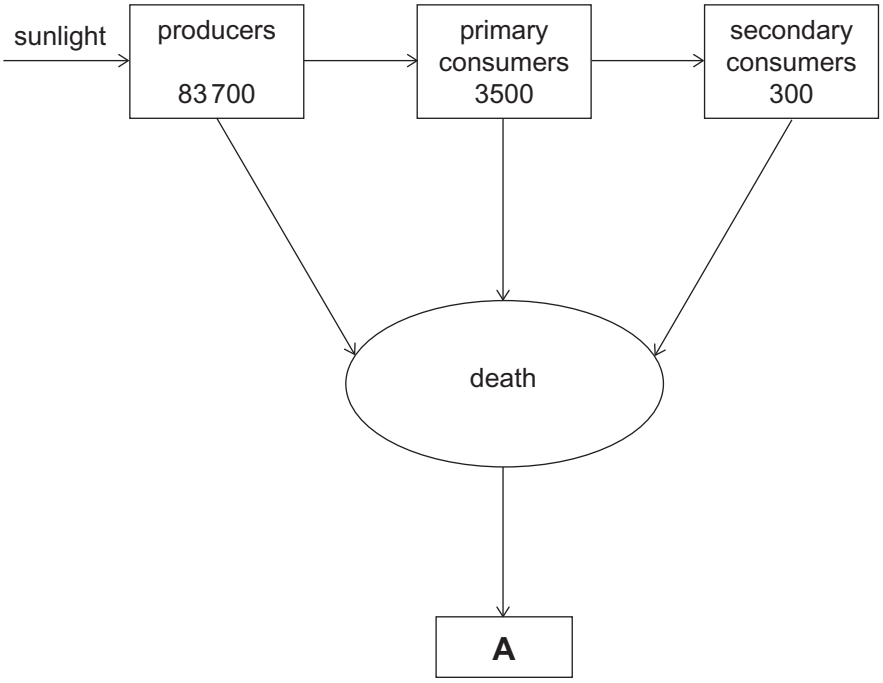
1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

(c) The diagram below shows the flow of energy through an ecosystem.

The figures in the boxes are kJ/m^2/year.



(i) Name the group of organisms represented by box **A**.

_____ [1]

(ii) Calculate the percentage of energy **lost** between primary consumers and secondary consumers.

Show your working.

_____ % [3]

(iii) Apart from death of the primary consumers, give two reasons why there is less energy available at the secondary consumer level compared to the primary consumer level.

1. _____

2. _____ [2]

THIS IS THE END OF THE QUESTION PAPER

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113971

Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

WEDNESDAY 13 NOVEMBER 2013, AFTERNOON

MARK SCHEME

STEMUP.CO.UK

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.

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			AVAILABLE MARKS
1	**(a)**	No starch present/iodine does not test for protein/only tests for starch/ [1]	
	(b)	Starch is completely broken down in tube A/no starch in A; 30 °C is correct temperature for amylase to function; Starch is *not* broken down/remains in tube C/incompletely broken down; Amylase denatured/destroyed/shape damaged in tube C [4]	
	(c)	Lock and key [1]	6
2	**(a)**	**(i)** *Leaf* placed in *boiling* water; to kill leaf/stop reactions/stop photosynthesis [2]	
		(ii) Remove chlorophyll/decolourise leaf [1]	
		(iii) Plant had been in light/had photosynthesised [1]	
	(b)	**(i)** oxygen/O_2 [1]	
		(ii) Any two from: • Light no longer limits the rate of photosynthesis; • some other factor limiting e.g. carbon dioxide or temperature now limits the rate [2]	
		(iii) Repeat measurements (at each light intensity) [1]	
		(iv) Equilibrate/acclimatise/adjust to the light intensity/allow bubbles to be produced at steady rate/adapt to light/conditions [1]	
	(c)	Any two from: • carbon dioxide limits photosynthesis • carbon dioxide leaks in at windows/door edges/more carbon dioxide • so more photosynthesis at the edge • more light [2]	11

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3 Indicative content

Q • Place quadrats (in the grassland)
S • Randomly/use coordinates or two tape measures set at right angles
I • Identify the plant species
K • Use key/plant identification book
C • Count the number of plant *species* in quadrat
R • Record/write down results (in the field)
A • Divide total number of species in all quadrats by number of quadrats
RQ • Repeat several times

Response	Mark
Candidates must use appropriate specialist terms throughout using at least five of the above points to describe how they would carry out this grassland survey. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout using three or four of the above points to describe how they would carry out the grassland survey. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how the grassland survey is carried out using one or two of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

AVAILABLE MARKS

6

				AVAILABLE MARKS
4	**(a)**	**(i)**	Eight [1]	
		(ii)	2 trends from – no species near city centre; – steady increase in number of species; – plateau; 1 data – no species up to 3 km – 1 species at 4–5 km; – Max 13 species recorded; – Increase between 5–10 km – No increase between 10–12 km [3]	
	(b)		50 [1]	
	(c)		Shrubby lichens; Explanation: are found where sulfur dioxide levels are low/are present far from city centre/after 7–8 km from city centre [2]	
	(d)		Crusty [1]	
	(e)	**(i)**	Less coal being burned/less burning of fossil fuels scrubbers/filters remove sulfur/desulfurisation use of renewable sources/electric cars [1]	
		(ii)	Some sulfur dioxide remains there/it takes these types some time to recolonise the city centres/they are very small in size and are not seen/recorded/sulfur dioxide levels still too high in city centres [1]	
	(f)		Any two from: • Algae cannot photosynthesise • No glucose/starch made • No substrate for respiration [2]	
	(g)		To know if *targets* for reduction are being met/to control level to that below where human health is affected/can plan for a reduction [1]	
	(h)		Shows effect over time/less equipment needed/low cost method [1]	14

			AVAILABLE MARKS
5	**(a)** Small intestine/ileum	[1]	
	(b) Any three from: • Finger-like shape/large surface area/microvilli/ • Single layer of cells in wall/thin walls/wall one cell thick/short diffusion distance • Capillary network/good blood supply • Lacteal • Continually moving • Permeable	[3]	
	(c) Any two from: • Acts in the *liver* • Converts glucose to *glycogen* • *Increased respiration* of glucose	[2]	
	(d) Glucose; Lactic acid/lactate	[2]	8

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AVAILABLE MARKS

6 (a) (i) Any three from:
- more oxygen;
- Used for respiration/energy release;
- to move minerals/nitrates against conc. gradient [3]

(ii) Any two from:
- FYM has slow release of nutrients
- Nutrients less likely to be leached/less likely to cause eutrophication
- Improved drainage
- Costs less/waste product from livestock [2]

(b) (i) A – nitrification
C – eating/ingestion/feeding/consumption [2]

(ii) Increase in denitrification (process B)
converts nitrate to nitrogen gas;
or less nitrification; less ammonia to nitrates;
or less nitrogen-fixation; less N_2 to nitrates/ammonia [2]

(c) Indicative content

G	• Nitrates cause excess growth of aquatic plants/algae/algal blooms
D	• These plants/algae eventually die
DC	• Plants/algae are decomposed
B	• By bacteria/microbes/fungi
O	• Bacteria use up oxygen
A	• So fish and invertebrates die
S	• Biodiversity decreases/fewer species

Response	**Mark**
Candidates must use appropriate specialist terms throughout using at least five of the above points to describe how nitrate impacts on the biodiversity of a lake. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates must use some appropriate specialist terms throughout using three or four of the above points to describe how nitrate impacts on the biodiversity of a lake. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates describe how nitrate affects biodiversity in a lake using one or two of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1–2]
Response not worthy of credit	[0]

[6]

15

		AVAILABLE MARKS
7	**(a)** All the living organisms/community; Together with the non-living (abiotic) environment; [2]	
	(b) Any two from: • Some light is reflected • Some light passes straight through cell • No chloroplasts in the vacuole/few chloroplasts/spaces between chloroplasts [2]	
	(c) **(i)** Decomposers/bacteria/fungi [1]	
	(ii) 3500 − 300 = 3200; 3200/3500; × 100 = 91.4% = 91% [3]	
	(iii) Any two from: • (Energy loss) as heat/from respiration • (Energy loss) as faeces/urine/waste/excretion/egestion • (Energy loss) in movement • Not all is eaten e.g. bones/hair • Reproduction [2]	10
	Total	**70**

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

TUESDAY 14 MAY 2013, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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(a)(i)** and **7(a)**.

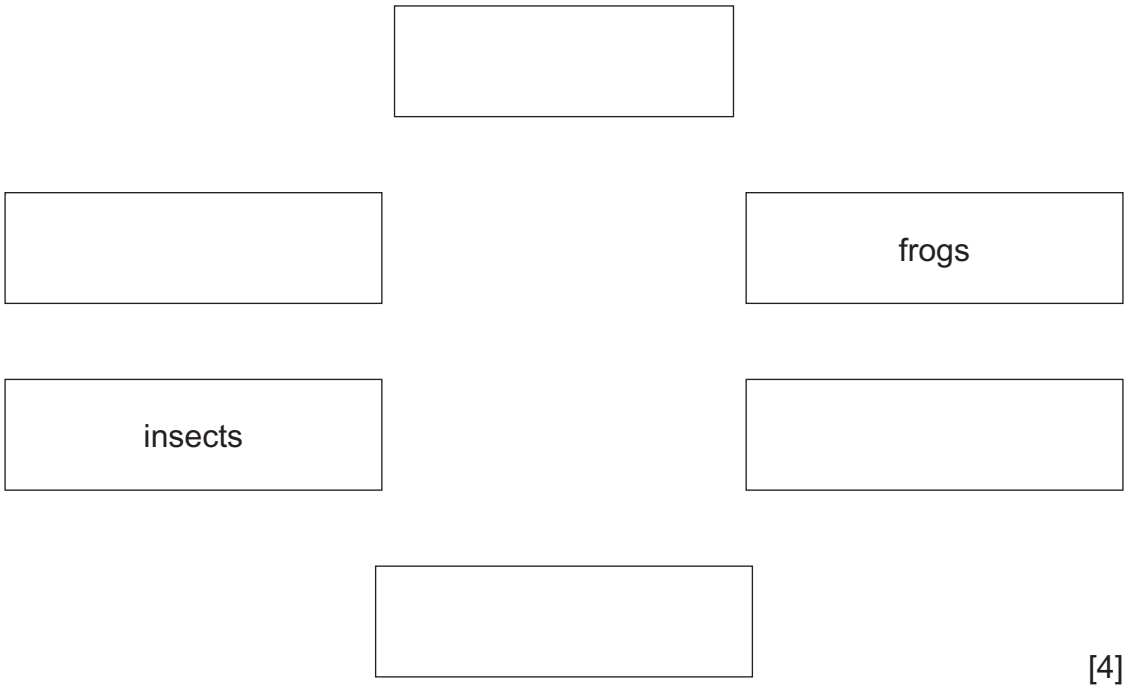
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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
Total Marks	

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Examiner Only	
Marks	Remark

1 (a) Using the information below, complete the food web.

- Earthworms are eaten by frogs and hawks.
- Frogs are eaten by hawks.
- Insects are eaten by spiders which in turn are eaten by hawks.
- Insects eat plants.
- Earthworms eat plants.



[4]

(b) Using the information in part **(a)** opposite, draw a labelled pyramid of numbers for the food chain that contains insects.

[3]

(c) **(i)** The energy in the plants is 10 000 kJ.

If 20% of the energy from one trophic level is transferred to the next trophic level calculate how much energy is available to trophic level three.

Show your working.

_____ kJ [2]

(ii) Give **one** way in which frogs lose energy.

_____ [1]

(iii) Explain why there is more energy available to the hawk by eating earthworms rather than frogs.

_____

_____ [1]

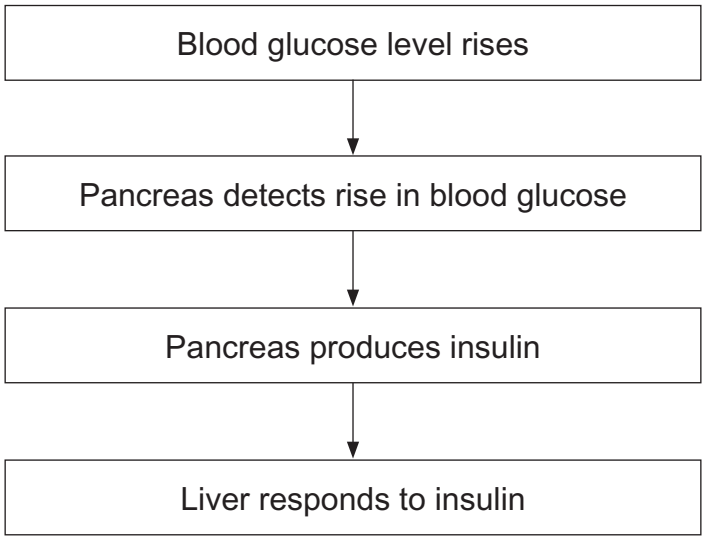
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

2 **(a)** The diagram shows some of the stages involved in the control of blood glucose levels.



(i) How does insulin travel from the pancreas to the liver?

_____ [1]

(ii) How does insulin affect blood glucose levels?

_____ [1]

(iii) Describe **two** ways in which the liver responds to insulin.

_____

_____

_____ [2]

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Examiner Only	
Marks	Remark

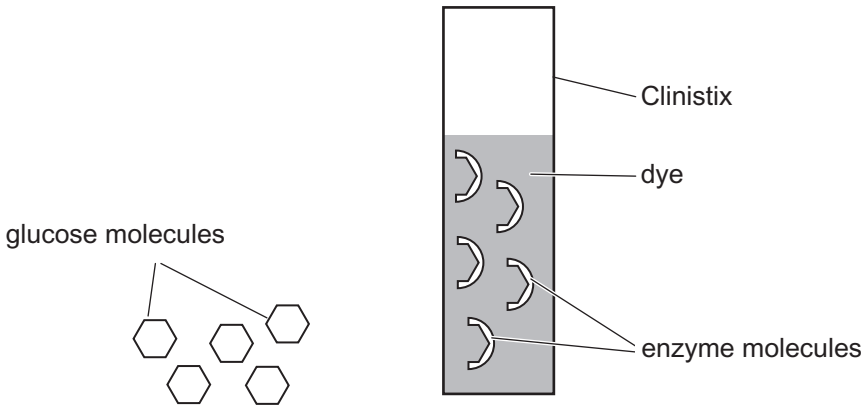
(b) If blood glucose levels drop below normal a different hormone is produced. This hormone acts in the opposite way to insulin.

Suggest **two** ways in which the liver responds to this hormone.

_____

_____ [2]

(c) One symptom of diabetes is the presence of glucose in the urine.
Using a Clinistix strip is a method of testing for glucose in the urine.
A Clinistix strip has large numbers of molecules of an enzyme and a dye embedded in it.
When dipped in urine containing glucose, the dye changes colour. The dye will become darker as more glucose molecules combine with enzyme molecules.



Source: Principal Examiner

(i) Using the diagram and your knowledge, name the model that describes the mechanism of enzyme action.

_____ [1]

(ii) Explain why the Clinistix will only produce a colour change when glucose is present in the urine.

_____ [1]

(iii) The Clinistix also provides information on the **amount** of glucose in the urine. How does it do this?

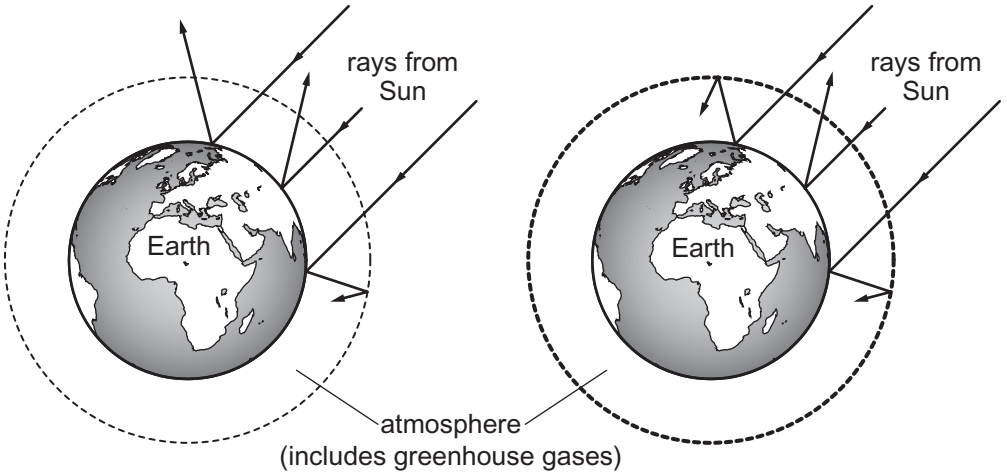
_____

_____ [1]

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Examiner Only	
Marks	Remark

3 The diagram represents what happened to rays of sunlight when they entered the Earth's atmosphere thirty years ago and five years ago.



thirty years ago **five years ago**

Source: Principal Examiner

(a) (i) Use the diagram, and your knowledge, to explain how global warming occurs.

_____

_____

_____

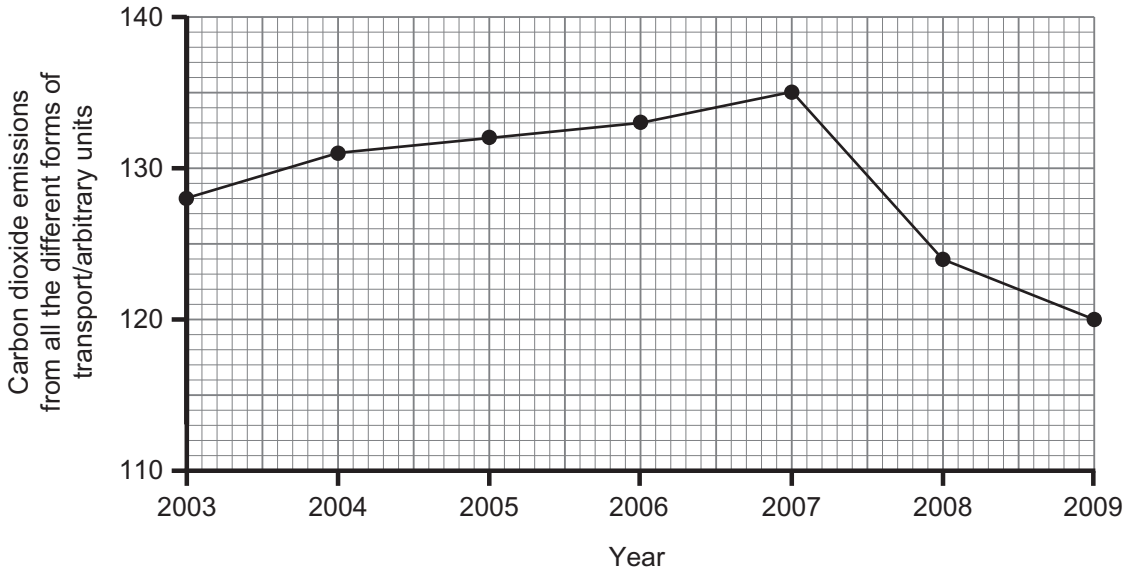
_____ [2]

(ii) Give **one** environmental consequence of global warming.

_____ [1]

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The graph shows carbon dioxide emissions from all the different forms of transport in the UK during the period 2003–2009.



© Crown copyright – Dept. of Energy and Climate Change

(b) Describe the trend in carbon dioxide emissions from transport between 2003–2009.

Use evidence from the graph to support your answer.

_____

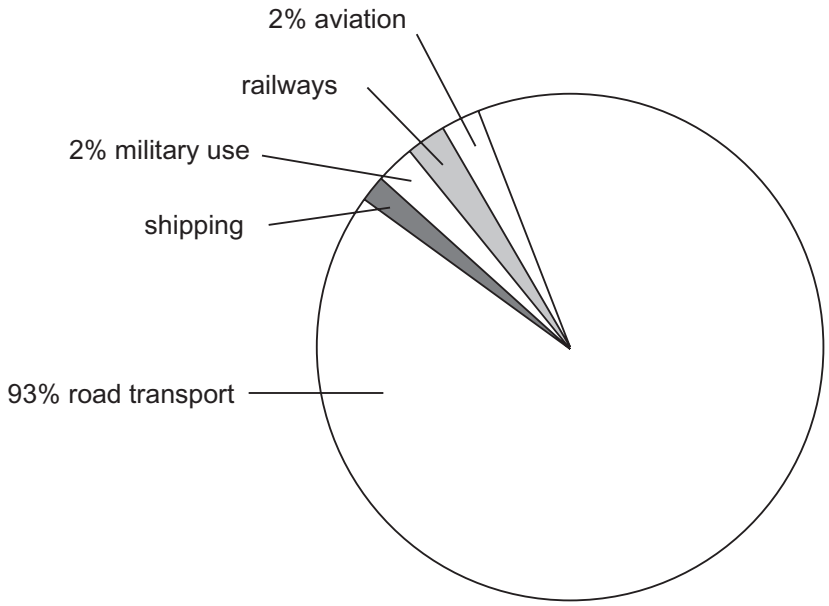
_____

_____ [2]

Examiner Only

Marks	Remark

The pie chart shows the percentage of carbon dioxide emissions from each of the different forms of transport in the UK in 2009.



© Crown copyright – Dept. of Energy and Climate Change

(c) Railways produce twice the amount of carbon dioxide emissions than shipping does.

Use this information and the pie chart to calculate the percentage of carbon dioxide emissions produced by the railways.

Show your working.

_____ % [3]

(d) **(i)** Suggest **one** way of reducing the carbon dioxide levels produced by road transport.

_____ [1]

(ii) Give **one** other source of carbon dioxide emissions apart from those produced by transport.

_____ [1]

Examiner Only

Marks	Remark

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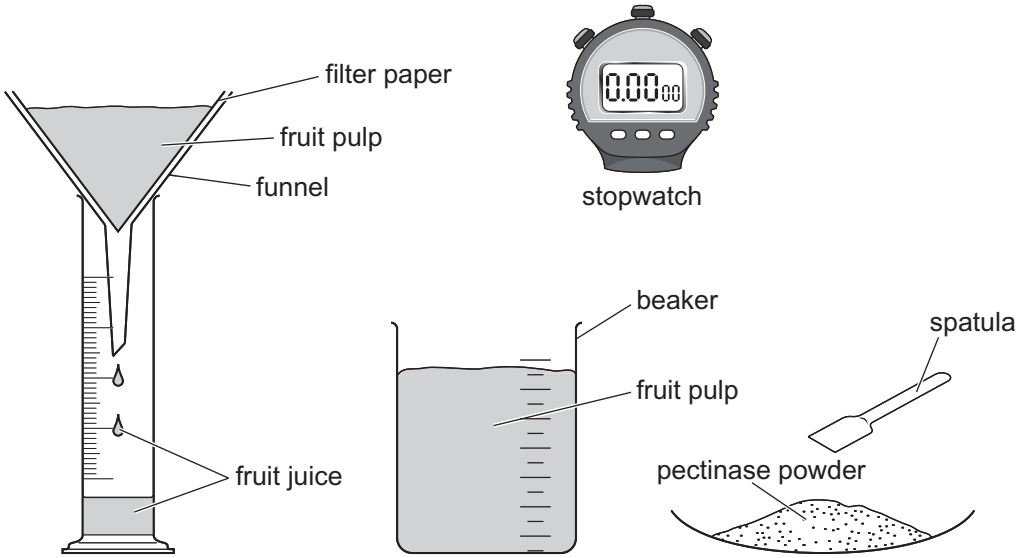
(Questions continue overleaf)

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Examiner Only	
Marks	Remark

4 **(a)** Fruit juice is normally obtained from fruit pulp. Fruit pulp is obtained by squeezing the fruit. The pulp is then treated by adding the enzyme pectinase, which breaks down pectin in the walls of fruit cells. This allows the fruit juice to be released more quickly from the cells.

The diagram shows some of the apparatus you may need.



Source: Principal Examiner

(i) Describe how you would carry out an investigation to compare how quickly fruit juice is released from fruit pulp with **and** without pectinase.

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

[6]

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Examiner Only	
Marks	Remark

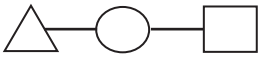
(ii) Give **one** other factor that could be investigated to see if it would cause the release of more fruit juice from the fruit pulp.

_____ [1]

(iii) Pectinase is used commercially by fruit juice manufacturers. Give **one** other commercial use of enzymes.

_____ [1]

(b) **(i)** Enzymes speed up digestion in the body. Complete the diagram with the name of the appropriate enzyme and **draw** the products produced when this protein molecule is broken down in the digestive system.

Protein molecule	Name of enzyme	Products	
	_____	_____	[3]

(ii) Where in the digestive system does digestion of proteins take place?

_____ and _____ [2]

(iii) Where in the digestive system does absorption of digested food take place?

_____ [1]

(iv) State **one** way that the digestive system is adapted for absorption.

_____ [1]

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Examiner Only	
Marks	Remark

5 **(a)** A market gardener wanted to increase his yield of lettuces by increasing the concentration of carbon dioxide in his glasshouse.

However, he had read that high concentrations of carbon dioxide may harm humans. He researched this and found the two tables below which gave him the information he required.

The table below shows how different concentrations of carbon dioxide affect the yield of lettuces in a glasshouse at 35 °C.

Carbon dioxide concentration in glasshouse/ppm	Yield of lettuces/%
700	100
950	100 + extra 25
1250	100 + extra 35

The table below shows how different concentrations of carbon dioxide could affect the health of humans.

Carbon dioxide concentration in glasshouse/ppm	Effect on health of humans
700–999	None
1000–1250	Possible dizziness and appearance of symptoms for people with asthma or respiratory conditions

Using the information in both tables, give the most suitable concentration of carbon dioxide to grow lettuces in the glasshouse. Explain your choice.

Concentration _____ ppm

Explanation _____

_____ [3]

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(b) Suggest **one** environmental factor, other than carbon dioxide, that helps the growth of lettuces in a glasshouse.

_____ [1]

(c) Give **one** economic factor the market gardener should consider when growing his lettuces in a glasshouse.

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

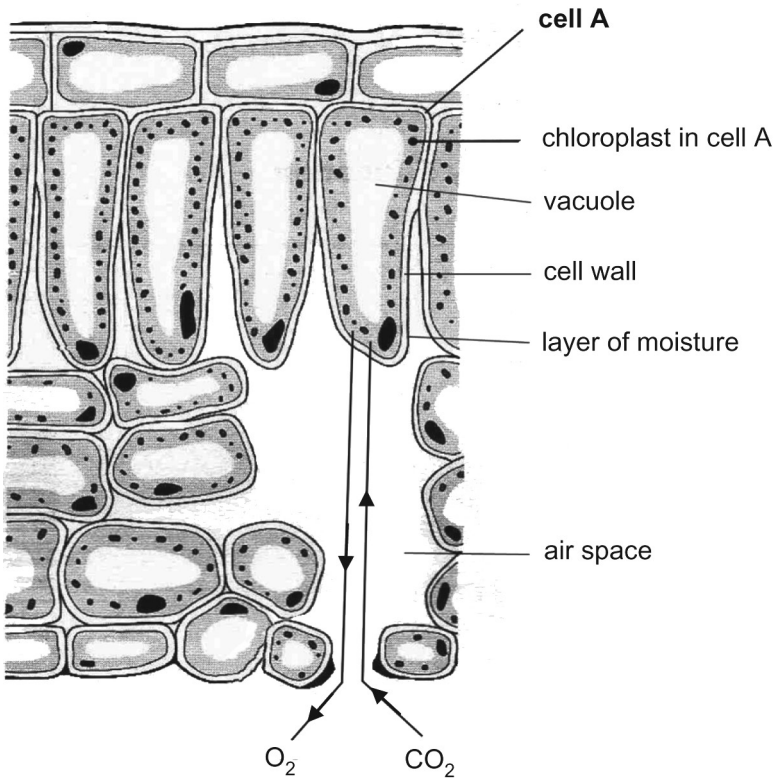
6 **(a)** **(i)** Respiratory surfaces occur in animal lungs and plant leaves. Give **one** way in which the respiratory surface in animals is adapted for respiration.

_____ [1]

(ii) Explain what causes the oxygen to move quickly across the respiratory surface in the lungs into the blood and the carbon dioxide to move quickly in the reverse direction.

_____ [1]

(b) The diagram shows a cross section of part of a leaf.



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(i) Name the process occurring in the leaf in **cell A** that uses carbon dioxide and produces oxygen.

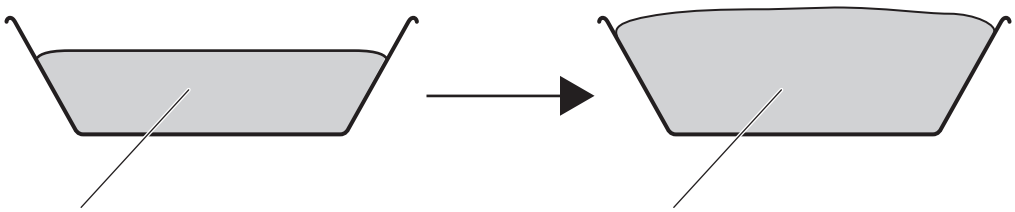
_____ [1]

(ii) Give two ways that **cell A** is adapted for gas exchange.

1. _____

2. _____ [2]

(c) Anaerobic respiration occurs when yeast is added to dough.

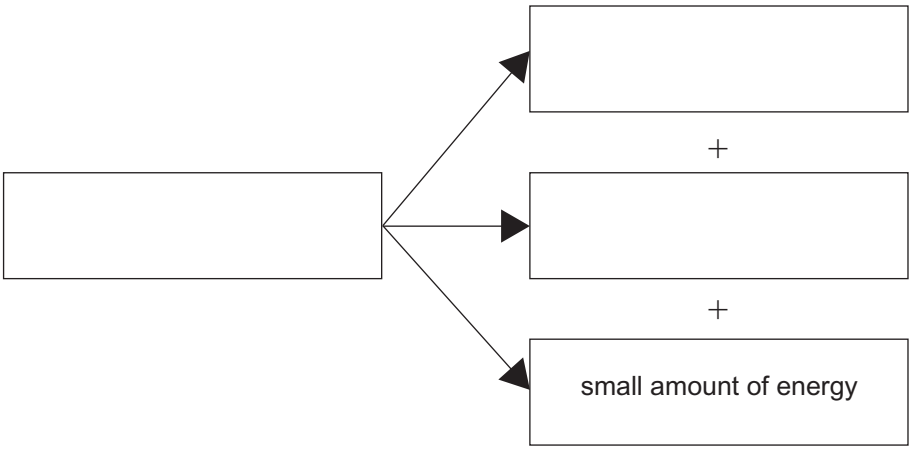


yeast + dough made up of flour, sugar and water

dough that has expanded (risen) after being left at 30 °C for an hour

Source: Principal Examiner

(i) Complete the equation for anaerobic respiration in yeast.



[2]

(ii) Using your completed equation, suggest why the dough would expand (rise) faster at 30 °C than 20 °C.

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 Some farmers use crop rotation where they plant barley in a field one year and the following year they plant peas or beans (legumes) in the same field. Peas and beans have swellings on their roots that contain nitrogen-fixing bacteria.

After the crop of peas or beans has been gathered the roots and stems of the plants are ploughed back into the soil.

Ploughing increases the amount of air in the soil.

(a) Using this information and your knowledge of the nitrogen cycle, describe and explain the advantages of this crop rotation to the **soil** and the **farmer**.

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

[6]

(b) During the two year period the farmer does not add any fertiliser or manure to the soil in the field.

(i) Explain why this would result in less eutrophication in a stream adjacent to the field.

_____ [1]

(ii) Explain fully the role of bacteria in eutrophication in a stream.

_____

_____

_____

_____ [3]

(iii) What are the consequences of eutrophication on aquatic animals?

_____ [1]

Examiner Only

Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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113166

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

TUESDAY 14 MAY 2013, 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.

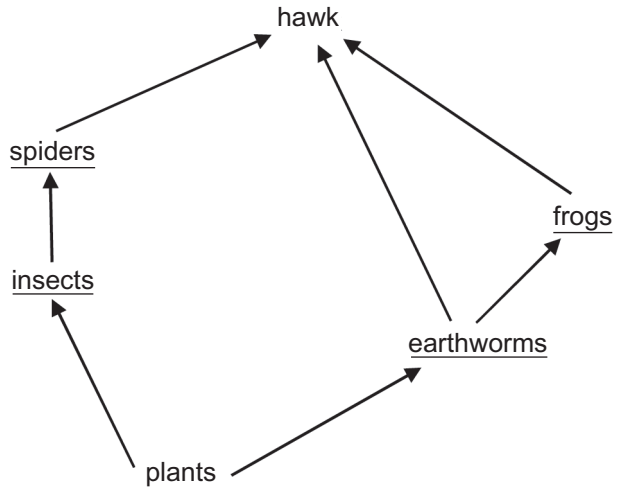
The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

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 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.

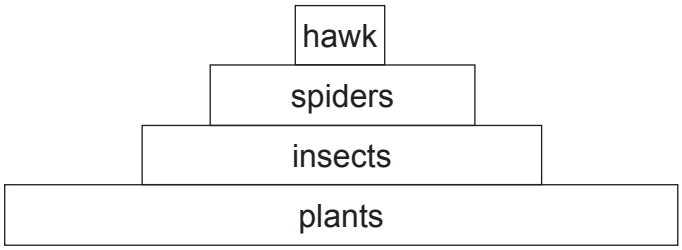
It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience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

1 (a)



1 mark for all 7 links;
1 mark for arrows correct direction from plants;
2 marks for organisms correct
plants bottom and hawk at top [1]
earthworms on right and spiders on left [1] [4]

(b)



plants at the bottom;
insects, spiders and hawks in correct order;
correct shape [3]

(c) (i) 10 000 × 20/100 = 2000; (1 for correct method)
2000 × 20/100 = 400; [2]

(ii) movement/reproduction/excretion respiration (or heat) [1]

(iii) less steps
less trophic levels
less energy lost <u>because</u> less trophic levels [1]

AVAILABLE MARKS

11

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				AVAILABLE MARKS
2	(a)	(i)	in the blood/plasma/bloodstream [1]	
		(ii)	lowered/reduced/decreases [1]	
		(iii)	Any two from ● more respiration of glucose; ● faster upake of glucose ● glucose converted to (or stored as) glycogen; ● glucose converted to (or stored as) fat [2]	
	(b)		Any two from ● convert glycogen to glucose; ● convert fat to glucose; ● less respiration of glucose; ● less uptake of glucose by liver; ● (more) glucose released to blood; [2]	
	(c)	(i)	lock and key [1]	
		(ii)	enzyme will only react when glucose is present/ enzyme specific to glucose [1]	
		(iii)	more enzyme molecules/more glucose react the darker the colour intensity or strength of colour dye becomes darker, more glucose more glucose changes quicker [1]	9
3	(a)	(i)	● more greenhouse gasses; ● radiation trapped/more rays trapped; ● earth's atmosphere warms up/earth's temp increase [2]	
		(ii)	more storms/changing weather conditions/coastal flooding sea levels rising/polar ice melting/climate change/desertification [1]	
	(b)		emissions up, emissions down; [1] up until 2007/up to max 135/ 2009 level is lower than 2003 [1]	
	(c)		93 + 2 + 2 = 97%; 100 − 97 = 3%; railways + shipping = 3% railways twice shipping railways 2% [3]	
	(d)	(i)	use public transport/use railway/more efficient engines/hybrid or electric cars/walk/cycle/drive more economically/car pool [1]	
		(ii)	electricity generation/(domestic) heating/agriculture (animals) factories/industry/waste management burning fossil fuels/landfill [1]	10

AVAILABLE MARKS

4 (a) (i) Indicative Content:

A ● Use the same amount of fruit pulp
B ● Add no pectinase (control)
C ● Add pectinase to other
D ● Stir/mix pectinase with fruit pulp
E ● Put pulp/mixture in funnel/into filter
F ● Measure the time taken to produce a certain volume of fruit juice/how much produced in a certain time
G ● Repeat for reliability/repeat expts
H ● Keep temperature/pH same/same thickness of filter paper do both expts at same time/same size funnel/same mixing or stirring

Response	**Mark**
Candidates use appropriate terms throughout and give at least five points from the indicative content to describe how to carry out an investigation to see how quickly fruit juice is released from fruit pulp with and without pectinase. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5–6]
Candidates use some appropriate terms throughout to partially describe how to carry out an investigation to see how quickly fruit juice is released from fruit pulp with and without pectinase. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3–4]
Candidates give one or two points and partially describe how to carry out an investigation to see how quickly fruit juice is released from fruit pulp with and without pectinase. They use limited spelling, punctuation or grammar skills.	[1–2]
Response not worthy of credit.	[0]

[6]

(ii) temperature/pH/stirring/amount or conc. pectinase [1]

(iii) washing powders/other commercial uses [1]

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				AVAILABLE MARKS
	(b)	**(i)** protease/peptidases/pepsin; molecules separate; all three different types (amino acids allowed for 1 mark) [3]		
		(ii) stomach and small intestine 1 mark each ileum or duodenum (as alt. for s. intestine) [2]		
		(iii) small intestine/ileum/at villi [1]		
		(iv) (presence of) villi/large surface area/thin (epithelium)/ permeable (walls)/good blood supply/presence of lacteals [1]		15
5	**(a)**	950–999 ppm; increases yield by quarter or 25%/yield 125%; any higher causes health problems [3]		
	(b)	temperature/light/protection from weather e.g. frost/minerals/water/ sun/fertiliser [1]		
	(c)	cost of adding carbon dioxide/fuel/heating/greenhouse/lighting/ fertiliser/how much profit [1]		5
6	**(a)**	**(i)** large surface area/thin/permeable/good blood supply/presence at alveoli/moist/short diffusion distance [1]		
		(ii) diffusion gradient/conc. gradient [1]		
	(b)	**(i)** photosynthesis [1]		
		(ii) any two from ● thin (cell wall); ● large surface area ● layer of moisture ● permeable [2]		
	(c)	**(i)** glucose; alcohol + carbon dioxide (need both) [1] [2]		
		(ii) ● increased enzyme activity ● more carbon dioxide [2]		9

7 (a) Indicative Content:

A ● Nitrates are the only form of nitrogen plants can absorb
B ● Nitrates used to produce proteins/growth in plants
C ● Ploughing increases the nitrogen fixing/nitrifying bacteria in the soil
D ● Nitrogen fixing bacteria produce nitrates (from Nitrogen)
E ● Ploughing peas/beans increases material for decay/compost
F ● Nitrifying bacteria turn ammonia into nitrates
G ● (Ploughing aerates the soil) therefore less denitrifying bacteria/ denitrification
H ● Ploughing increases (rate of) nitrification/N-fixing
I ● (Ploughing aerates the soil) – rate of active transport increases in roots
J ● Farmer needs to use less fertiliser/manure
K ● Economic – buy less fertiliser
– save time on spreading fertiliser

Response	Mark
Candidates use appropriate terms throughout and give at least five points from the indicative content to describe and explain the advantages of crop rotation. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5–6]
Candidates use some appropriate terms throughout and give 3 or 4 points to describe or explain the advantages of crop rotation. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3–4]
Candidates give one or two points and partially describe or explain the advantages of crop rotation. They use limited spelling, punctuation or grammar skills.	[1–2]
Response not worthy of credit.	[0]

[6]

(b) (i) less run off/less fertiliser into stream [1]

(ii) Any 3 from
- plants/algae die;
- decomposition of plants/algae;
- by bacteria/microbes/microorganisms;
- bacteria use up oxygen [3]

(iii) die/decrease in numbers/population declines/suffocate decline in biodiversity/oxygen starved [1]

Total

AVAILABLE MARKS

11

70

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

MONDAY 25 FEBRUARY 2013, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **2(b)** and **7(b)**.

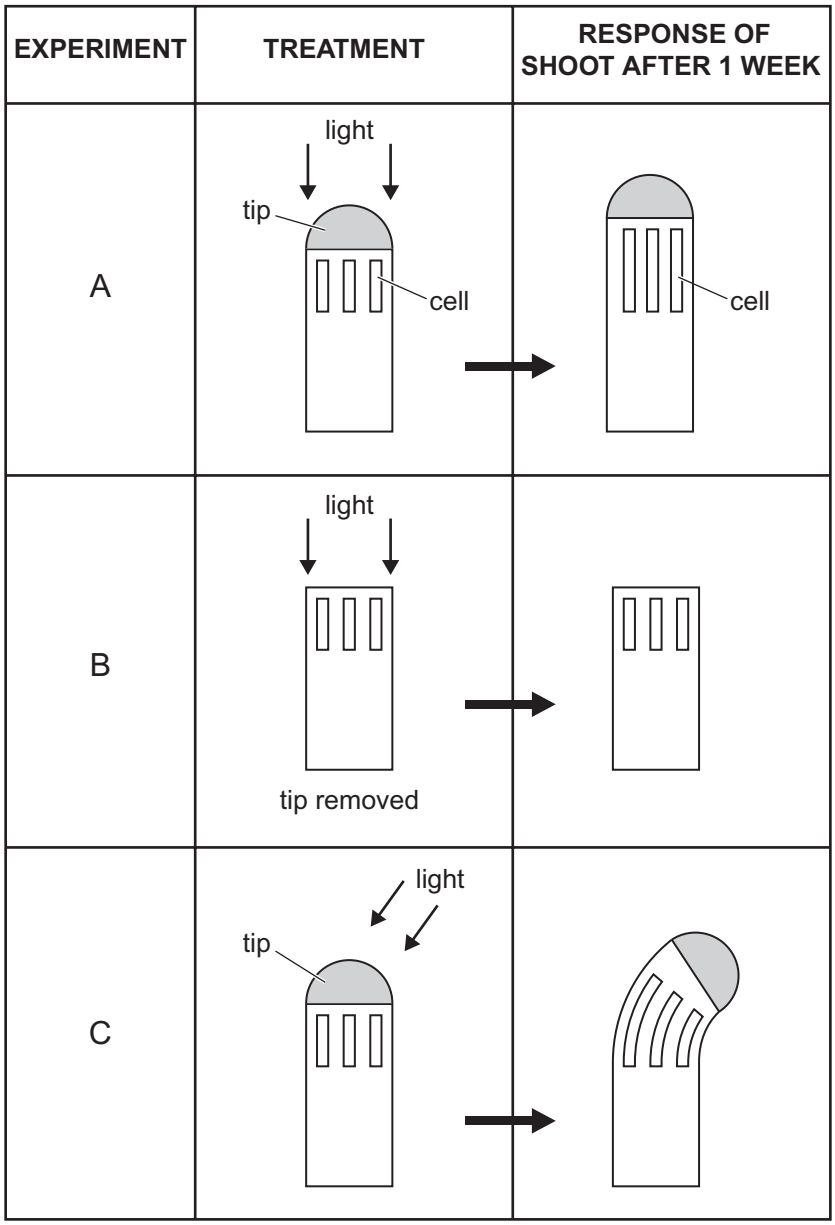
For Examiner's use only	
Question Number	Marks
1	
2	
3	
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5	
6	
7	
Total Marks	

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Examiner Only	
Marks	Remark

1 The response of plants to light is controlled by a hormone produced in the shoot tip.

The diagram shows the results of three experiments, A, B and C in an investigation into the response of plants to light.



Source: R McIlwaine / CCEA

(a) Name the plant response in experiment C.

_____ [1]

(b) Name the hormone involved.

_____ [1]

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(c) Describe and explain the results in

(i) experiment B.

_____

_____ [2]

(ii) experiment C.

_____

_____

_____

_____

_____ [4]

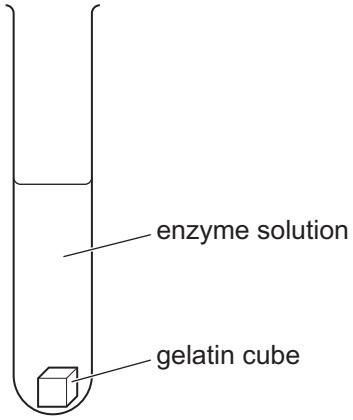
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** The diagram shows one test tube from an investigation into enzyme action on a cube of gelatin. The enzyme used is found in the stomach.

The investigation was carried out at seven different temperatures.

The enzyme breaks down the gelatin into amino acids.



The table shows the amount of amino acids present after three hours at each temperature.

Temperature/°C	5	15	25	35	45	55	65
Amount of amino acid produced after three hours/arbitrary units	45	53	110	260	220	100	62

(i) Use the information given to state what type of substance gelatin is.

_____ [1]

(ii) Name the enzyme used in this experiment.

_____ [1]

(iii) Give two variables that need to be controlled in this investigation.

1. _____

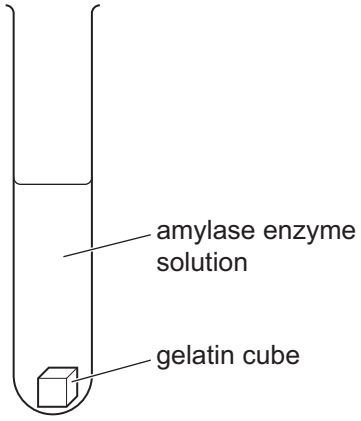
2. _____ [2]

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(b) The investigation was repeated using another enzyme, **amylase**, at 35 °C as shown in the diagram.

Using your knowledge of enzymes and their structure, describe and explain the results you would expect after 3 hours.

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



[6]

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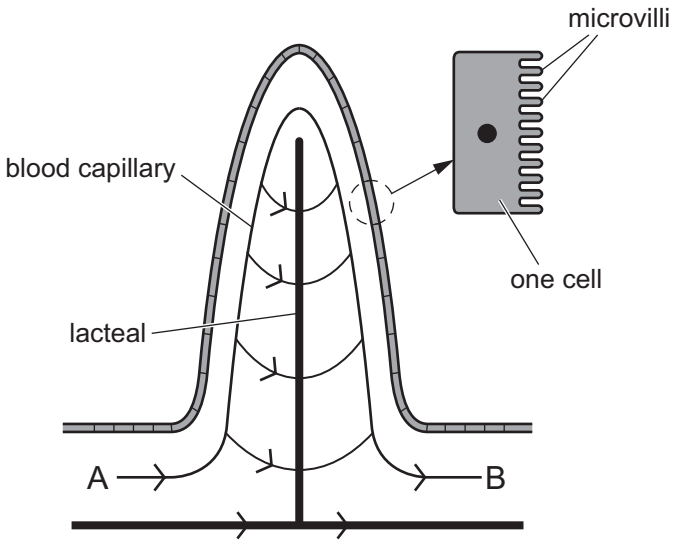
Marks	Remark

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Examiner Only	
Marks	Remark

(c) Absorption of digested foods takes place in the small intestine. One adaptation of the small intestine is the presence of villi.

The diagram shows a villus from the small intestine and one enlarged cell from the layer lining the villus.



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Use the diagram and your knowledge to answer the following questions.

(i) Describe and explain how the cells lining the villus are adapted for absorption.

_____

_____

_____

_____

_____ [3]

(ii) What substances are absorbed in the lacteal?

_____ and _____ [2]

(iii) Give two ways in which the blood in **B** would be different to the blood in **A**.

1. _____

2. _____ [2]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

3 **(a)** Pupils collected animal samples from an area near their school during a fieldwork investigation.

(i) Name **one type** of animal they could have collected in a pitfall trap.

_____ [1]

(ii) Describe how the pupils would have used pitfall traps to collect animals.

_____

_____

_____

_____ [3]

(b) Earthworms burrow in damp soil. They feed on dead matter in the soil, partly digest it and pass most of it out as waste. This waste is then broken down by bacteria and fungi which increases the mineral content of the soil.

The earthworms' burrows help drainage and aeration in the soil and so improve soil structure.

(i) What process do bacteria and fungi in the soil carry out on the earthworms' waste?

_____ [1]

(ii) Earthworms belong to a group of animals called annelids.

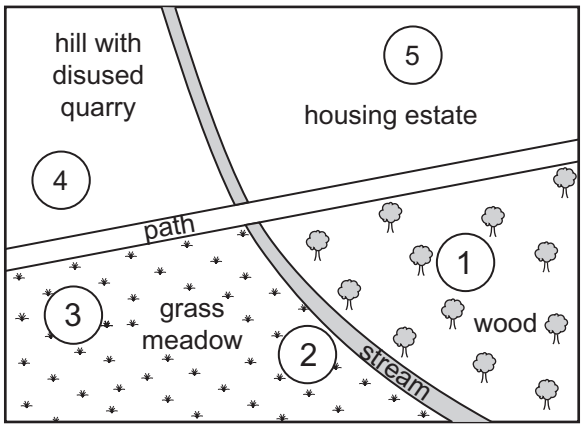
Name two characteristic features of annelids.

1. _____

2. _____ [2]

(c) During their fieldwork investigation the pupils sampled earthworms in five locations around the school. The locations are marked 1–5 on the diagram below.

They encouraged the earthworms to move up out of their burrows to the surface by spraying washing up liquid on the ground in each area. This enabled the earthworms to be easily counted.



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The table shows their results.

Location	Number of earthworms counted/m^2
1	23
2	26
3	14
4	4
5	6

(i) Name the apparatus the pupils used to sample earthworms.

_____ [1]

(ii) Locations 2 and 3 are in the grass meadow area. Use the information in the table to work out the average number of earthworms sampled in the grass meadow.

_____ /m^2 [1]

(iii) How does the average number of earthworms sampled in the grass meadow compare with the number of earthworms sampled in the quarry?

_____ [1]

Examiner Only

Marks	Remark

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(iv) Using the information about earthworms given in part **(b)** on page 8 of this question, suggest a reason for the difference in the numbers of earthworms sampled from the grass meadow and the quarry.

_____ [1]

(v) How could the pupils have increased the reliability of their results?

_____ [1]

(vi) Give **one** reason why the actual number of earthworms in all the locations is likely to be greater than the numbers the pupils counted.

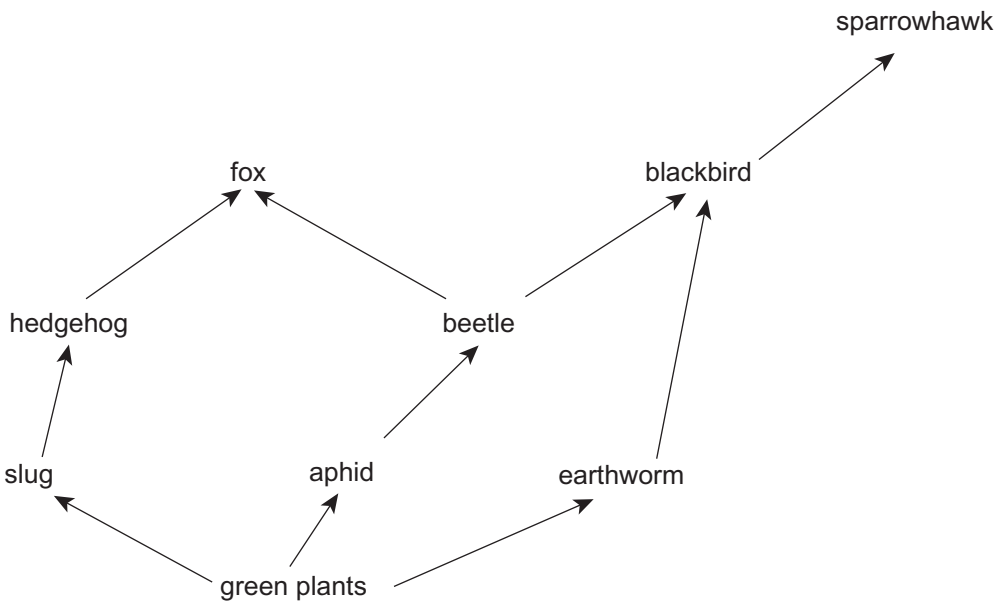
_____ [1]

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Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** The diagram below shows a food web from a woodland area.



Use this diagram and your knowledge to answer the following questions.

(i) Name the animal that is feeding at two trophic levels in this food web.

_____ [1]

(ii) If the number of beetles decreased in the woodland area what effect would this have on the number of earthworms in this area? Explain your answer.

_____

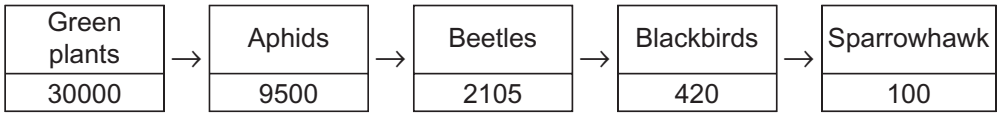
_____ [2]

(iii) Draw a labelled pyramid of numbers diagram for the food chain containing the earthworm.

[2]

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(b) The diagram shows the amount of energy (kJ/m^2/year) available at each trophic level in one of the food chains.



(i) Give two ways in which beetles can lose energy.

1. _____

2. _____ [2]

(ii) What percentage of energy is **not** transferred from beetles to blackbirds?

Show your working.

_____ % [3]

(iii) Why are shorter food chains more efficient?

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 Diabetes is a condition in which the body cannot control blood glucose levels. There are two types of diabetes.

Type 1 diabetes, also known as insulin dependent diabetes, is caused by the inability of cells in the pancreas to produce sufficient insulin. It usually develops at an early age.

Type 2 diabetes, also known as non-insulin dependent diabetes, usually develops much later in life, especially in people who are overweight.
In this type of diabetes, the cells in the pancreas produce insulin but only some liver cells respond to the insulin.

(a) (i) Describe the effect of insulin on blood glucose levels.

_____ [1]

(ii) Explain how the liver responds to insulin.

_____

_____ [2]

(b) (i) One difference between Type 1 and Type 2 diabetes is the age at which it usually develops.

Using the information above, give **another** difference between Type 1 and Type 2 diabetes.

_____

_____ [1]

(ii) A man with Type 2 diabetes has been advised by his doctor to increase his exercise level.

Explain how increasing his exercise level would help in the control of his diabetes.

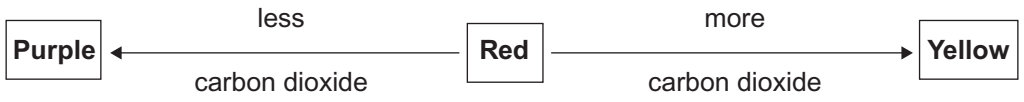
_____

_____ [2]

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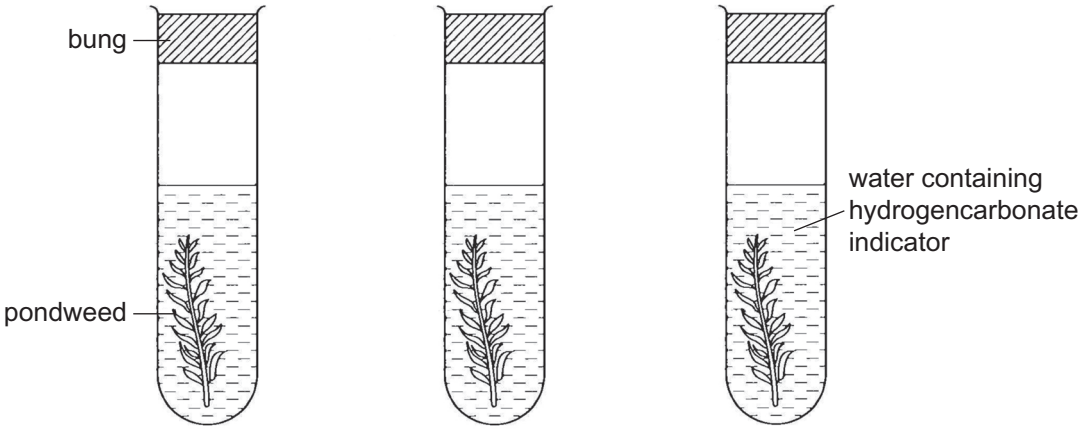
Examiner Only	
Marks	Remark

6 Hydrogencarbonate indicator can be used to show levels of carbon dioxide concentration. The diagram shows how the colour changes with different carbon dioxide concentrations.



A student investigated the changes in carbon dioxide concentration in water containing pondweed under different light intensities for two hours using hydrogencarbonate indicator.

The diagram below shows the experiment she set up.



Source: R McIlwaine / CCEA

The result for test tube B is shown in the table.

Test tube	**A**	**B**	**C**
Colour of hydrogencarbonate indicator		Red	

(a) Complete the table to give the colour of the indicator in test tubes A and C at the end of the experiment. [2]

(b) Explain the result for test tube B.

_____

_____

_____ [2]

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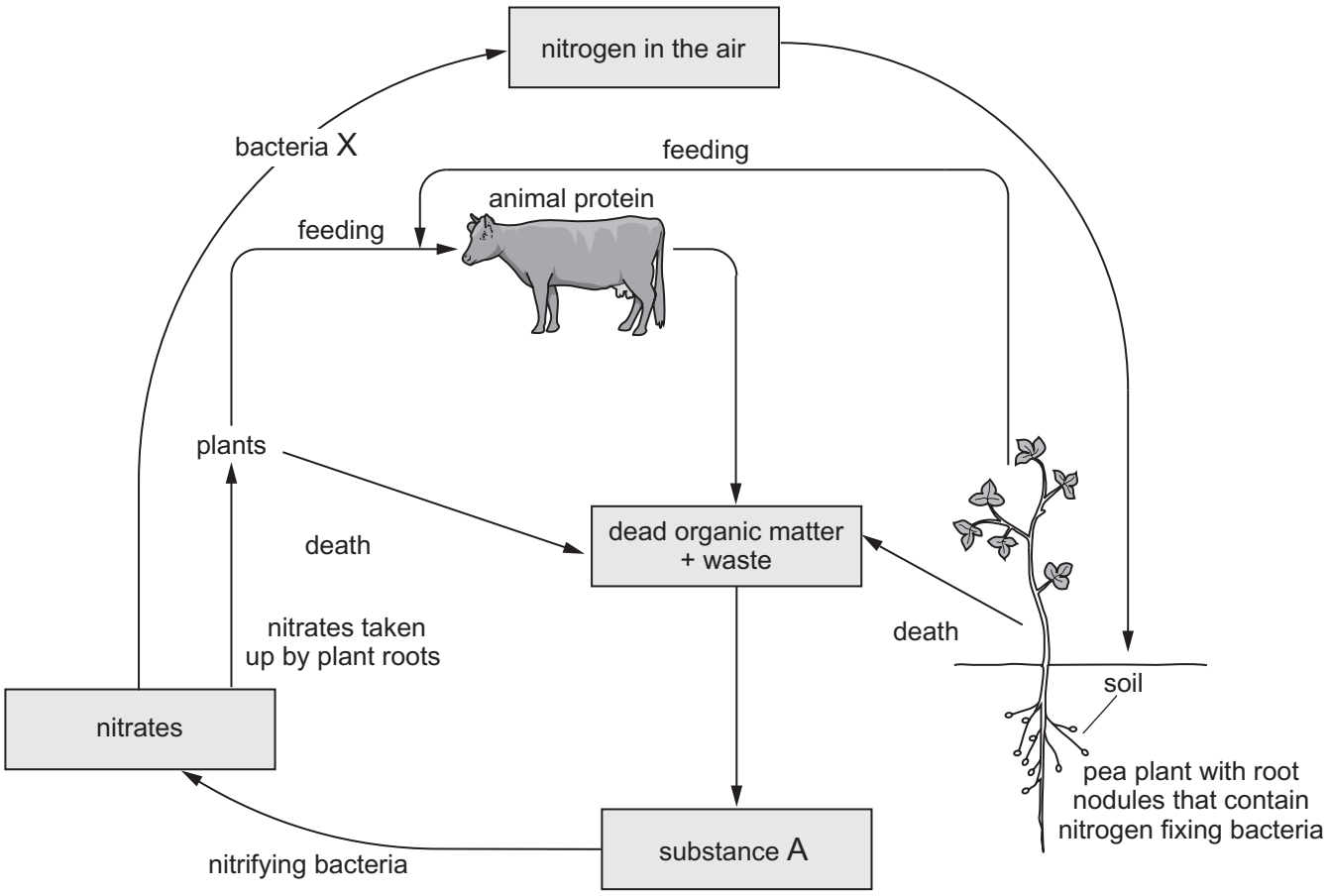
(c) Explain why the student could have included one more test tube containing only hydrogencarbonate indicator in the investigation.

_____

_____ [1]

Examiner Only	
Marks	Remark

7 **(a)** The diagram shows a nitrogen cycle.



Source: R McIlwaine / CCEA

Use the diagram and your knowledge to answer the following questions.

(i) Name substance A.

_____ [1]

(ii) Name bacteria X.

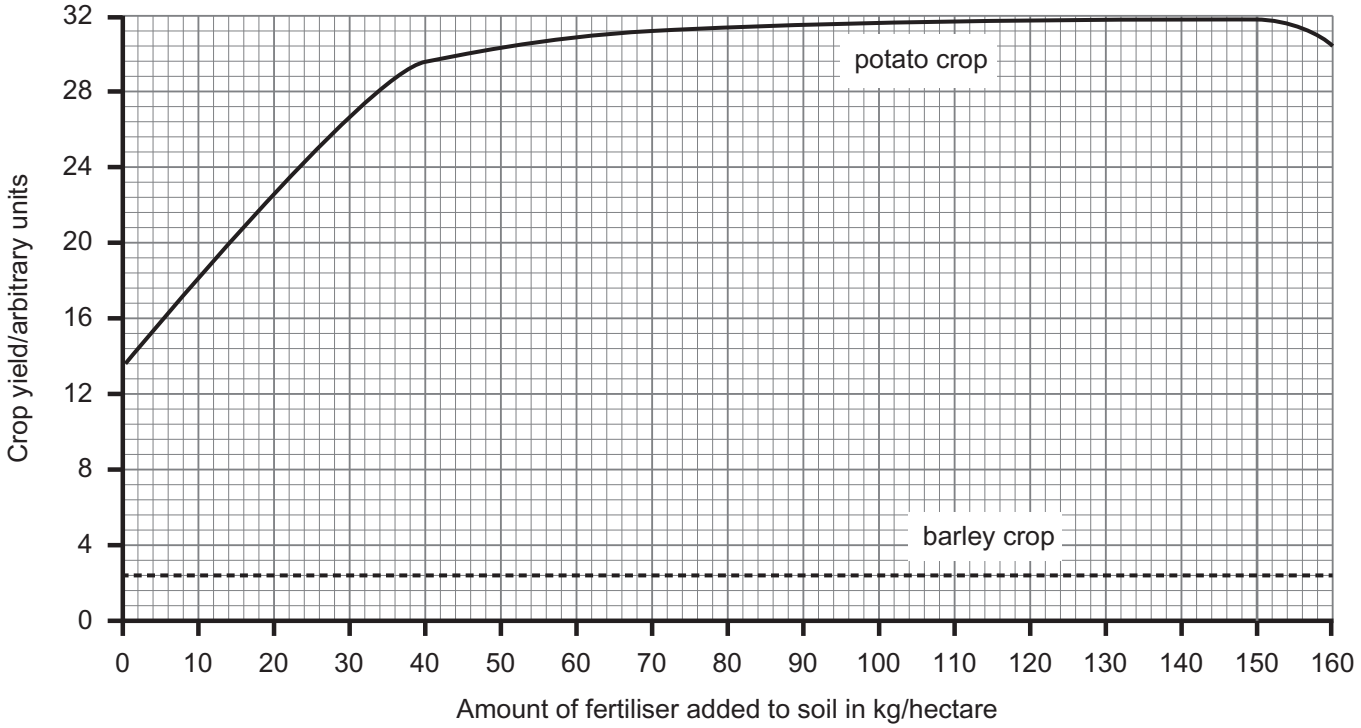
_____ [1]

(iii) Name the process that occurs in plant roots to absorb minerals from the soil.

_____ [1]

Examiner Only	
Marks	Remark

(b) An investigation was carried out to show the yield of potatoes when a particular fertiliser was added at different levels to the soil in which potatoes were grown. The graph shows the results obtained.
The graph also shows the yield of barley when the same fertiliser was added at the same levels to the soil in which barley was grown.



Source: R McIlwaine / CCEA

Examiner Only	
Marks	Remark

Use the data in the graph and your knowledge to describe and explain the advice you would give to a farmer about the application of this fertiliser when growing potatoes and barley.

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

[6]

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THIS IS THE END OF THE QUESTION PAPER

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113852

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

MONDAY 25 FEBRUARY 2013
9.30 am–10.30 am

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)**	phototropism	[1]	
	(b)	auxin	[1]	
	(c)	**(i)** hormone/no auxin produced/no shoot tip; no growth/no cell elongation	[2]	
		(ii) Any four from: shoot tip bends to light; hormone auxin moves to side away from light; shaded side; cell elongation on side away from light; more growth on side away from light/bends more on shaded side; shoot gets **more** light/can photosynthesise **more**;	[4]	8
2	**(a)**	**(i)** protein	[1]	
		(ii) protease/pepsin	[1]	
		(iii) Any **two** from: ● amount of enzyme/volume of enzyme solution; ● concentration of enzyme; ● pH of solution; ● same size/amount of gelatin cubes.	[2]	
	(b)	**Indicative content** ● no **breakdown** of gelatin/cube stays intact ● no amino acids produced ● amylase ***not*** specific for **protein/amylase** is specific for **starch** ● **protease** is only enzyme that breaks down gelatin ● **lock and key** model of enzyme activity ● **shape** of amylase does not fit with protein (gelatin) ● **temperature** is **not** the cause/35 °C is the optimum temperature for enzyme activity		

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Response	Mark
Candidates use appropriate terms throughout to describe and explain in a logical manner what happens to the gelatin giving at least 5 points from the indicative content. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5]–[6]
Candidates use some appropriate terms throughout to partially describe and explain what happens to the gelatin giving 3 or 4 points from the indicative content. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3]–[4]
Candidates partially describe or explain what happens to the gelatin. They give 1 or 2 points from the indicative content. They use limited spelling, punctuation and grammar skills.	[1]–[2]
Response not worthy of credit.	[0]

[6]

(c) (i) Any three from:
- lining cells thin;
- short diffusion distance/close to blood/good blood supply
- presence of microvilli;
- increase surface area – must be linked to microvilli [3]

(ii) fatty acids; glycerol
either order [2]

(iii) more *digested* foods in B;
example glucose/sugar; amino acids; vitamins; minerals;
or two examples
less O_2/more CO_2 in B; [2]

AVAILABLE MARKS

17

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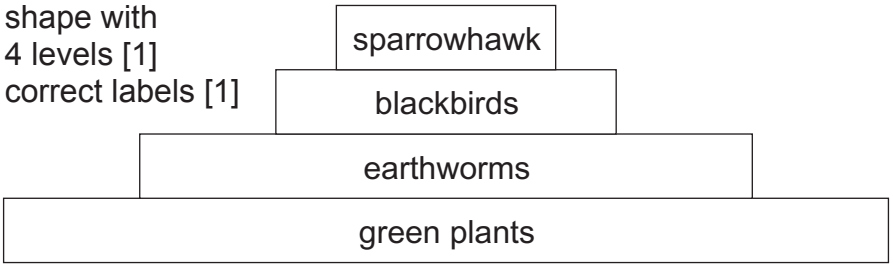
				AVAILABLE MARKS
3	(a)	(i)	invertebrates/insects/named examples [1]	
		(ii)	Any **three** from: ● dig hole; ● put in jar/container; ● put stones/cover on top/supported to allow invertebrate entry; ● return after certain time/leave overnight ● identify/count organisms. [3]	
	(b)	(i)	decomposition/decay [1]	
		(ii)	Any **two** from: ● segmented body; ● chaetae/s ● body temperature not constant [2]	
	(c)	(i)	quadrat [1]	
		(ii)	20 [1]	
		(iii)	more (in grassland)/fewer in quarry [1]	
		(iv)	not much soil in quarry/not much decaying matter/mostly rock/too dry **or** converse/damper near stream/in meadow [1]	
		(v)	repeat [1]	
		(vi)	not all worms come up to the surface/some remain underground [1]	13

AVAILABLE MARKS

4 **(a)** **(i)** blackbird/sparrowhawk [1]

(ii) less earthworms;
more eaten by blackbirds/because blackbirds have less/no beetles
or
less earthworms; because more aphids/less green plants [2]

(iii) shape with
4 levels [1]
correct labels [1]



[2]

(b) **(i)** Any **two** from:

- respiration/heat loss
- movement
- waste materials/excretion
- not all food digested
- reproduction. [2]

(ii) $\frac{420}{2105}$; $\times$ 100; 100 $-$ 19.95 $=$ 80.05

or 2105 $-$ 420 $=$ 1685;
1685/2105 $\times$ 100;
$=$ 80.05 [3]

(iii) less steps/trophic levels;
less energy loss; [2]

12

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					AVAILABLE MARKS
5	**(a)**	**(i)**	lowers it/reduces it [1]		
		(ii)	changes *glucose* to glycogen; increased respiration; *glucose* stored as fat; *more* uptake of glucose into cells; Any **two** [2]		
	(b)	**(i)**	type 1 do not produce insulin/type 2 do produce insulin/type 2 liver cells do not respond/type 2 caused by overweight/type 2 can be avoided/type 1 needs insulin injected type 2 linked to lack of exercise/sedentary lifestyle/type 2 controlled by diet [1]		
		(ii)	uses up sugar; less insulin produced/liver cells need to respond to less insulin; less chance of insulin injection being needed/less medication needed; lose weight; Any **two** [2]		6
6	**(a)**		A – yellow; C – purple [2]		
	(b)		no change in CO_2 levels/CO_2 produced is absorbed; because rates of photosynthesis and respiration are equal [2]		
	(c)		to show that pondweed is responsible for the changes/to show that changes only occur when pondweed present [1]		5

		AVAILABLE MARKS
7 **(a)** **(i)**	A – ammonia/ammonium compounds [1]	
(ii)	X – denitrifying [1]	
(iii)	active transport/active uptake [1]	

(b) **Indicative content** – any **six** from:

- crops will grow without fertiliser;
- minerals/nitrates already in the soil;
- addition of fertiliser increases yield of potatoes; up to 40–150 kg/hectare
- farmer should use 40 kg/h for potato crop;
- for potato crop > 40 kg/h is a waste/uneconomic;
- after 150 kg/h for potato there is a drop in yield
- barley crop – no increase in yield with the fertiliser
- farmer should use a different fertiliser for the barley;
- no point in adding fertiliser for barley
- fertiliser/nitrates lead to increased protein;
- fertiliser can be washed out/causes eutrophication

Response	Mark
Candidates use appropriate terms throughout to describe and explain in a logical manner what happens to crop yield when different fertiliser levels are added to soil with specific crops, i.e. potatoes and barley. They use at least 5 points from the indicative content. They demonstrate good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5]–[6]
Candidates use some appropriate terms throughout to partially describe and explain what happens to crop yields when different fertiliser levels are added to soil used for growth of potatoes and barley. They use 3 or 4 points from the indicative content. They demonstrate good spelling, punctuation and grammar skills. Form and style are of a high standard.	[3]–[4]
Candidates partially describe or explain what happens to crop yields when different fertiliser levels are added to soil for the growth of potatoes or barley. They use 1 or 2 points from the indicative content. They show limited spelling, punctuation or grammar skills.	[1]–[2]
Response not worthy of credit.	[0]

[6] 9

Total **70**

New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

MONDAY 12 NOVEMBER 2012, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **1(d)(i)** and **8**.

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

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Examiner Only	
Marks	Remark

1 **(a)** Complete the table about food tests.

Food type	Reagent used to carry out food test	Initial colour of reagent	Final colour for a positive result
Fat		Clear	
Protein			Purple

[4]

(b) Explain why obesity levels have increased greatly in the United Kingdom and many other countries in recent years.

_____

_____

_____ [2]

(c) Name the component of an unhealthy diet that can cause

high blood pressure. _____

diabetes. _____ [2]

Examiner Only	
Marks	Remark

(d) (i) Paul read in a magazine that orange juice that has been freshly squeezed from oranges contains more vitamin C than the processed orange juice purchased in cartons. Paul wished to investigate this.

His teacher provided him with a dropper, graduated cylinder, test tubes, the two different orange juices and DCPIP solution. Describe an experiment that Paul would carry out to test the claim that freshly squeezed orange juice contains more vitamin C than processed orange juice.

Give one factor that needs to be controlled to make the test a valid (fair) one.

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

[6]

(ii) Explain why it would have been better for Paul to use a syringe rather than a dropper in this investigation.

[1]

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Examiner Only	
Marks	Remark

2 **(a)** Explain the ecological term habitat.

_____

_____ [1]

(b) The table shows the percentage of different invertebrate groups present on the ground, in the vegetation and in the air above the vegetation in a grassland.

Area where found	Invertebrate group/%			
	Spiders	**Flies**	**Beetles**	**Bees**
On the ground	67	20	7	30
In the vegetation	33	37	52	26
In the air	0	43	41	44
Total	100	100	100	100

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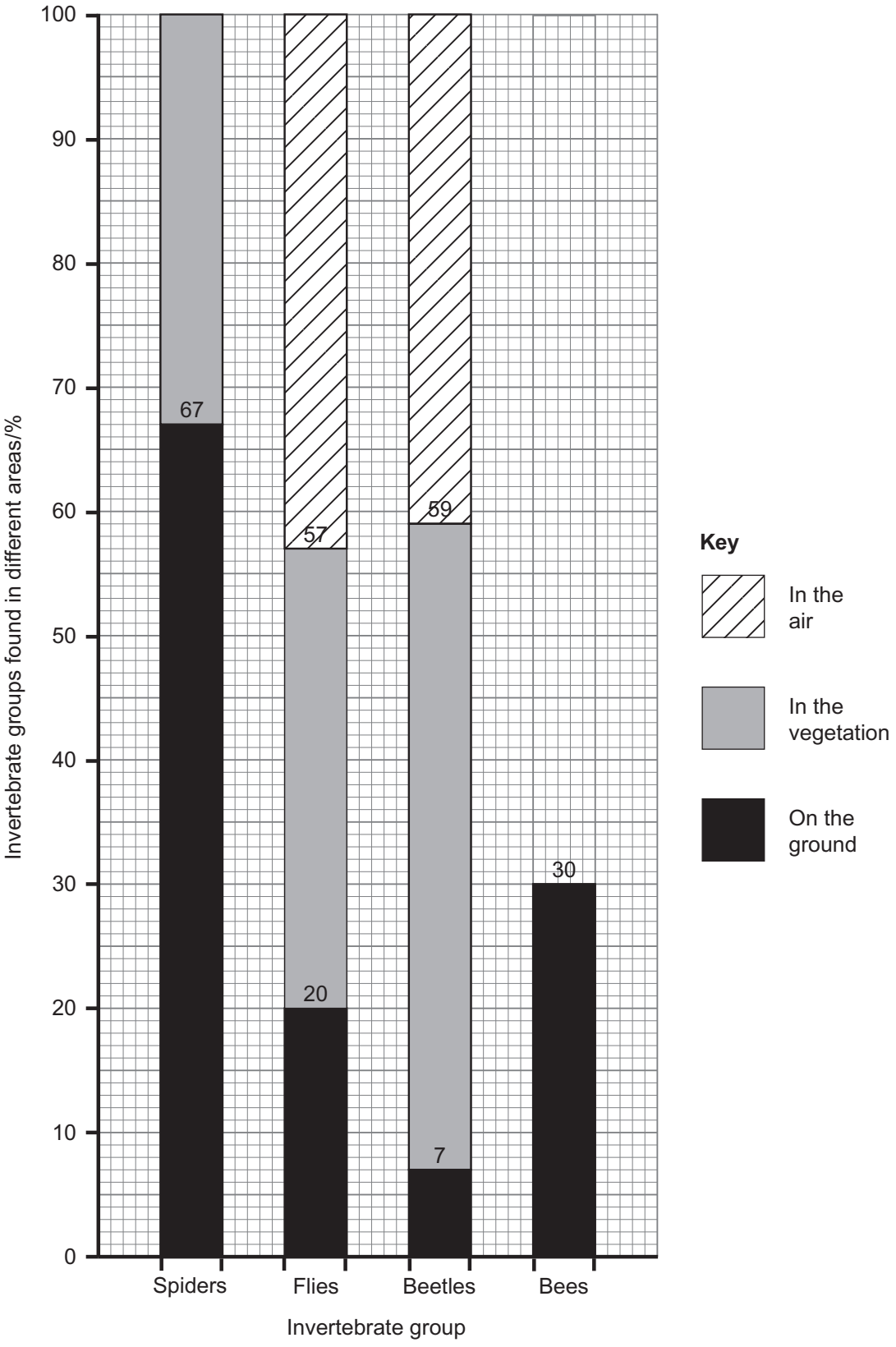
Suggest a suitable sampling method for collecting invertebrates

on the ground. _____

in the vegetation. _____ [2]

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(c) Complete the bar chart to include the figures for the bees.



[2]

Examiner Only

Marks	Remark

(d) Use the bar chart to state which invertebrate group cannot fly.

_____ [1]

(e) Yellowhammers are small birds found mostly in the east of Northern Ireland. The yellowhammer chicks feed on insects, while the adult birds feed on barley and wheat seeds.

If the grassland, referred to in part **(b)**, was sprayed with an insecticide (a chemical that kills insects), explain the impact on the population of yellowhammers.

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

3 The table gives information on some sources and amounts of greenhouse gas (GHG) emissions in the United Kingdom for the years 2000 and 2010.

Source	Amount of GHG emissions/ million tonnes		Percentage change, 2000–2010
	2000	2010	
Generating Electricity	220	205	
Transport	120	114	–5
Business	110	90	–18
Residential	91	89	–2
Agriculture	58	51	–12

© Crown Copyright - Department of Energy and Climate Change

(a) Complete the information in the table by entering the missing value. (Show your working.)

[2]

(b) Describe the general trend for the amounts of GHG emissions for all sources over the period 2000–2010.

_____ [1]

(c) The table below shows the cost of generating electricity from different sources in the United Kingdom and shows whether the source produces carbon dioxide.

Carbon dioxide is a greenhouse gas. Scientific research suggests that an increase in levels of carbon dioxide leads to global warming.

Source	Cost per unit of electricity/p	Carbon dioxide produced
Gas	2.2	Yes
Coal	2.5	Yes
Wind	5.5	No
Wave	6.6	No

© RenewableUK

Use the information in the table to argue why there is controversy about using renewable energy (wind and wave) as a solution to global warming.

[3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** Describe and explain the function of digestive enzymes.

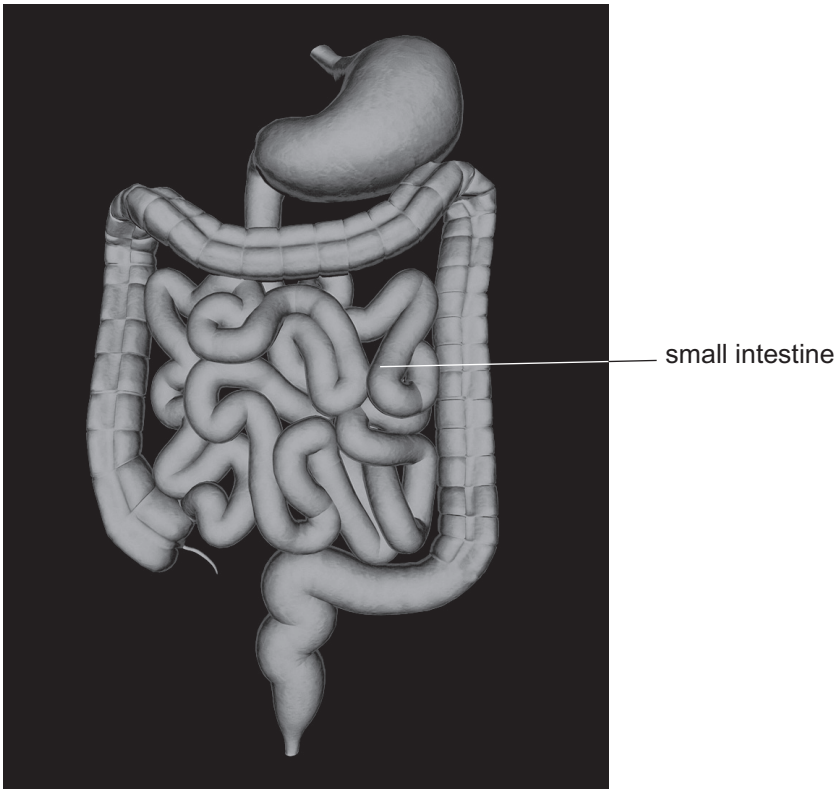
_____

_____

_____

_____ [2]

(b) The image shows part of the digestive system.



© PASIEKA / Science Photo Library

(i) Using only the information in the image give **one** adaptation of the small intestine for absorption.

_____ [1]

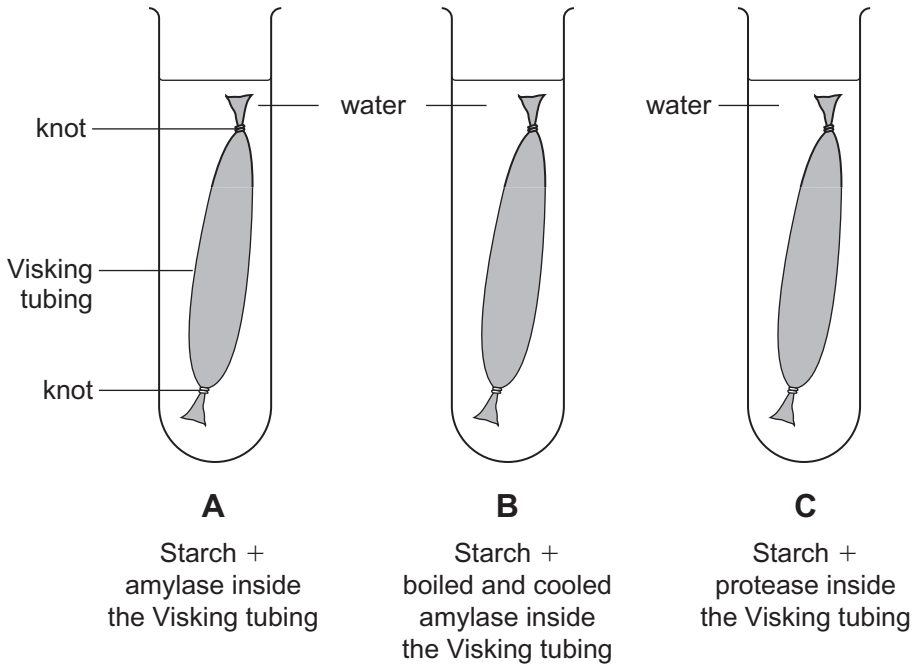
(ii) Give another adaptation of the small intestine for absorption, that is **not** shown in the diagram.

_____ [1]

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Examiner Only	
Marks	Remark

(c) The diagram shows apparatus and materials used by a student to investigate the effect of two digestive enzymes, amylase and protease, on starch.



Visking tubing allows small molecules (e.g. glucose) to pass through but not large molecules (e.g. starch).

The experimental set-up was left for 30 minutes. The student then carried out the Benedict's test on the liquid outside the Visking tubing in each of the boiling tubes **A**, **B** and **C**.

(i) Describe and explain the result the student obtained for the liquid in

tube **A** _____

_____

_____

tube **B** _____

_____

_____ [4]

(ii) Explain why there was a negative result for the Benedict's test in tube **C**.

_____

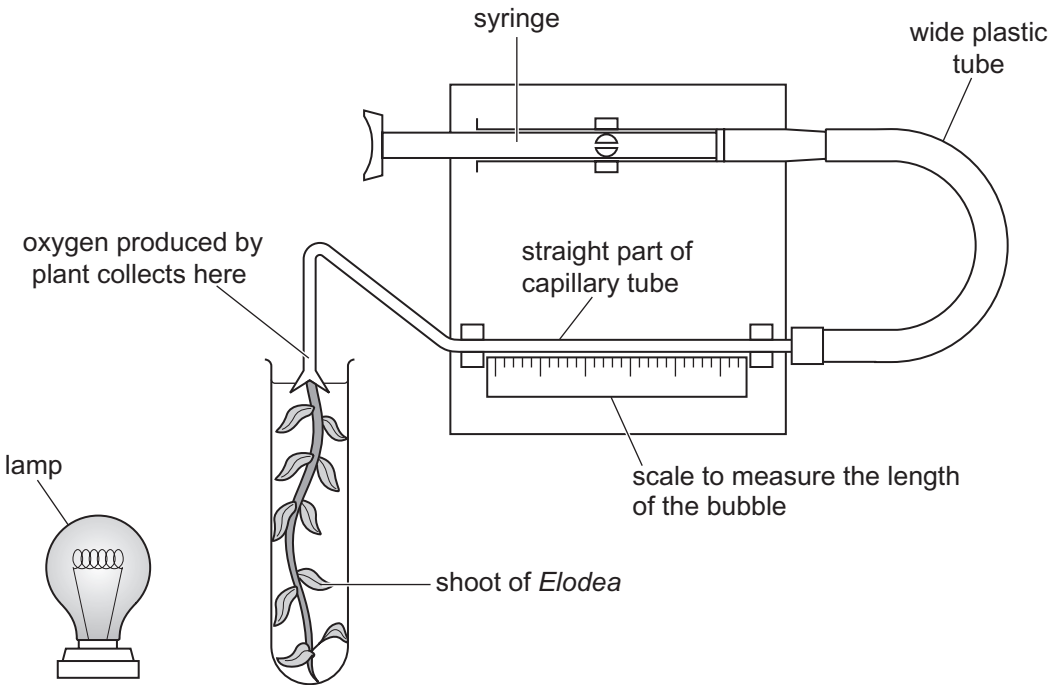
_____ [1]

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Examiner Only	
Marks	Remark

5 The apparatus shown below was used to investigate the effect of light intensity on the rate of photosynthesis in an aquatic plant (*Elodea*).

The light intensity available to the plant depends on the distance the lamp is from the plant. As the lamp is moved away from the plant, the light intensity available to the plant decreases.



The lamp was placed 10 cm away from the *Elodea*.

The *Elodea* was left at this light intensity for 5 minutes.

The oxygen produced by the *Elodea* over the next 10 minutes was drawn into the straight part of the capillary tube using the syringe.

The length of the oxygen bubble produced in these 10 minutes was measured.

The procedure was carried out three times and the average length of the oxygen bubble was calculated.

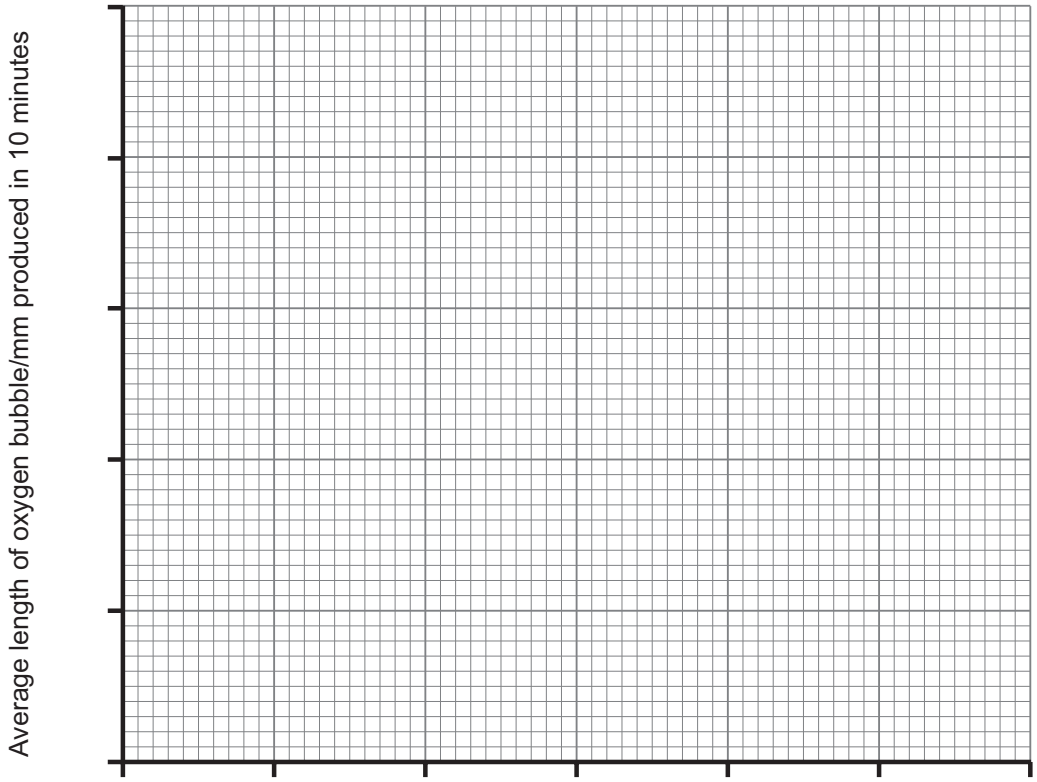
The experiment was repeated for six other distances.

The results are given in the table.

Distance of the lamp from the *Elodea*/cm	**Average length of oxygen bubble produced in 10 minutes/mm**
10.0	43
12.5	43
15.0	43
17.5	28
20.0	21
25.0	11
30.0	7

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(a) On the axes below, plot a line graph of average length of oxygen bubble against distance of the lamp from the *Elodea*.



[4]

(b) Describe the trend shown in your graph.

_____

_____

_____ [2]

(c) Explain the trend shown in the graph.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

(d) Name two variables that must be controlled in this experiment to ensure valid results are produced.

1. _____

2. _____ [2]

(e) Not all of the oxygen produced in photosynthesis will be collected by this method. Suggest a reason for this.

_____

_____ [1]

Examiner Only	
Marks	Remark

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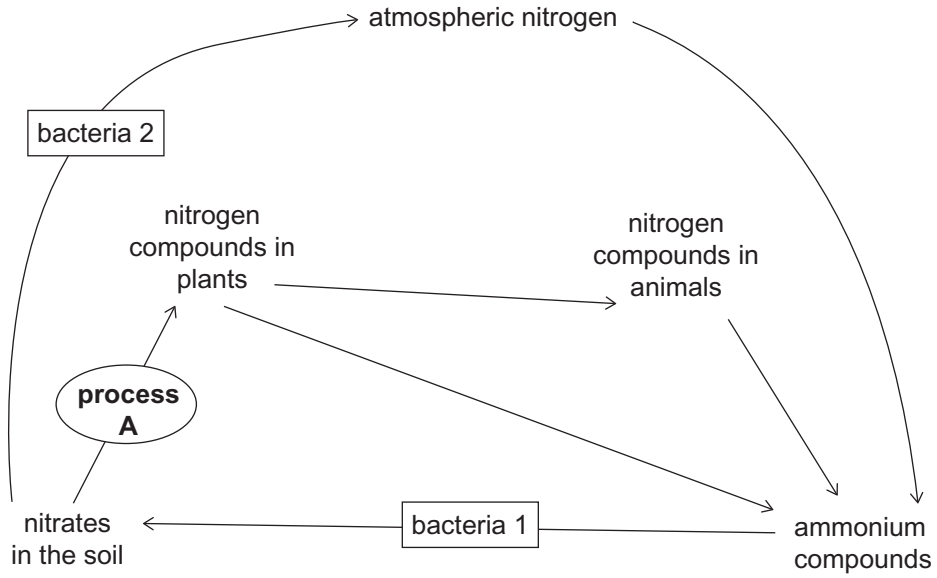
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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

6 The diagram shows part of the nitrogen cycle.



(a) Use the diagram and your knowledge to answer the following questions. Name bacteria types 1 and 2.

bacteria 1 _____

bacteria 2 _____ [2]

(b) Process A is the uptake of nitrates by plant roots. Describe and explain this process.

_____

_____

_____

_____

_____ [3]

(c) Nitrates are soluble and can be washed out of the soil (leached) and enter rivers. This causes excessive growth of aquatic plants and algae in the rivers. Explain how the death of these aquatic plants and algae can result in reduced biodiversity of aquatic animals.

_____

_____

_____

_____

_____ [3]

(d) Name one nitrogen compound found in animals.

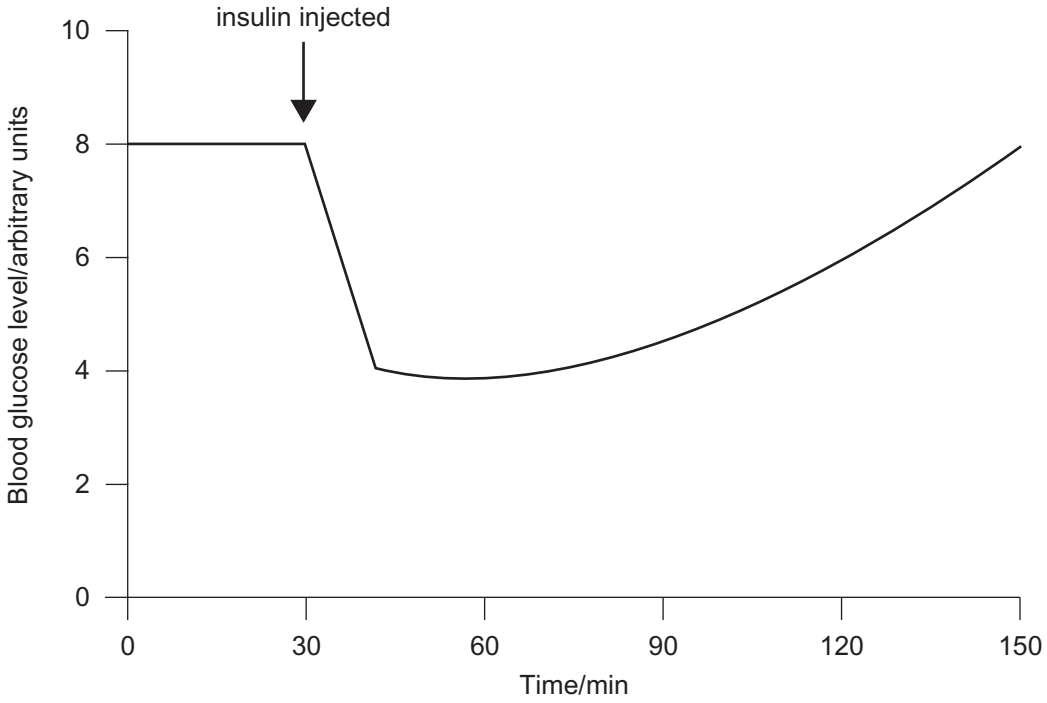
_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 The hormonal system is one of the two communication systems in the human body. Hormones are chemical messengers that bring about a response in a target organ.

Insulin is a hormone that controls blood glucose levels. The graph shows the effect of an insulin injection on the blood glucose level of a person with diabetes.



Use the information given and your knowledge to answer the following questions.

(a) Name the target organ for insulin.

_____ [1]

(b) Describe how insulin reduces blood glucose level.

_____

_____

_____

_____ [2]

The other communication system is the nervous system.

Examiner Only	
Marks	Remark

(c) Give **two** ways in which communication by the nervous system differs from communication by the hormonal system.

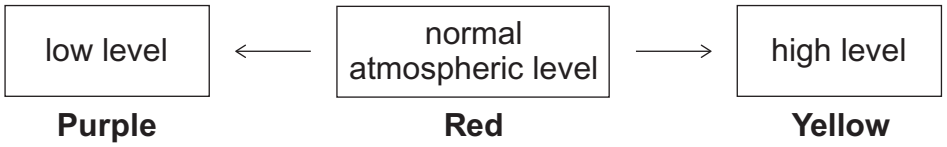
1. _____

_____

2. _____

_____ [2]

8 A scientist investigated gas exchange in tomato plants growing in a glasshouse. He placed test tubes of hydrogencarbonate indicator in the glasshouse. He recorded the colour of the indicator over a 24 hour period. The diagram shows how hydrogencarbonate indicator changes colour with different levels of carbon dioxide.



Describe and explain the results he would expect to obtain at midnight, 8 am (dawn) and 2 pm. Your answer must include the colour changes at the three times.

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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112971

New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

MONDAY 12 NOVEMBER 2012
1.30 pm–2.30 pm

MARK SCHEME

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AVAILABLE MARKS

1 (a)

Fat	Ethanol		White
Protein	Biuret	Blue	

[4]

(b) Energy intake/food intake is higher/too much food eaten/junk food/bad food is cheaper/cheap alcohol [1]
Not enough exercise/sedentary lifestyle described [1] [2]

(c) sodium/salt/fat/cholesterol [1]
glucose/sugar [1] [2]

(d) (i) Indicative Content:

- Place DCPIP in test-tube
- Add drops of juice to the DCPIP
- Shake/mix
- Count the number of drops of juice (needed to produce colour change in the DCPIP)
- DCPIP goes colourless/clear or changes from blue to clear or changes from blue to pink/clear
- Repeat for the other orange juice
- The fewer the drops of juice needed the more vit. C or converse – more drops needed the less vit. C present (one that changes the fastest has most vit. C)
- Repeat for reliability – same juice several times
- Controlled variable – same amount of mixing/shaking – or same volume of DCPIP in both test-tubes

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout using at least **5** of the above points (which must include a controlled variable) to describe in a logical sequence how they would compare the amounts of vitamin C in freshly squeezed orange juice and processed orange juice. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates must use some appropriate specialist terms throughout using **3** or **4** of the above points to partially describe how they would compare the amounts of vitamin C in freshly squeezed orange juice and processed orange juice. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe using **1** or **2** of the above points how they would compare the amounts of vitamin C in freshly squeezed orange juice and processed orange juice. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

(ii) More accurate determination of volume/size of drops can be variable [1]

15

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				AVAILABLE MARKS
2	**(a)**	Place where an animal or plant is found/lives	[1]	
	(b)	1. Pitfall trap [1] 2. Sweep net/net [1]	[2]	
	(c)	Vegetation figure correctly plotted [1] Air figure correctly plotted and shaded [1]	[2]	
	(d)	Spiders	[1]	
	(e)	Any **three** from: • less insects/food • for chicks to feed on • so population decreases • fewer breeding adults as chicks do not survive to adults	[3]	9
3	**(a)**	–6.8/–7% = [2]	[2]	
	(b)	Decreasing (emissions)	[1]	
	(c)	Any **three** from: • While renewable does not produce carbon dioxide • Does not contribute to global warming • The cost of producing electricity is far greater than the non-renewables • People not prepared to pay extra cost	[3]	6
4	**(a)**	Any **two** from: • They break down **starch**/**fat**/**protein**/food • From large to small molecules/named correctly • From insoluble to soluble molecules • So that these can be absorbed/taken into the bloodstream • Biological catalyst/speed up chemical reactions	[2]	
	(b)	**(i)** Long/large surface area	[1]	
		(ii) Has villi/microvilli/good blood supply/walls only one cell thick/ lacteals/folds/large surface area/folded/semi-permeable/ permeable/short diffusion distance	[1]	

only allow large surface area once

			AVAILABLE MARKS
(c)	**(i)**	**Tube A** Any **two** from: • (Amylase) breaks down starch (into glucose) • sugar/glucose passes through pores of Visking tubing/into water/solution/boiling tube • Benedict's turns **from blue to** brick red [2] **Tube B** Any **two** from: • Amylase does not break down the starch/starch not broken down • Enzyme it is destroyed/damaged (by boiling) • Negative result for Benedict's/remains blue/no colour change • No glucose present [2]	
	(ii)	Enzyme specificity/lock and key fit/protease doesn't break down starch/only breaks down protein/only amylase breaks down starch/starch doesn't fit protease/no substrate for protease [1]	9
5	**(a)**	x-axis scale [1] y-axis scale [1] all points correctly plotted [1] points joined by straight lines [1] [4]	
	(b)	When lamp is 10–15 cm away from plant, lots/more oxygen production/longer bubble/bubble [1] As lamp is moved away, less oxygen produced [1] [2]	
	(c)	At lower light intensity/longer distances, as light increases photosynthesis increases [1] At shorter distances/higher light intensity, light does not limit rate of photosynthesis/something else is limiting [1] [2]	
	(d)	Any **two** from: • temperature • pH • carbon dioxide • size of plant • wattage/power of lamp/size of bulb [2]	
	(e)	Some of the oxygen will be used in **respiration**/some of the oxygen will dissolve in the water/funnel does not capture all bubbles produced/O_2 escapes into atmosphere [1]	11

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			AVAILABLE MARKS
6	**(a)** 1. Nitrifying bacteria [1] 2. Denitrifying bacteria [1]	[2]	
	(b) Any **three** from: • plants use **root hair cells** • nitrates taken up by **active transport**/active uptake • process needs oxygen/respiration/energy • taken up against a concentration gradient/described	[3]	
	(c) Any **three** from: • decay/decomposition of algae • by bacteria • (bacteria) which uses up oxygen • fish/aquatic animals die	[3]	
	(d) Amino acids/protein/nucleic acid/chlorophyll/urea	[1]	9
7	**(a)** Liver	[1]	
	(b) Any **two** from: • Converts glucose to glycogen • **Increases** respiration of glucose • **Increased** uptake • Converted to fat	[2]	
	(c) Any **two** from: • nervous is very fast/hormonal is slow • nervous system is electrical/hormone system chemical • nervous travels along nerves/hormones travel in the blood • nervous does not affect target organs/hormones do affect target organs/nervous system more specific	[2]	5

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8 Indicative Content:

Midnight
- indicator is yellow
- plants respire/produce carbon dioxide/high CO_2
- no photosynthesis occurs

8 am
- indicator is red
- photosynthesis and respiration are balanced/equal/ at same rate/compensation point
- carbon dioxide absorbed equals carbon dioxide given out

2 pm
- indicator is purple
- photosynthesis is greater than rate of respiration
- more carbon dioxide taken in than is given out

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout using at least **5** of the above points to describe and explain the results. Answers must include the colour changes at the three times. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates must use some appropriate specialist terms throughout using **3** or **4** of the above points to describe and explain the results. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe and explain, using **1** or **2** of the above points, the results expected from this experiment. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

Total

AVAILABLE MARKS

6

70

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Biology

Unit B1

Higher Tier

[GSD12]

GSD12

TUESDAY 15 MAY 2012, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all six** questions.

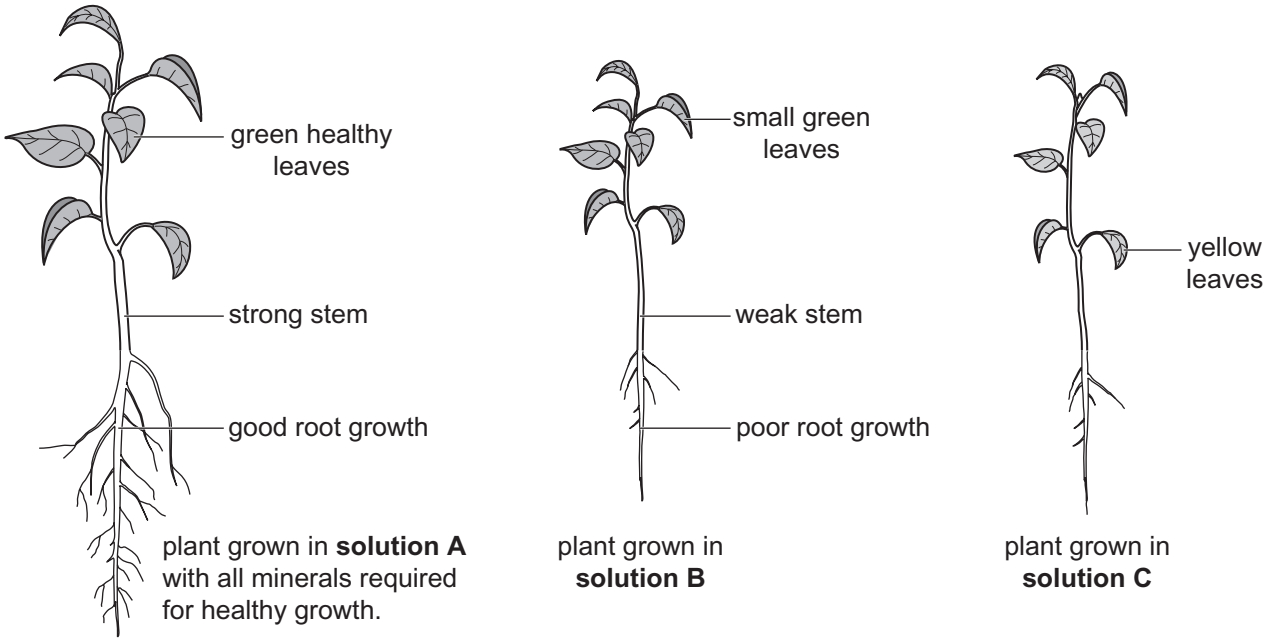
INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
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 **3(a)(v)** and **5(b)**.

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

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1 **(a)** The diagrams show three plant cuttings two weeks after they had been growing in three different mineral solutions.



Source: © Biology at a Glance 3rd edition, J. Dodds, ISBN 9781840760866, Manson Publishing Ltd. Page 119

Examiner Only	
Marks	Remark

(i) Suggest which mineral is missing from solution B and explain why the cutting in this solution shows poor growth.

_____

_____ [2]

(ii) Magnesium is missing from solution C.

Use the diagram to explain why the growth of this cutting is reduced.

_____

_____

_____ [2]

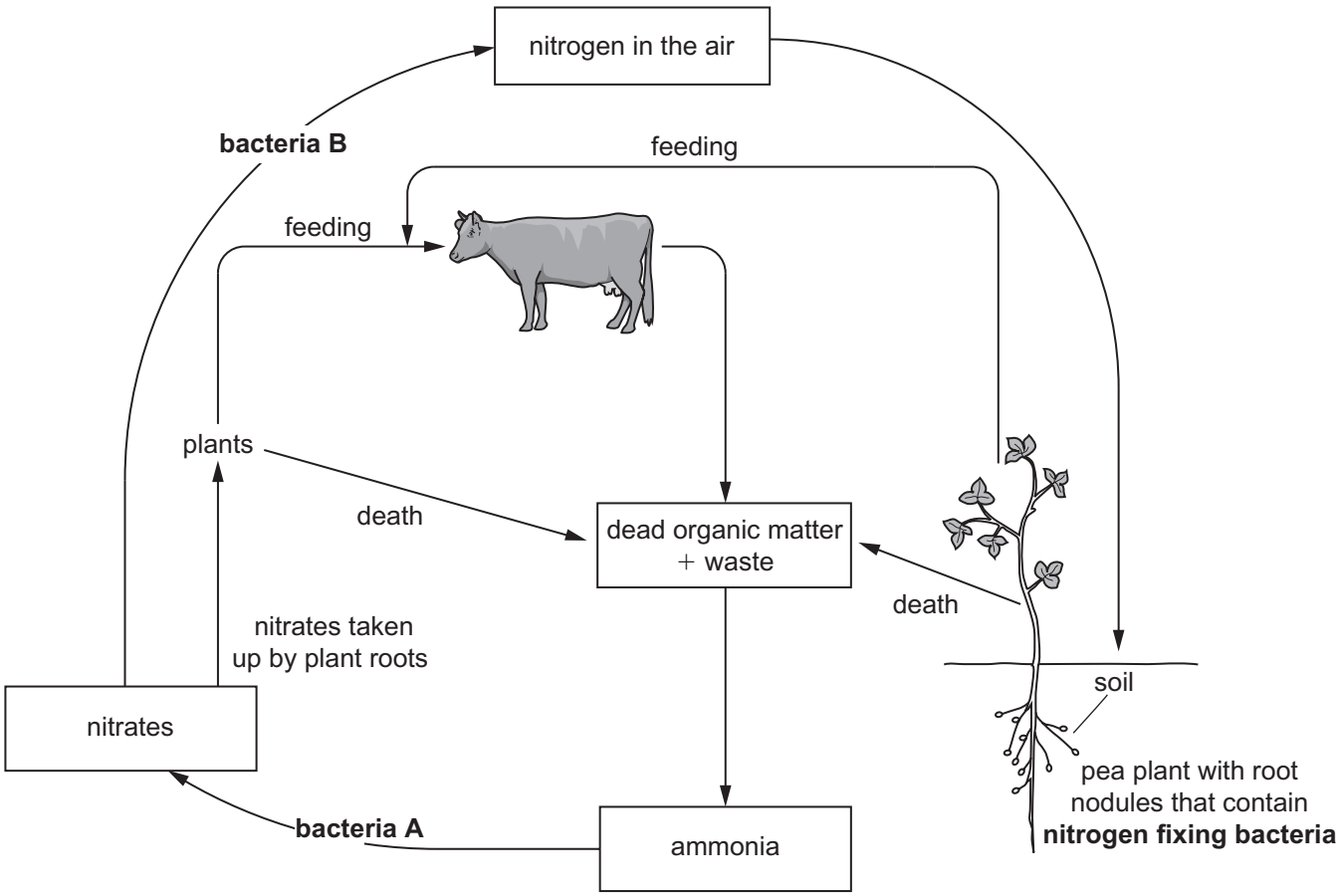
(iii) The process of absorbing minerals from the soil by root hair cells requires energy.

Name the process used in absorption and explain why it requires energy.

Process _____

Explanation _____ [2]

(b) The diagram shows the nitrogen cycle.



Source: © Biology at a Glance 3rd edition, J. Dodds, ISBN 9781840760866, Manson Publishing Ltd. Page 58

Use the information in the diagram and your knowledge to answer the following questions.

Nitrogen fixing bacteria in the root nodules of the pea plant have a relationship with the pea plant where they both benefit.

(i) Suggest how the pea plant benefits from the relationship.

_____

_____ [1]

(ii) Suggest what substance the pea plant provides for the benefit of the bacteria living in its root nodules.

_____ [1]

(iii) Name the process carried out by **bacteria B**.

_____ [1]

Examiner Only	
Marks	Remark

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(iv) When growing crops, farmers often increase the mineral content of the soil by adding manure or artificial fertiliser.

Give **one** advantage of adding manure rather than artificial fertiliser to the soil.

_____ [1]

(c) (i) Name the process that can result when excess fertiliser runs off (leaches) from fields into a stream.

_____ [1]

(ii) Describe the role of bacteria in this process.

_____

_____

_____

_____ [2]

(iii) Describe the effect this has on aquatic animals in the stream.

_____ [1]

Examiner Only	
Marks	Remark

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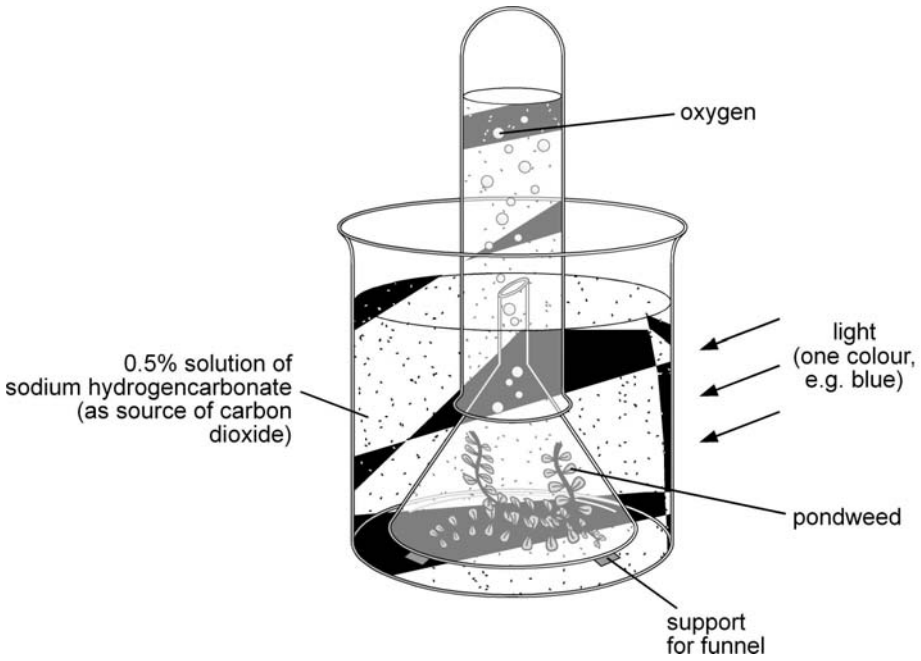
(Questions continue overleaf)

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Examiner Only	
Marks	Remark

2 **(a)** Normal light is made up of different individual colours. A student carried out an experiment to test the effect of different individual colours on the rate of photosynthesis. The diagram shows the apparatus he used.

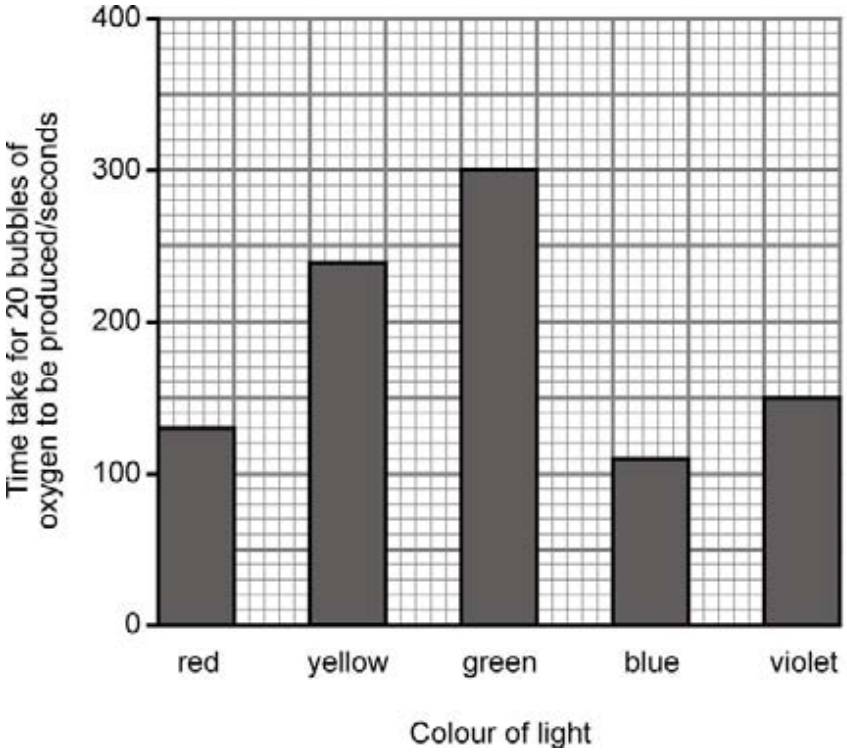
The pondweed was exposed to one colour of light, e.g. blue, for five minutes. The student then measured the time taken for twenty bubbles of oxygen to be produced. He repeated the experiment with different individual colours of light.



Adapted from Understanding Biology through problem solving - Hoey - ISBN-0216-92938-5

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The bar chart shows the results of the experiment.



Adapted from Understanding Biology through problem solving - Hoey - ISBN - 0216-92938-5

(i) Suggest why measurements were only taken after the pondweed had been left for five minutes in each individual colour of light.

_____

_____ [1]

(ii) Give **one** factor that should be kept constant during the experiment.

_____ [1]

Examiner Only

Marks	Remark

(iii) The photograph shows a geranium plant.



Source: Principal Examiner

Using the results from the bar chart, explain why a grower would use blue light to maximise profit when growing geraniums.

_____

_____

_____

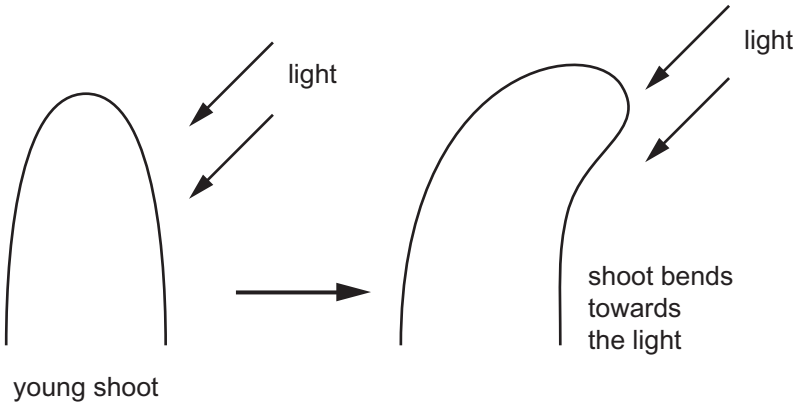
_____

_____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(b) The diagram shows the growth response of a young shoot to light from one direction.



(i) Name the growth response shown by the young shoot.

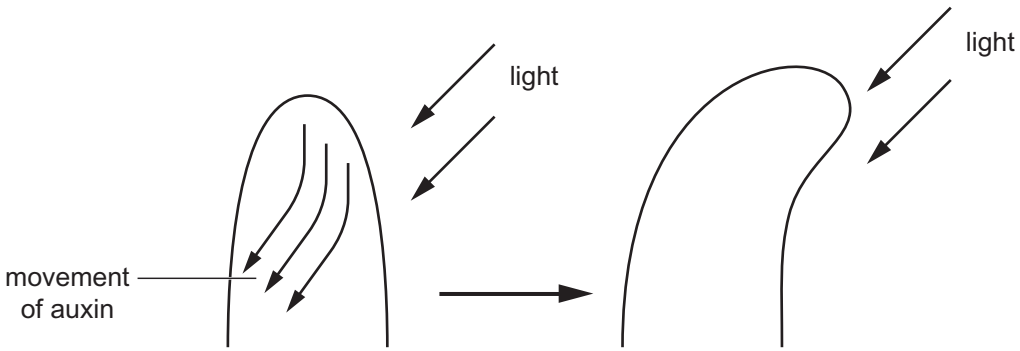
_____ [1]

(ii) Auxin is the substance that causes this growth response.

What type of substance is auxin?

_____ [1]

The diagram shows the movement of auxin in the shoot tip.



(c) Suggest how bending of the shoot tip is brought about by auxin.

_____

_____

_____ [2]

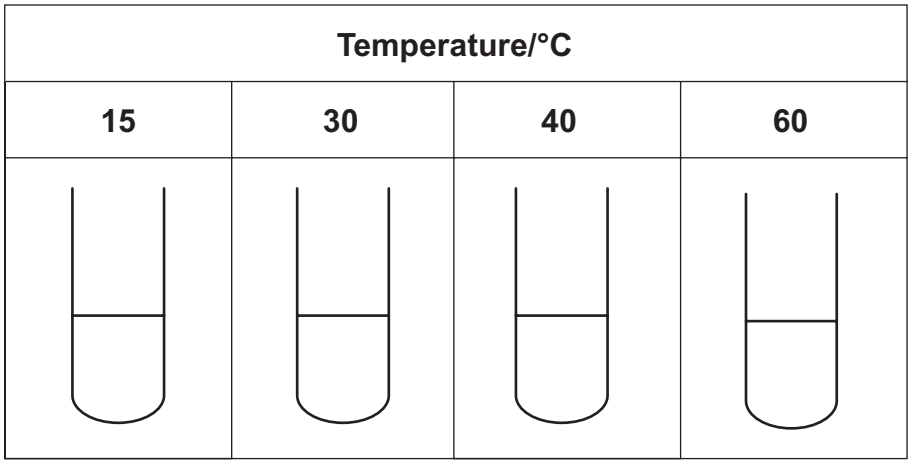
Examiner Only	
Marks	Remark

3 Some washing powders contain enzymes which help to break down stains on clothes. A student tested two enzymes (enzyme 1 and enzyme 2) to find which was more effective at breaking down fat stains on clothing over a range of temperatures.

(a) (i) Name the enzyme that breaks down fats.

_____ [1]

The diagram shows the experimental set-up the student used to find out the time taken to break down fat in the test tubes.



(ii) What substances would need to be present in each of the test tubes?

_____ and _____ [1]

(iii) Give **two** variables that the student should have kept the same.

1. _____

2. _____ [2]

(iv) What are fats broken down into?

_____ and _____ [2]

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The table shows the student's results using the two enzymes.

	Time taken to break down fat/minutes	
Temperature/°C	**Enzyme 1**	**Enzyme 2**
15	30	40
30	10	20
40	15	18
60	50	120

(v) Most washes in washing machines are carried out at temperatures between 30 °C and 60 °C and the washing cycle lasts no more than 90 minutes.

Describe and explain the results for the two enzymes and explain why enzyme 1 is more effective when added to washing powder.

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

[6]

Examiner Only

Marks	Remark

(b) (i) Starch present in foods can also stain clothes. It is broken down by a different type of enzyme. Name the enzyme involved.

_____ [1]

(ii) Suggest why this enzyme would not break down fat stains.

_____

_____ [1]

4 Diabetes is a condition in which the blood glucose control mechanism fails.

(a) (i) One symptom of diabetes is the presence of glucose in the urine.

Give **one** other symptom of diabetes and **one** possible long term effect.

_____

_____

_____ [2]

(ii) An older man who is overweight is at risk of developing diabetes. Give **two** lifestyle changes you would advise to reduce his risk.

1. _____

2. _____ [2]

(b) (i) For many years, the presence of glucose in urine was detected by using the normal food test for glucose.

Describe this test and give the colour change when glucose is present.

Description _____

_____

Colour change _____ [3]

Examiner Only

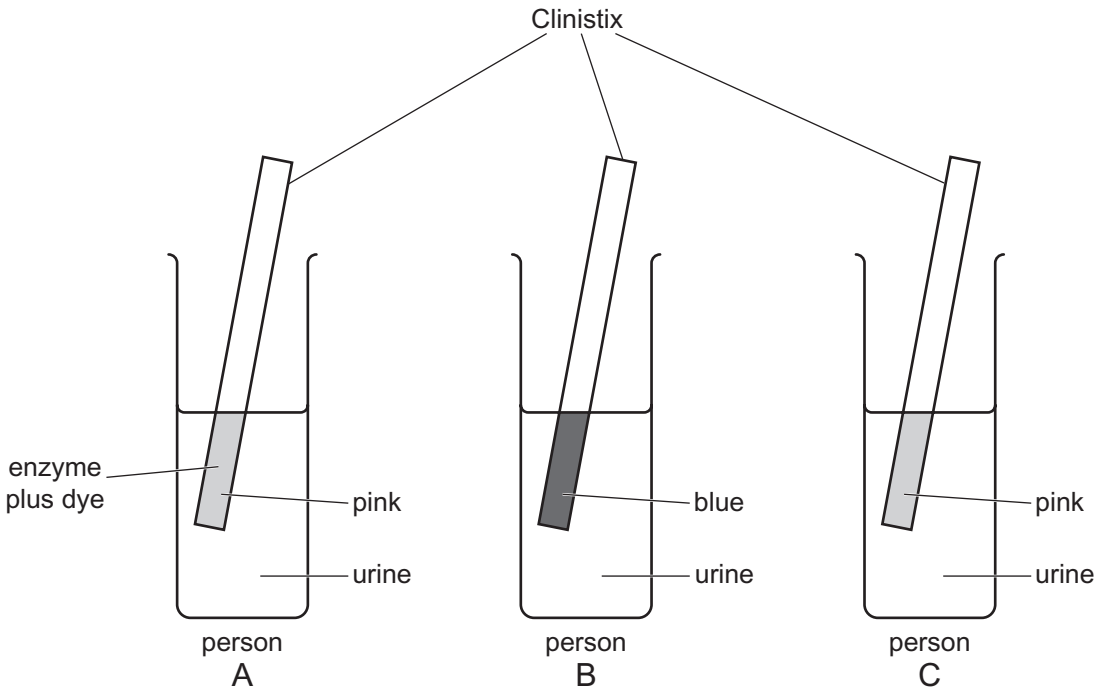
Marks	Remark

Testing urine for the presence of glucose can now be carried out in a doctor's surgery using small diagnostic strips called Clinistix.

These are dipped into the urine and change colour if glucose is present.

The strips contain an enzyme and a dye. The enzyme reacts with any glucose present producing a change in the colour of the dye from pink to blue.

The diagram shows the results when the urine from three people was tested with Clinistix.



(ii) Describe and explain the results for person C. _____

_____

_____ [2]

(iii) Give **one** advantage of using Clinistix for this test rather than using the normal food test for sugar.

_____ [1]

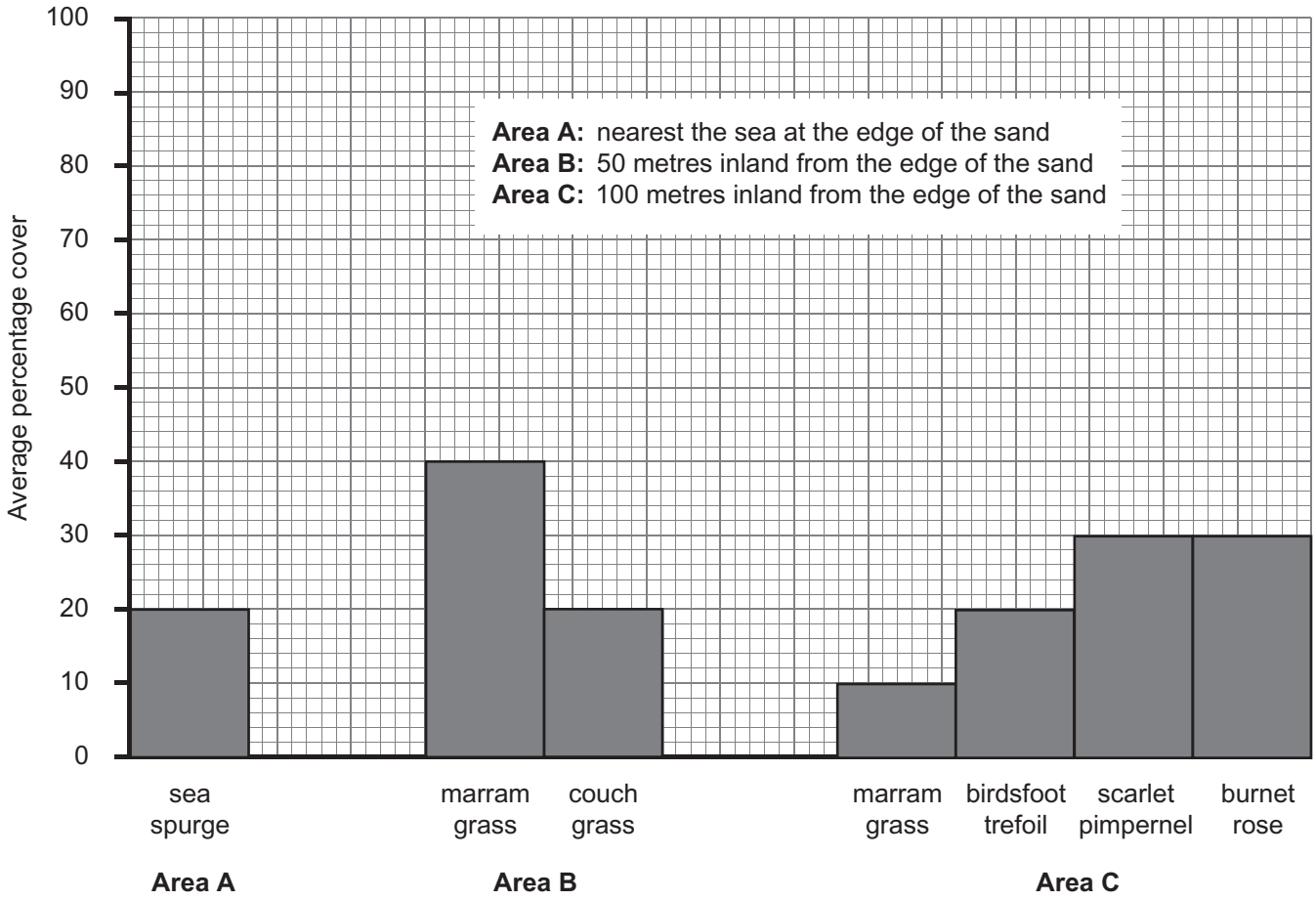
(iv) Suggest why the Clinistix will only react with glucose.

_____ [1]

Examiner Only

Marks	Remark

5 **(a)** Pupils carried out an investigation into plant distribution and physical (abiotic) factors on sand dunes in April. The graph below shows their results for the plant distribution.



(i) Give **two** trends shown by the graph across the three areas.

1. _____

2. _____ [2]

(ii) Suggest **one** explanation for these trends.

_____ [1]

Examiner Only	
Marks	Remark

(b) Describe how the pupils would have carried out this investigation into plant distribution. Your account should describe how they would have measured **one** physical factor.

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

[6]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** During strenuous exercise, lactic acid is produced in certain tissues.

The table below gives figures for the lactic acid level in these tissues during strenuous exercise and for a period of time after the exercise stops.

The exercise was carried out for a fifteen minute period.

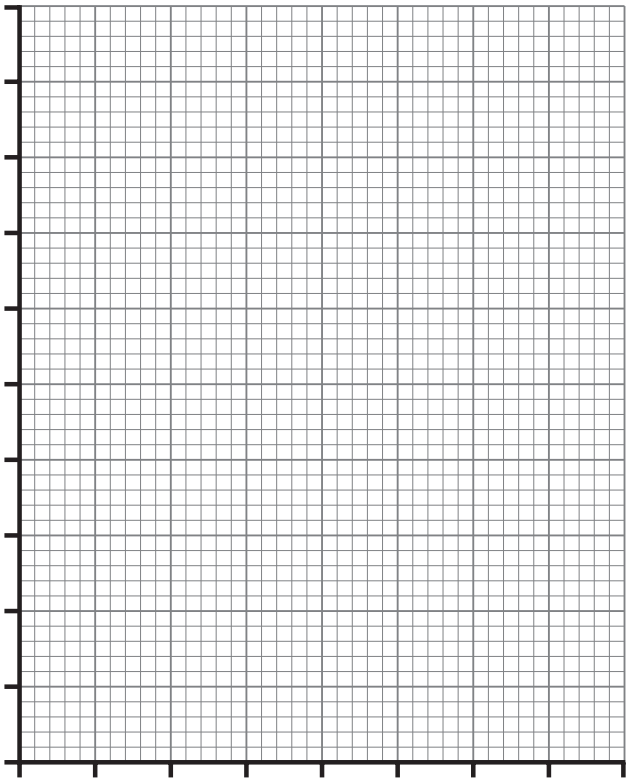
	Time after start of exercise/min	Lactic acid level in tissue/arbitrary units
Exercise started →	0	0
	10	80
Exercise stopped →	15	95
	20	70
	40	35
	60	22
	80	0

(i) Name the tissue where lactic acid is produced.

_____ [1]

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(ii) Using the data in the table, plot and draw a line graph on the axes below to show how the lactic acid level changed over time.



[4]

Using the information in the table or graph, calculate:

(iii) the rate of increase in the lactic acid level during the first fifteen minutes.

_____ arbitrary units/min [1]

(iv) the rate of decrease in the lactic acid level between fifteen and forty minutes.

_____ arbitrary units/min [1]

(v) Describe the difference between the two rates and explain what causes the initial increase in lactic acid.

_____

_____

_____

_____

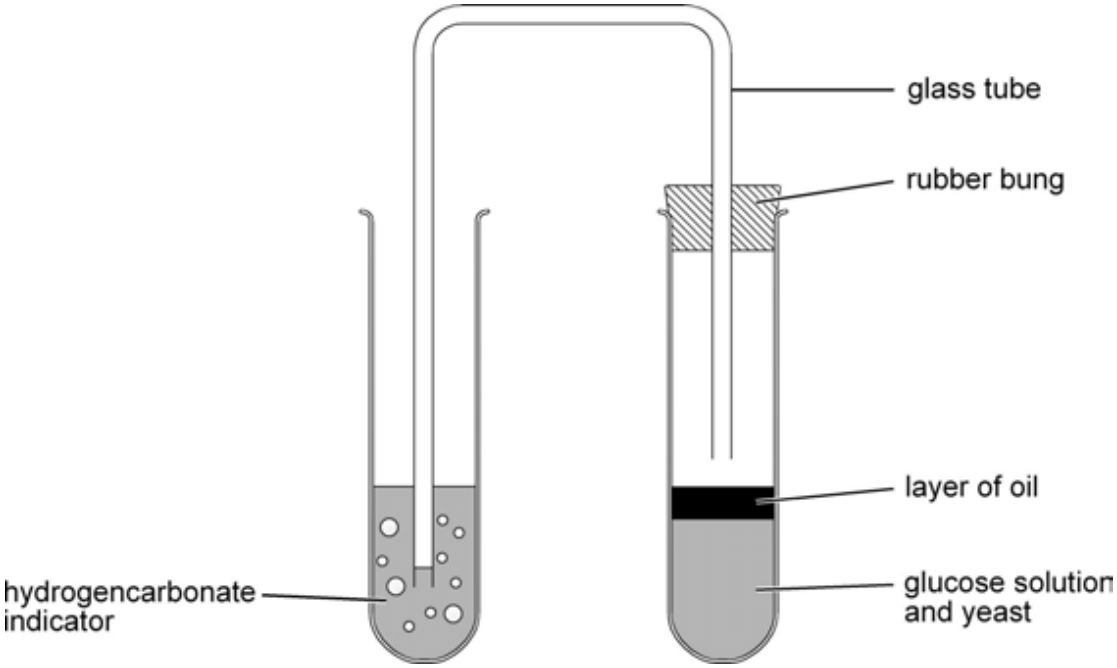
_____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

(b) The diagram shows apparatus that was set up to investigate respiration in yeast.



Adapted from GCSE Quick Check Study Guide ISBN 0-17-448153-5

(i) Suggest the function of the layer of oil.

_____ [1]

(ii) What colour would you expect the hydrogencarbonate indicator to be after thirty minutes?

Explain your answer.

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

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New Specification

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Unit B1

Higher Tier

[GSD12]

TUESDAY 15 MAY 2012, MORNING

MARK SCHEME

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				AVAILABLE MARKS
1	(a)	(i)	nitrate; lack protein or amino acids *or* calcium; no/weak cell walls [2]	
		(ii)	Any two from: • no/less chlorophyll/ chloroplasts • less photosynthesis • no sugar/starch [2]	
		(iii)	active transport/active uptake; moves minerals against concentration/diffusion gradient or described [2]	
	(b)	(i)	pea plant gets nitrates/can make amino acids/proteins [1]	
		(ii)	bacteria get sugar/glucose/starch from plant/carbohydrate [1]	
		(iii)	denitrification [1]	
		(iv)	improves soil structure/slower release of minerals /improves drainage/less soluble/less run off/less leaching/breaks down slower/adds humus content [1]	
	(c)	(i)	eutrophication [1]	
		(ii)	bacteria decompose/break down (algae/plants); bacteria use up oxygen; [2]	
		(iii)	die/suffocate/fish cannot breathe/numbers decrease/kills [1]	14

				AVAILABLE MARKS
2	(a)	(i)	equilibrate/acclimatise to that colour/time for a steady stream of bubbles/time to stabilise/time to adjust [1]	
		(ii)	any one from: • amount pondweed • amount of carbonate in water/concentration amount of CO_2/ concentration of carbonate • temperature (of water) • amount of water in beaker/amount of solution • intensity of light/distance of lamp from plant [1]	
		(iii)	less time taken to produce gas bubbles/O_2 produced faster/only took 110 s to produce O_2; shows **more** photosynthesis/more starch/more glucose; more yield/faster growth [3]	
	(b)	(i)	phototropism/tropism [1]	
		(ii)	hormone [1]	
	(c)		unequal distribution of auxin/more auxin on shaded side/auxin moves to the left; causes more cell *elongation* on side away from light/more growth on shaded side/faster growth on that side [2]	9