WJEC GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT B2 FOUNDATION TIER 4471 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

S16-4471-01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

P.M. TUESDAY, 17 May 2016

1 hour

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

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ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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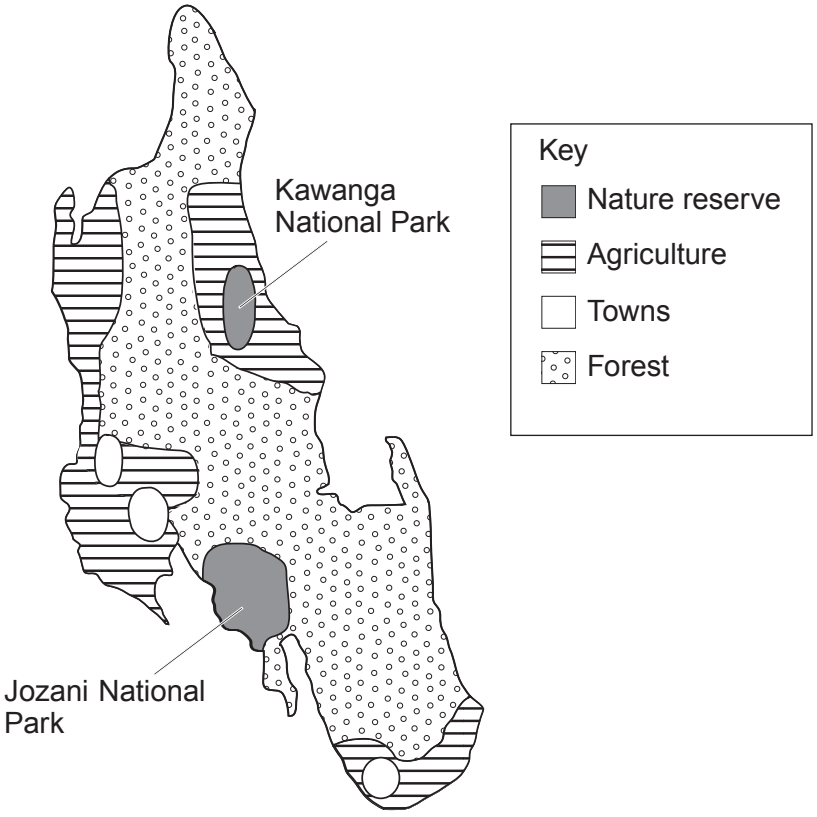
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Answer **all** *questions.*

1. The red colobus monkey *(Procolobus kirkii)* lives in forests on the island of Zanzibar, feeding on leaves and tree bark. It is an endangered species and its numbers are declining because of human activities. This is despite the species being protected in the National Parks.



In 2012 conservationists estimated that there were 1600 red colobus monkeys on the whole island, with 50% of them living in the Jozani National Park. 150 colobus monkeys were then moved from the Jozani National Park to the Kawanga National Park to increase the population there. The diagram below shows a map of the island of Zanzibar.



Fact File – Human activities which harm the red colobus monkey.
The illegal capture for sale as pets in other countries.
Destroying habitat by using land.
Poisoning and hunting by farmers.

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(a) Use only the information opposite to answer the following questions.

(i) What is the habitat of the red colobus monkey on the island of Zanzibar? [1]

.....

(ii) Give **two** ways in which the use of land by humans has caused the habitat to be destroyed. [2]

.....

.....

(iii) The Kawanga National Park has not been as successful as the Jozani National Park in protecting the red colobus monkey. Suggest a reason for this. [1]

.....

(iv) Calculate the number of monkeys estimated to be living in the Jozani National Park after the conservationists had moved some of them to the Kawanga National Park. [2]

Number of monkeys= .....

(b) How could the Convention on the International Trade in Endangered Species (CITES) help to protect the red colobus monkey? [1]

.....

7

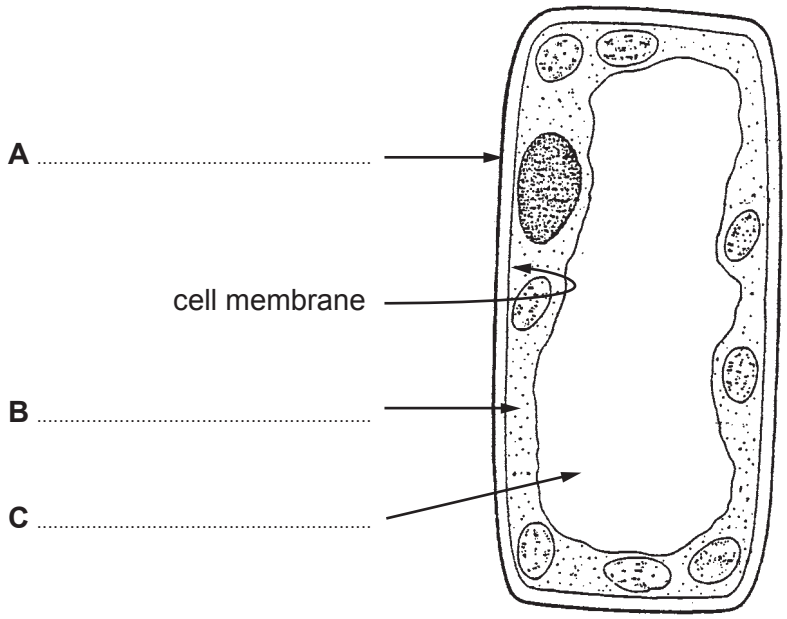
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2. *(a)* (i) Complete the labels **A**, **B** and **C** on the diagram of a plant cell below. [3]



(ii) State the function of the cell membrane. [1]

.....

(b) (i) Which two structures shown on the diagram would **not** be present in an animal cell? Underline your answer. [1]

A and B **A and C** **B and C**

(ii) Name a structure shown in the diagram which would be present in both an animal cell and a yeast cell. [1]

.....

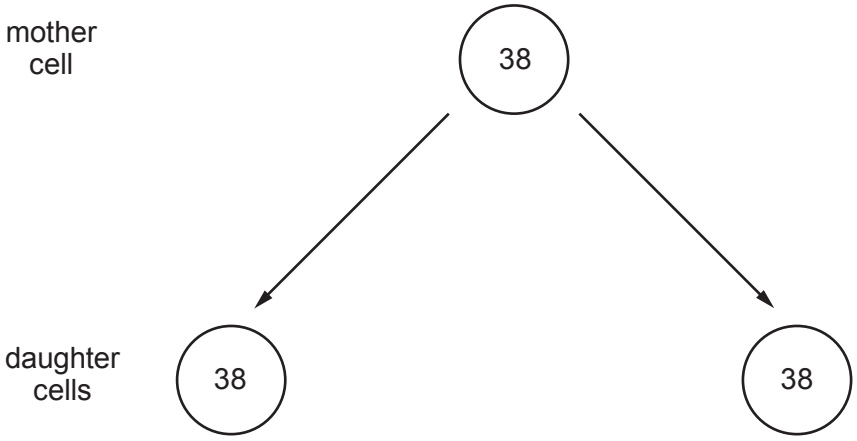
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3. The diagram below shows cell division of a cell from a cat. The number of chromosomes is shown.



(a) What name is given to the type of cell division shown in the diagram? Give a reason for your answer. [2]

Type of cell division .....

Reason .....

(b) The table shows the numbers of chromosomes in the cells of pigeons and humans before and after dividing by meiosis.

(i) Complete the table. [1]

	number of chromosomes	
	cell before meiosis	sex cells (sperm and egg cells) after meiosis
human	46	
pigeon		40

(ii) State how many sex cells would be produced from one cell by meiosis and give the scientific term for these sex cells. [2]

.....

.....

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(c) The table below shows some animals, the number of chromosomes in their body cells and their adult body length.

animal (not shown to scale)		mean adult body length (cm)	number of chromosomes in body cells
carp fish		80	104
chimpanzee		100	48
earthworm		10	36
goat		65	60
hedgehog		15	88

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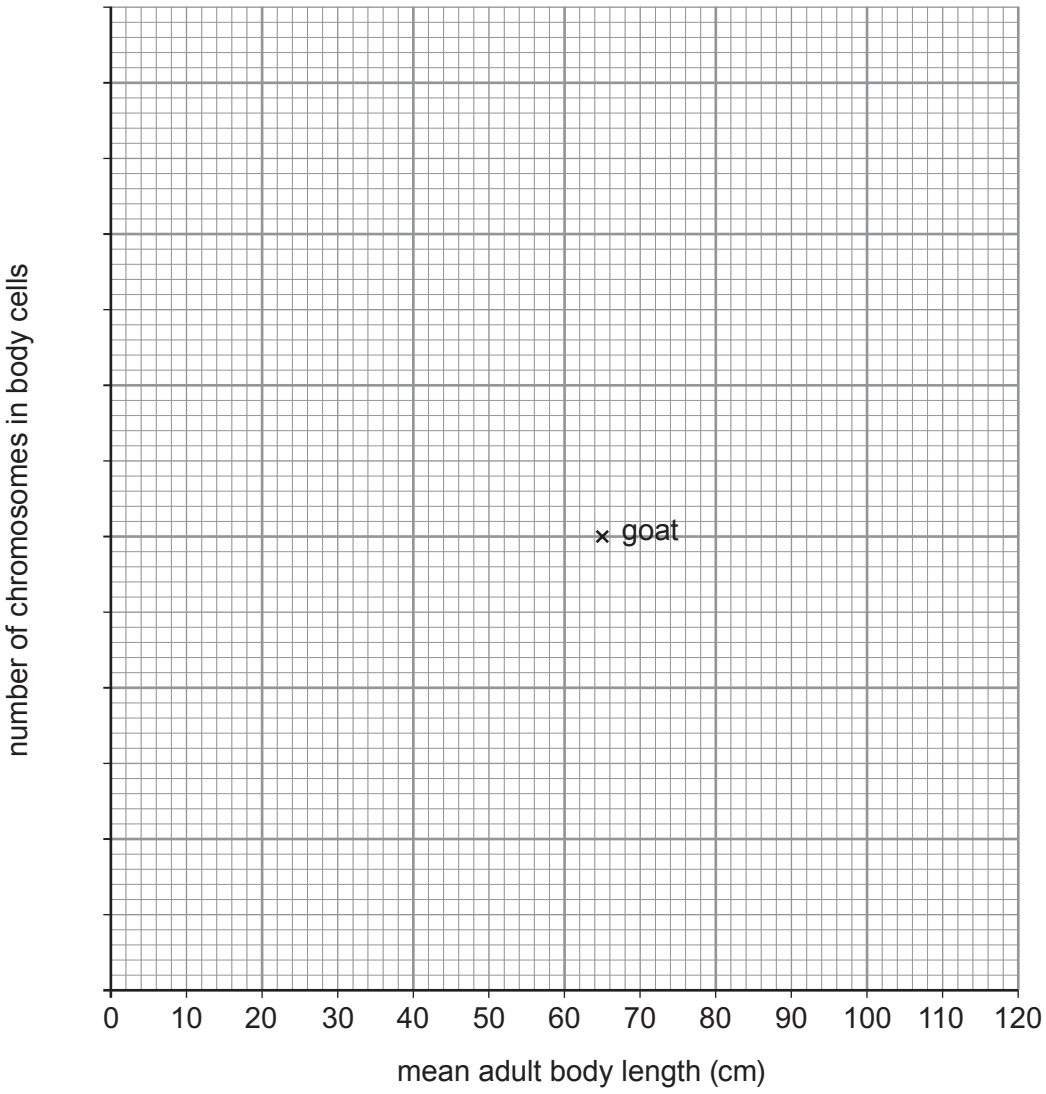
(i) Complete the **scattergraph** below by:

I. adding a scale for the number of chromosomes, [1]

II. plotting the values for each animal, [2]

III. labelling each of your plots.

The goat has been done for you.



(ii) What does the information in **this scattergraph** show?
Underline your answer. [1]

A. The larger animals have larger numbers of chromosomes.

B. The size of an animal is not related to the number of chromosomes.

C. The smaller animals have larger numbers of chromosomes.

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4. *(a)* Complete the sentences below. [2]

During photosynthesis chlorophyll absorbs ..... energy. Carbon dioxide and ..... are converted into glucose and ..... .

(b) The glucose formed in photosynthesis may be stored as starch. Scientists investigated the effect of different concentrations of carbon dioxide on the rate of photosynthesis in algal cells. They recorded the mass of starch produced.



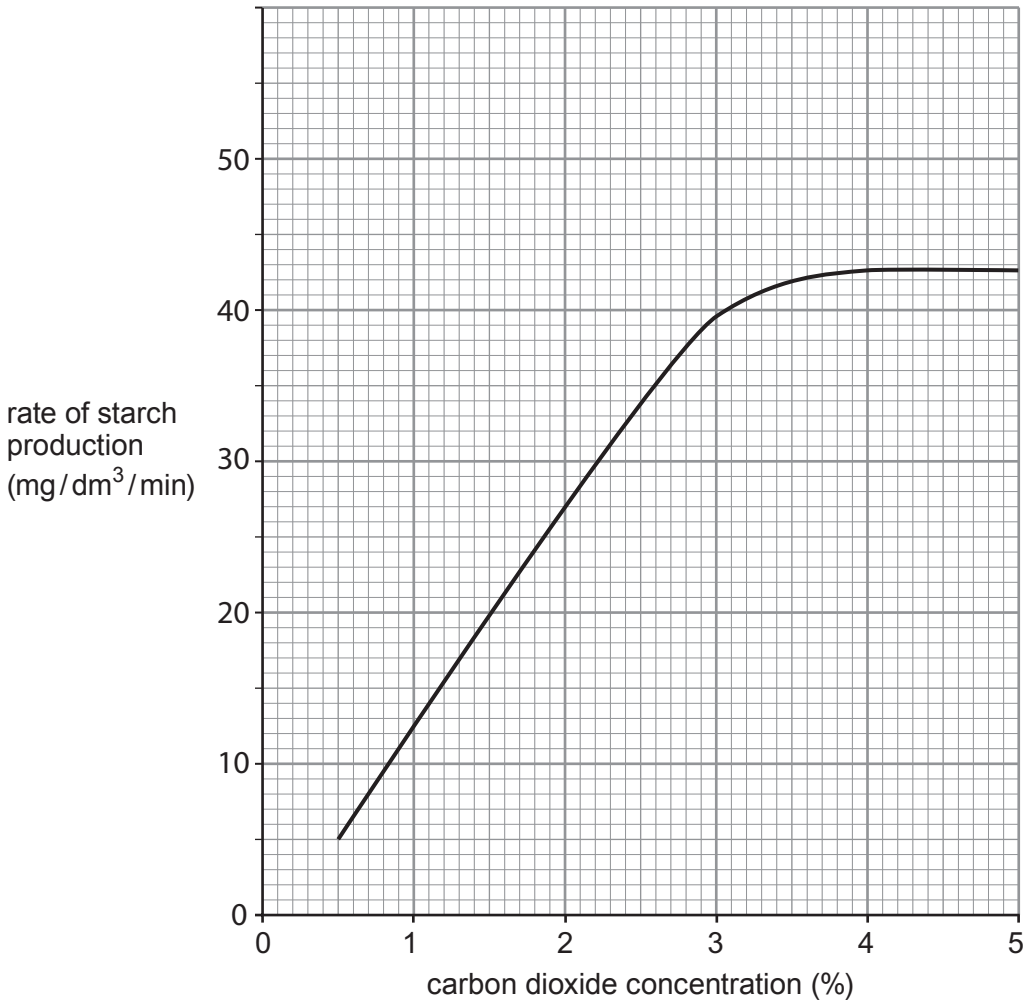
Large numbers of algal cells in containers with different concentrations of carbon dioxide.

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The results of the investigation are shown on the graph below.



From the graph

(i) Describe the effect of increasing carbon dioxide concentration on the rate of starch production. [2]

.....

.....

(ii) Calculate the change in the rate of starch production between levels of 1.5% and 2.5% carbon dioxide. [2]

..... (mg / dm^3 / min)

(c) A chemical is used to indicate the presence of starch.
Name the chemical and describe the colour change that would indicate a positive result. [2]

Chemical: .....

Colour change: .....

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5. *(a)* Smoking affects health. State how people are made aware of this when they buy packets of cigarettes. [1]

.....

(b) (i) Cigarette smoke contains tar which causes cancer.
Following laboratory observations in 1971, doctors predicted rates of lung cancer linked to cigarettes containing different levels of tar. Their predictions were based on people smoking 15 cigarettes per day.

tar content (mg / cigarette)	predicted rates of lung cancer (cases / 100 000 population)
7	10
9	15
11	108
17	146
22	174

Giving evidence from the table, describe the effect of different levels of tar on the predicted rate of lung cancer. [2]

.....

.....

(ii) In the 1970s, low tar cigarettes became cheaper and many people were smoking far more than 15 cigarettes per day. Suggest the effects on the rates of lung cancer in these people. [1]

.....

(c) Name **one** medical condition, other than cancer, which is linked to smoking cigarettes and describe the effects on the person. [2]

.....

.....

6

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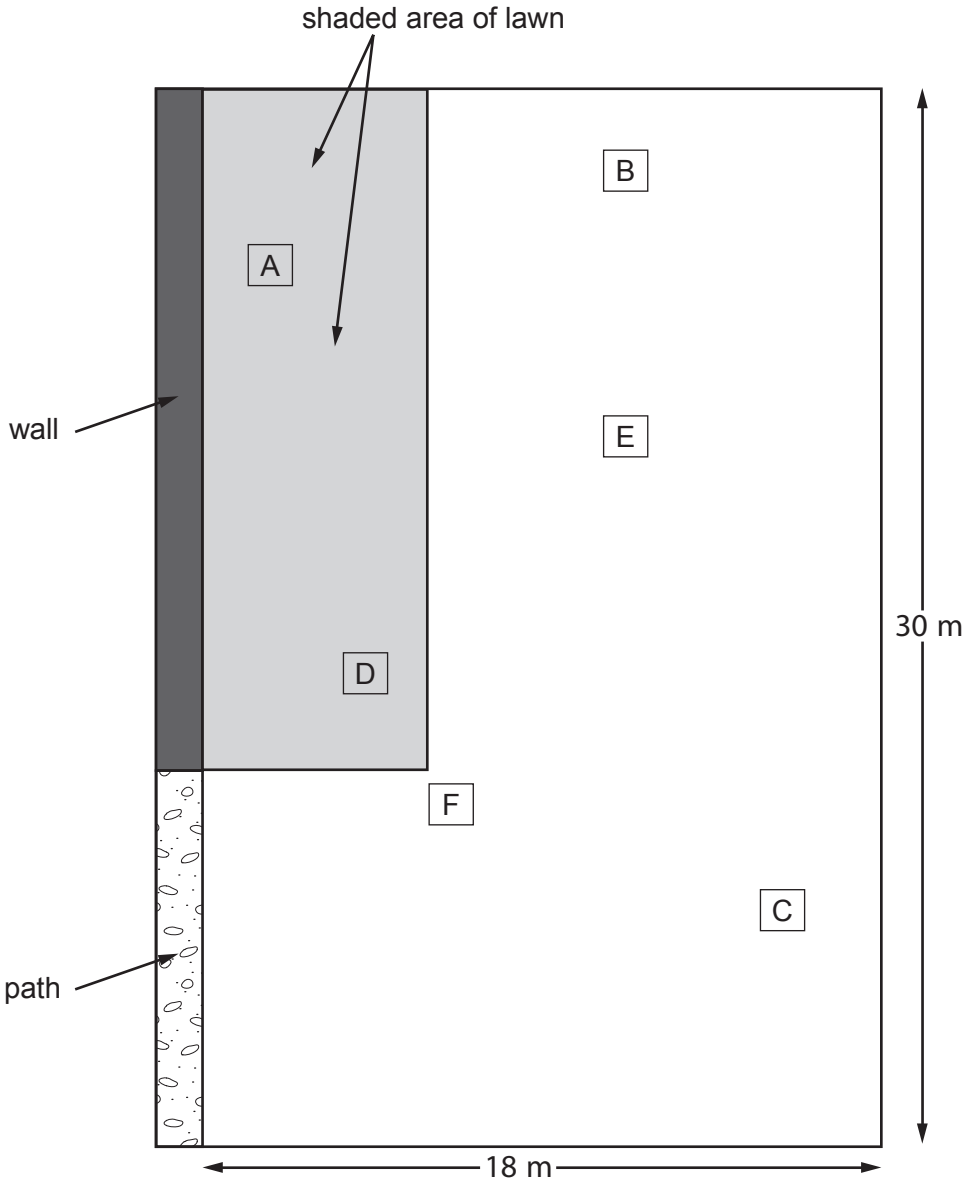
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6. Some students investigated the number of dandelion plants on a lawn. The diagram shows the lawn and the location of 6 quadrats (A to F) which the students had placed at random on the lawn.



Key: ☐ quadrat

The students counted the number of dandelions in each quadrat and recorded their results in the table below.

quadrat	number of dandelions
A	7
B	2
C	1
D	6
E	2
F	0

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(a) Each quadrat measured $1\,m^2$.
Calculate the mean number of dandelions per square metre for the 6 quadrats. [1]

Mean number of dandelions = ...

(b) Calculate the area of the lawn. [1]

Area of lawn = ...

(c) Use your answers from parts *(a)* and *(b)* to estimate the total number of dandelions on the lawn. [1]

Estimated total number of dandelions = ...

(d) In fact, the **actual** number of dandelions on the lawn is 1250.
Use the formula below to calculate the percentage error of the estimate in part *(c)* above. [1]

$$\text{percentage error} = \frac{\text{estimated number of dandelions} - \text{actual number of dandelions}}{\text{actual number of dandelions}} \times 100$$

percentage error = ... %

(e) How could the strength of evidence in the investigation be improved? [1]

.....

.....

5

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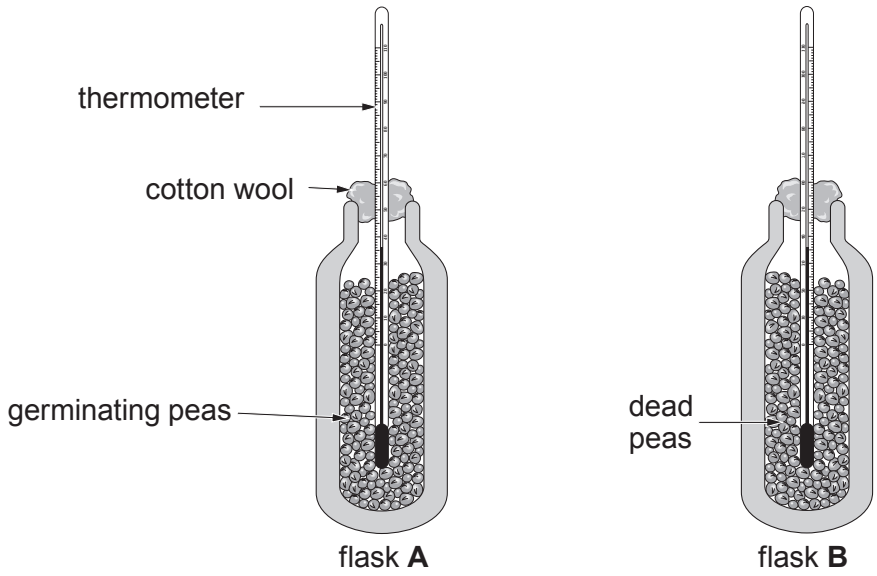
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7. Dan and Beth investigated the heat released by germinating peas.

The diagram below shows their experiment.



(a) The temperature of the peas in each flask was recorded at the start of the experiment and after two days. The results are shown in the table below.

flask	temperature (°C)	
	start	after two days
A	21	28
B	21	21

Describe and explain the results for **both** flasks. [3]

.....

.....

.....

.....

.....

.....

(b) The students did not disinfect the peas before setting up the experiment.
Explain the importance of disinfecting the peas in order to make a valid conclusion. [2]

.....

.....

.....

.....

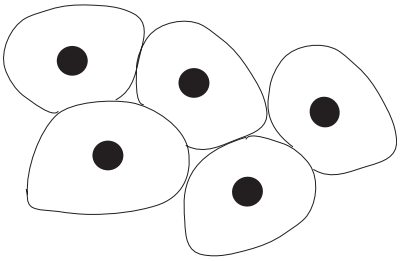
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8. *(a)* The drawing below shows human embryonic stem cells.



What features of stem cells could make them useful in treating many different medical conditions? [2]

.....

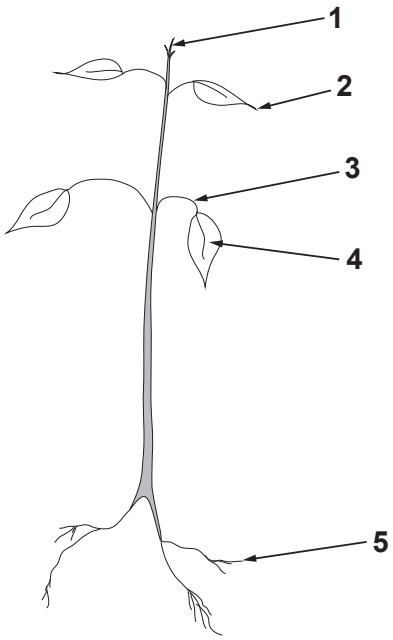
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(b) A laboratory in Japan has recently developed stem cells from human adult skin cells. Suggest why using human adult stem cells might be preferred to using human embryonic stem cells. [1]

.....

.....

(c) Plants also have stem cells.



Which **two** numbered parts (**1** to **5**) of the plant shown above contain stem cells? [1]

..... and .....

4

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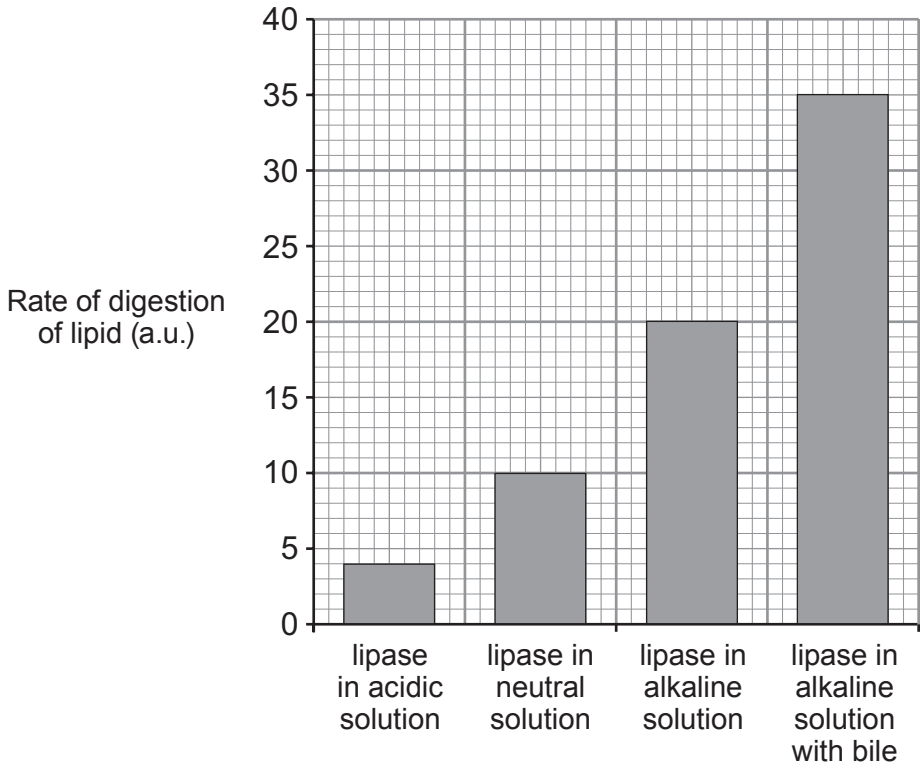
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9. *(a)* Why do we need to digest large food molecules? [1]

.....

.....

(b) The graph below shows the rate of digestion of lipids by lipase under different conditions.



(i) Describe the effect of pH on the rate of digestion of the lipids. [1]

.....

.....

(ii) Explain the effect of bile on the rate of digestion of the lipids. [2]

.....

.....

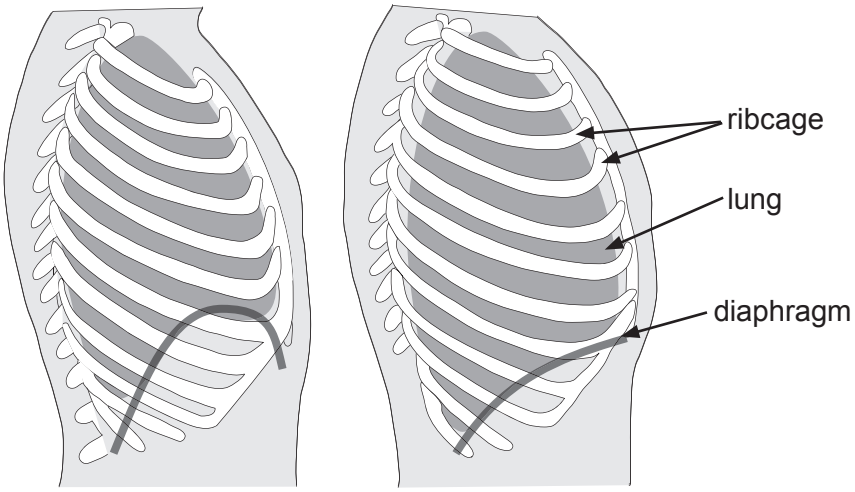
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10. The diagrams below show side views of the chest cavity before and after inspiration (breathing in).



Using both diagrams, explain how the movements of the **diaphragm and ribcage** bring about inspiration (breathing in). [6 QWC]

END OF PAPER

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GCSE MARKING SCHEME

SUMMER 2016

SCIENCE – BIOLOGY 2
4471/01/02

INTRODUCTION

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

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

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

GCSE Biology 2 – Foundation only questions

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)	(i)		1	Forest;	trees		
			(ii)		2	Agriculture; Building /Towns;	Farms/ farmland/ use of land to grow crops		deforestation
			(iii)		1	Surrounded by agricultural land/ smaller area (at Kawanga); it = Kawanga	reverse argument for Jozani		Near to agricultural land
			(iv)		2	1600/2 -150; Answer 650; (Incorrect answer, correct method =1) Correct answer , no working =2)	649.92/ 649.9		
		(b)			1	Any one from: • {prevent /work against/ control/ ban/ stop} selling monkeys to other countries/ • stop exporting of monkeys/ • stop trafficking of monkeys;			Hunting/ poaching/ selling monkeys unqualified
		Total Mark			7				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
2		(a)	(i)		1 1 1	<u>Cell</u> wall; Cytoplasm; Vacuole;	 Cell sap		
			(ii)		1	{Allow/ control/ lets/ enables } entry and exit of molecules/substances/ particles/ 'things';	Controls what goes in and out (of the cell)	protection	
		(b)	(i)		1	A **and** C;			
			(ii)		1	cytoplasm/nucleus/cell membrane;			
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)			1 1	Mitosis; correct spelling Any one from: • two <u>daughter/ new</u> cells/ • <u>daughter</u> cells have same chromosome number as the mother cell;	There is only one division	Genetically identical to mother cell/ there are only two cells	
		(b)	(i)		1	Column 1 80 Column 2 23 Both correct for **1 mark**			
			(ii)		2	4; Gametes/ sperm/ egg;			
		(c)	(i)		1 2	Correct scale (must include 0 at origin and go up to at least 110); all plots correct and labelled (2 marks);; tolerance ±½ small square 1 error = 1 mark More than one error = 0 marks Joining plots with line = 1 error Missing 1 label = 1 error Missing more than1 label = 2 errors			
			(ii)		1	B;			
		Total Mark			9				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
4		(a)			1 1	Light; Water **and** Oxygen;	sunlight		Sun/ solar
		(b)	i		2	increase then {plateau/ levels off}; plateau occurs at 4%;	Range of 3-4%	Reference to figures from *y*-axis	
			ii		1 1	34 – 20; 14; (correct answer but no working shown = 2) (incorrect answer but correct readings = 1)			
		(c)			2	Iodine (solution); {Yellow/Orange/Brown} to {blue-black / black};	Iodide		
		Total Mark			8				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
5		(a)			1	{Warnings/ notice/ information/ pictures} {<u>on packets/ on the back</u>};	'Smoking kills' on the packet		
		(b)	(i)		2	Tar content increases (rates of lung) cancer increases; Large increase at 11(mg) tar;	ORA		
			(ii)		1	Increases (rate of lung cancer);			
		(c)			2	Emphysema/ description of emphysema/ COPD; Coughing/shortness of breath / short of oxygen ; **OR** Heart disease/ CVD; Heart attack/ heart failure/ thrombosis **OR** Stroke; Mobility/ paralysis/ speech difficulties **OR** Angina; Chest pain/ mobility issues	Damage to alveoli		
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6	**1**	(a)			1	3;	3 per m^2 $3/m^2$ 3 m^{-2}		$3m^2$
		(b)			1	540$\underline{m^{2;}}$ unit needed			
		(c)			1	1620; allow ecf from (a) and (b)			
		(d)			1	29.6; allow ecf from (c)	30		
		(e)			1	Any one from: • increase {number/ area/ size} of quadrats/ • repeat investigation / • do two separate studies – one of shaded area and one in the full sunlight area;	Use a bigger sample size/ throw quadrat more often	Throw the quadrat more	Use transects
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	**2**	(a)			3	• (only) living things respire/ {germinating/ living} peas respire (dead do not)/ peas in A respire; • producing heat (linked to respiration); • so temperature rose in flask A but not in flask B;	ORA		
		(b)			2	• (disinfectant) kills {microorganisms/ bacteria/ fungi}; Any one from: • which would {respire/ release heat}/ • so you can be confident that the {heat release/respiration} is from the peas;	Destroys	get rid of	Denatures/ stops them growing
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	**3**	(a)			2	undifferentiated/ not specialised; can turn into/grow into/ change into/ can differentiate into different kinds of {cells/tissues/organs};	Named cell/ tissue/ organ		
		(b)			1	Any one from: • Destruction of life/ destruction of embryos/ • {reduced/no} {ethical/ moral} issues / {less/no} public disquiet;	Religious issues/ embryos do not have a choice		playing god
		(c)			1	1 **and** 5;			
		Total Mark			4				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	4	(a)			1	Any one from: • (small enough) to be absorbed/ • to make food soluble/ • to pass {into the blood/ through the intestine wall};	ORA	To make them smaller	
		(b)	i		1	the rate (of digestion) increases when {pH/ alkalinity} increases; it = rate of digestion	ORA At high pH it is faster		
			ii		2	bile emulsifies fat/ bile turns fat into {droplets/ globules}; bile creates greater surface area for {lipase/enzyme} to work on;	Bile breaks down fats into droplets	Bile breaks down fats	
		Total Mark			4				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
10	5				6 QWC	Indicative content: *diaphragm* • contracts • flattens/ moves down *ribcage* • moves up **and** out • volume of chest/ thorax increases • air pressure in chest/ thorax falls • lung volume increases/ lungs inflate • external air pressure is now higher • so air rushes/is pushed in **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant inaccuracies in spelling, punctuation and grammar. **0 marks**			
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			2	carbon dioxide + water; ⟶ *glucose* + oxygen;	Correct symbols		
		(b)			4	1. **X** has photosynthesised; 2. **X** has starch; 3. **Y** no photosynthesis; 4. starch {turned (back) into glucose/used up}/ destarched;			Reference to stored glucose
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)			2	Ratio of A:T approximately equal; Ratio of G:C approximately equal;	Similar masses/ similar ratio		Similar results/ numbers/ amount
		(b)			2	Sugar phosphate label pointing to sides of structure; Base molecule pointing to square/ oblong;	arrow to phosphate labelled sugar and vice versa/ arrow to bond		Arrow to hydrogen bond
		(c)			3	{AAA/ codon/ three bases/ triplet} {are/is} missing; {Triplet code / three bases} determine amino acid; Amino acids determine the protein;			
		Total Mark			7				

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Question Number								
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			2	Anjum produces less lactic acid/ concentration of lactic acid is lower; It is broken down quicker / removed quicker / repays oxygen debt quicker/ needs a shorter time to recover;			
		(b)			1	The marathon runner does not need to release energy {quickly / in a short time} (like a sprinter);			
		Total Mark			3				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(a)	(i)		1	Loses {water/ volume} when placed in salt solution;			
			(ii)		1	Does not gain or lose {water/ volume} in this range/ stays the same in these concentration/ no net movement of water;			
		(b)			2	Any two from: • pH; • Temperature; • Volume of solution;			Ph/ ph Heat
		(c)			4	• Water passes out; • by osmosis; • from the cell where water is in higher concentration to sea water where it is in lower concentration; • Via semi-permeable membrane;			
		Total Mark			8				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	10	(a)			2	Any two from: • Pesticide becomes {diluted/ less concentrated}/ pesticide has to be added every two weeks; • does not kill all fish lice; • pesticide kills the lice if above 2.5 concentration ;			
		(b)	(i)		1	biological / biocontrol;			bio
			(ii)		3	Any three from: • Effect of wrasse on biodiversity/ would wrasse {harm/ effect} other species/ become pests; • Would wrasse reproduce/ survive; • Would {salmon/ other predators} eat the wrasse; • Would wrasse spread disease; • Could enough wrasse be obtained / bred to meet demand; • The cost of wrasse is less than the cost of pesticides; • Check wrasse do not leave cages;			
		Total Mark			6				

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Question Number			
FT	HT	Mark	Answer
	11	6 QWC	*Indicative content:* **Reference to international trade in species** -Legislation aims to prevent trade in endangered species. **Sites of special scientific interest** -Allow ecosystems to develop unharmed. **Captive breeding** - Endangered spp. can be reintroduced to their habitats. **National parks/ nature reserve** - Allow large scale management of ecosystems via controlled ecotourism/ stop destruction of habitat **Seed banks** - Preservation of rare species for future planting. **Legislation of fishing quotas** - Prevents over fishing and allows build-up of stocks. **Prevent poaching/ hunting of animals** - increase in legislation to stop hunting **Educational awareness e.g. WWF** – make people aware of advantages of conservation **Legislation against pollution/ litter –** relevant examples **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

W16-4471-01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

A.M. THURSDAY, 7 January 2016

1 hour

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

4471 010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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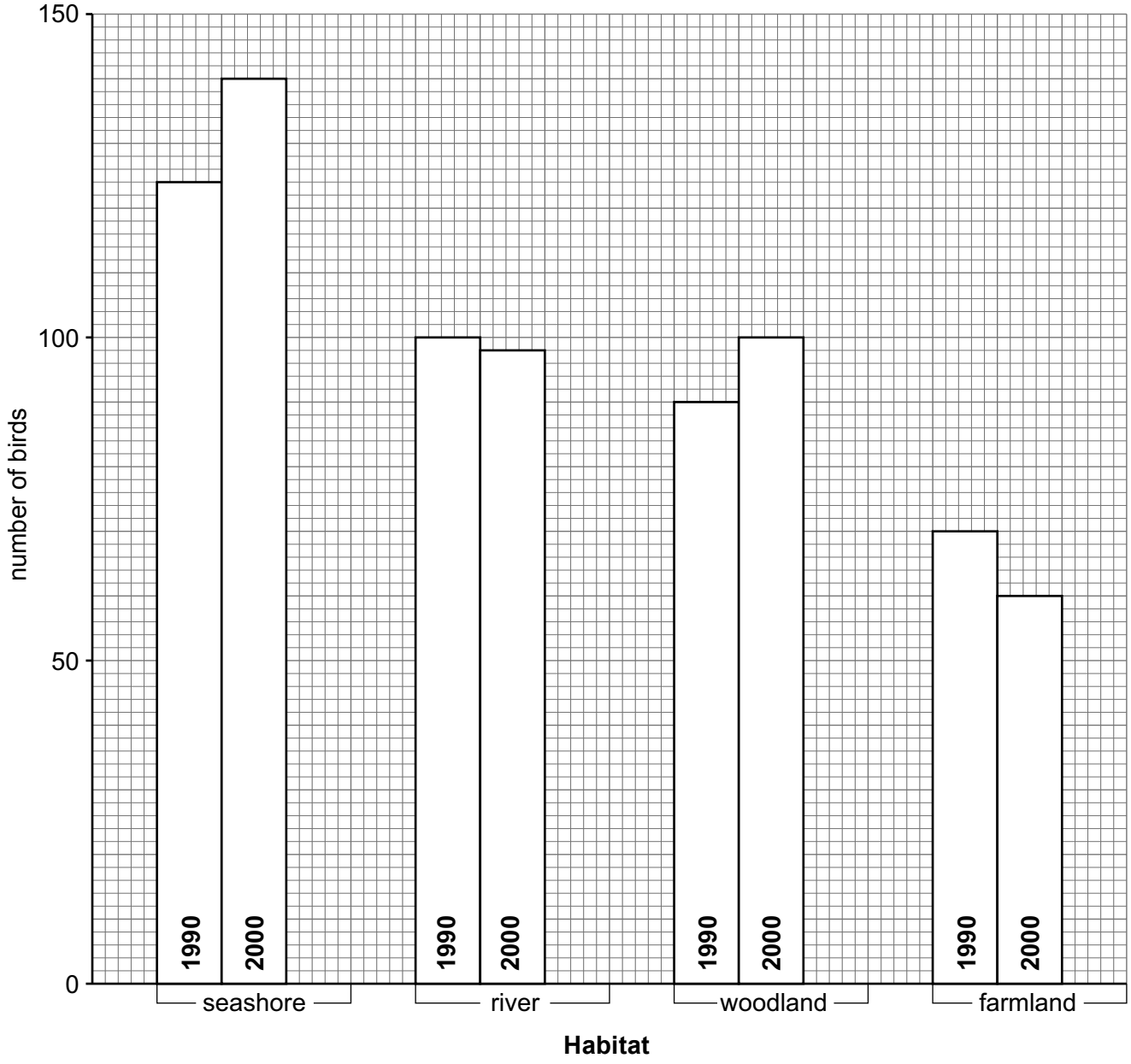
Examiner only

Answer **all** *questions.*

1. *(a)* Scientists recorded the number of birds in a small area of the UK in 1990, 2000 and 2010.

They studied four habitats.

Their results for 1990 and 2000 are shown in the bar chart and results for 2010 are shown in the table.



habitat of bird	number of birds in 2010
seashore	120
river	95
woodland	96
farmland	44

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(i) Use the table at the bottom of page 2 to complete the bar chart to show the number of birds in 2010. [3]

(ii) From the bar chart, identify [3]

I. a habitat where numbers of birds increased between 1990 and 2000 but decreased in the next ten years;

.....

II. a habitat which showed a decrease in numbers of birds for the periods 1990 to 2000 and 2000 to 2010;

.....

III. the habitat with the greatest decrease in numbers of birds from 1990 to 2010.

.....

(iii) The scientists also noted the number of different species of birds in each habitat.

Which habitat had the greatest biodiversity?
Underline your answer. [1]

Sea birds – 19 species

River birds – 26 species

Woodland birds – 38 species

Farmland birds – 17 species

(b) In another survey carried out in 2010, scientists found that many birds, commonly seen in Wales, had decreased in number since 1995. Their results are shown in the table below.

species of bird	number in 1995	number in 2010	decrease in number of birds
Yellow Wagtail	15000	0	15000
Starling	300000	60000	.....
Willow tit	.....	1200	2300

(i) Complete the missing data in the table above. [1]

(ii) Suggest a reason for the decrease in numbers of farmland birds in Wales in recent years. [1]

.....

.....

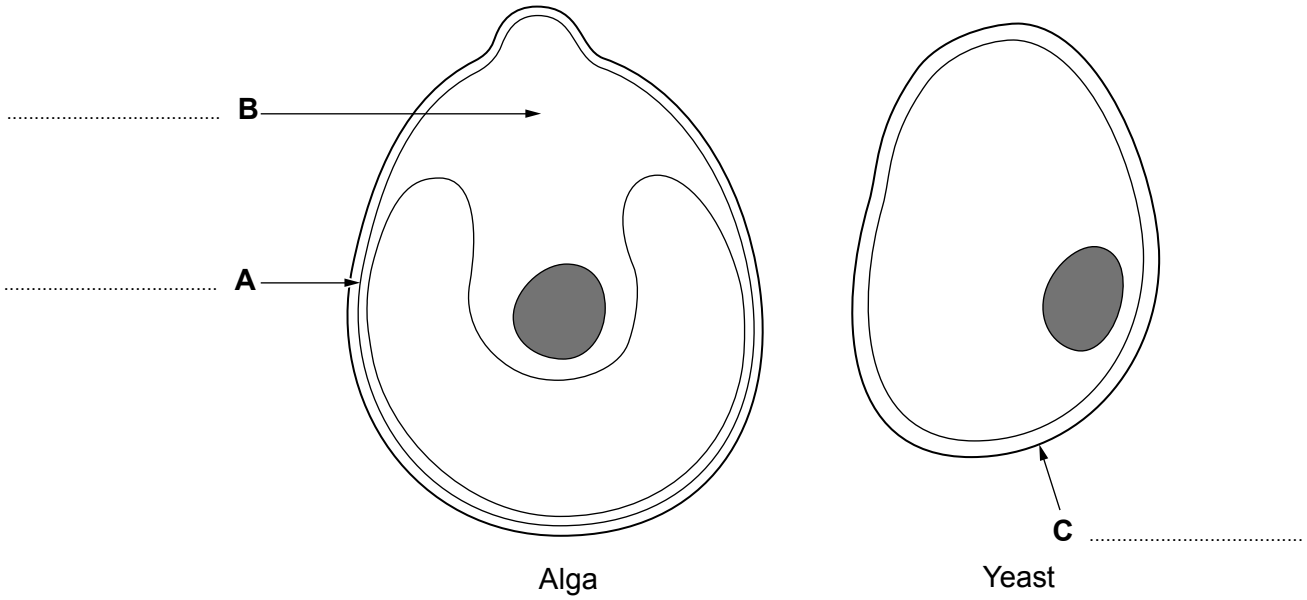
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2. The diagrams show cells of two micro-organisms.



Alga Yeast

(a) (i) Complete labels **A**, **B** and **C** on the diagrams. [3]

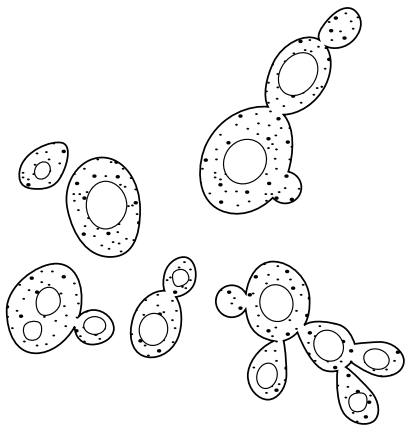
(ii) Name the group of organisms to which yeast belongs. [1]

.....

(b) Name a structure which is present in yeast and algal cells but is absent from bacteria. [1]

.....

(c) The diagram below shows asexual reproduction in yeast.



Name the process used in asexual reproduction in yeast, as shown in the diagram. [1]

.....

(d) How do bacterial cells reproduce asexually? [1]

.....

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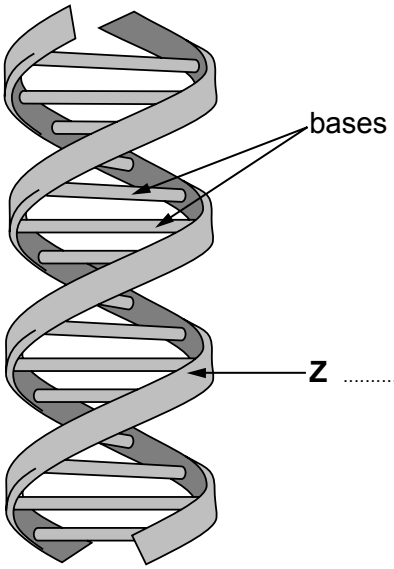
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3. *(a)* The diagram shows the structure of a small section of DNA.



..... and .....

(i) Complete the diagram by writing the names of the **two** molecules which make up the chain shown by **Z**. [1]

(ii) The bases are known by four letters. One is **A**.

I. State the letter names of the other **three** bases. [1]

A ....

II. Describe how the bases are arranged in DNA. [2]

.....

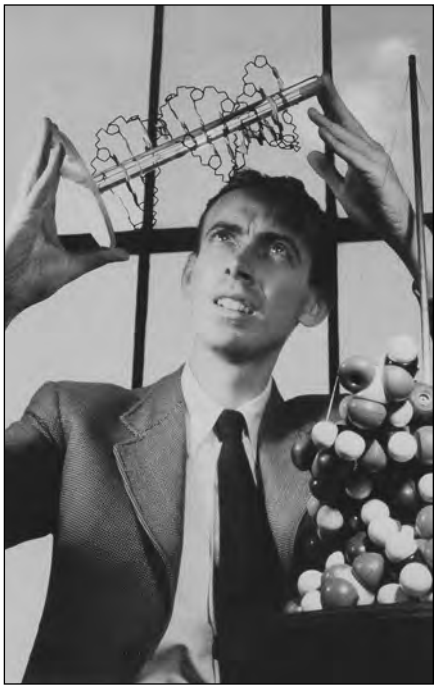
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(b) The photograph shows James Watson, a scientist who investigated the structure of DNA in the 1950s.



Choose the correct statement to complete the sentence. [1]

The structure of DNA was discovered by

A one scientist using one technique.

B one scientist using many different techniques.

C a number of scientists using different techniques.

D a number of scientists using the same technique.

Answer .....

(c) State the part of a living cell which contains DNA. [1]

.....

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4. *(a)* Complete the word equation for photosynthesis. [2]

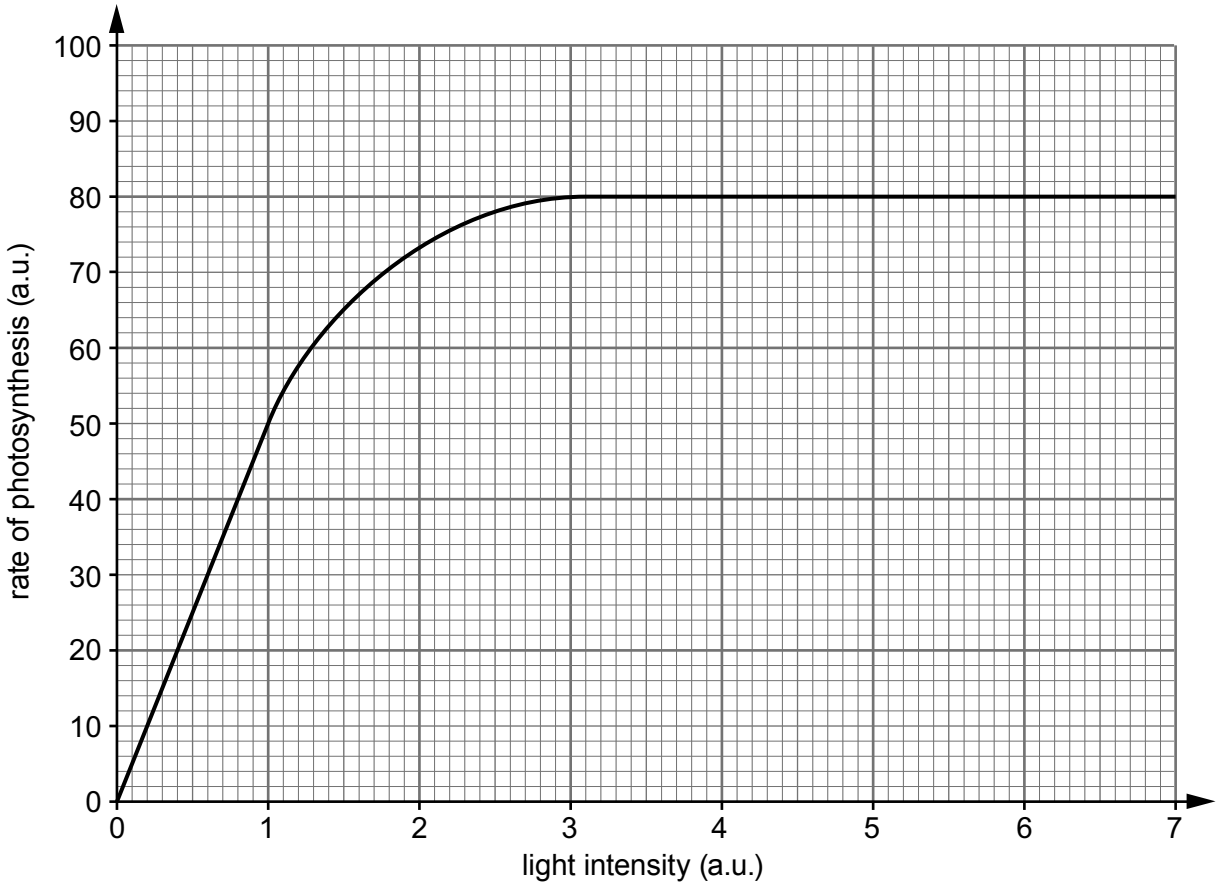
..... + water $\xrightarrow{\text{light}}$ ..... + glucose

(b) Photosynthesis occurs in chloroplasts. Explain why chloroplasts are necessary for photosynthesis to occur. [2]

.....

.....

(c) The graph below shows how the rate of photosynthesis varies in different light intensities.



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Use the graph to:

(i) describe how the rate of photosynthesis changes as the light intensity increases; [2]

.....

.....

(ii) calculate the change in the rate of photosynthesis between 1 and 3 units of light intensity. [2]

Answer ..... a.u

8

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5.

Ragwort – a problem plant



- The poisonous weed, ragwort *(Jacobaea vulgaris)* was taken to New Zealand in 1870 and the plants became a serious problem on cattle farms by the 1930s.
- Chemical weed-killers, which controlled ragwort on sheep farms, were poisonous to cattle, so scientists investigated using plant-eating insects to control the ragwort.

Results of investigations.

name of insect	original habitat of insect	observations
cinnabar moth	New Zealand	reproduced slowly and ate ragwort leaves
weed beetle	New Zealand	reproduced slowly and ate leaves and stems of ragwort
plume moth	Europe	reproduced quickly and ate all parts of ragwort

In 2005 the Environmental Authority gave permission for plume moths to be used freely on cattle farms throughout New Zealand.

Use this information and your knowledge to answer the questions.

(a) Give a reason why ragwort caused serious problems for cattle farmers in the 1930s. [1]

.....

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(b) Ragwort was introduced to New Zealand by people arriving from another country.

State the scientific term used for a species which is introduced in this way and give **one** *other* example from the table. [2]

.....

.....

(c) What name is given to the type of control where insects are used to control pest species such as ragwort? [1]

.....

(d) From the table, state **one** way in which the plume moth was better than the weed beetle in controlling ragwort. [1]

.....

.....

(e) Suggest what the Environmental Authority would have to do before giving permission for the plume moth to be used freely in New Zealand. [1]

.....

.....

6

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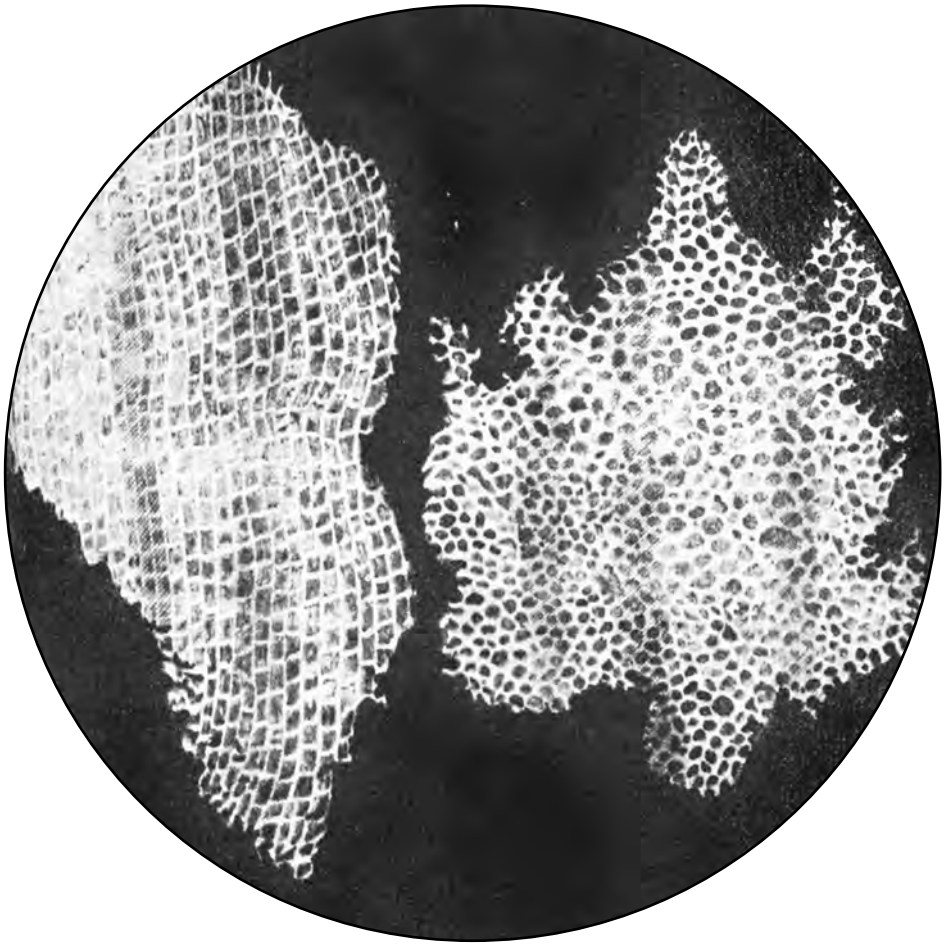
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6. Robert Hooke (1635 – 1703) was an English scientist who studied the structure of living organisms using one of the first light microscopes. In 1665 Hooke viewed a thin cutting of cork (tree bark) and discovered empty spaces, surrounded by walls, which he called cells. The work of Hooke and other scientists led to the development of the Cell Theory.

Hooke's drawing of cork as viewed under the light microscope



(a) What does the Cell Theory state? [1]

.....

.....

(b) Viruses were discovered in the 1950s. State **two** reasons why viruses are not thought to be living organisms. [2]

(i) .....

(ii) .....

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(c) You are provided with a sample of pond water containing single-celled swimming organisms. Which microscope would you use to observe the swimming action of these organisms? Place a tick (✓) in the box under the microscope you would choose and state the reason for your choice. [1]

Light microscope
(magnification up to x 1 500)



☐

Electron microscope
(magnification up to x 500 000)



☐

Reason .....

.....

4

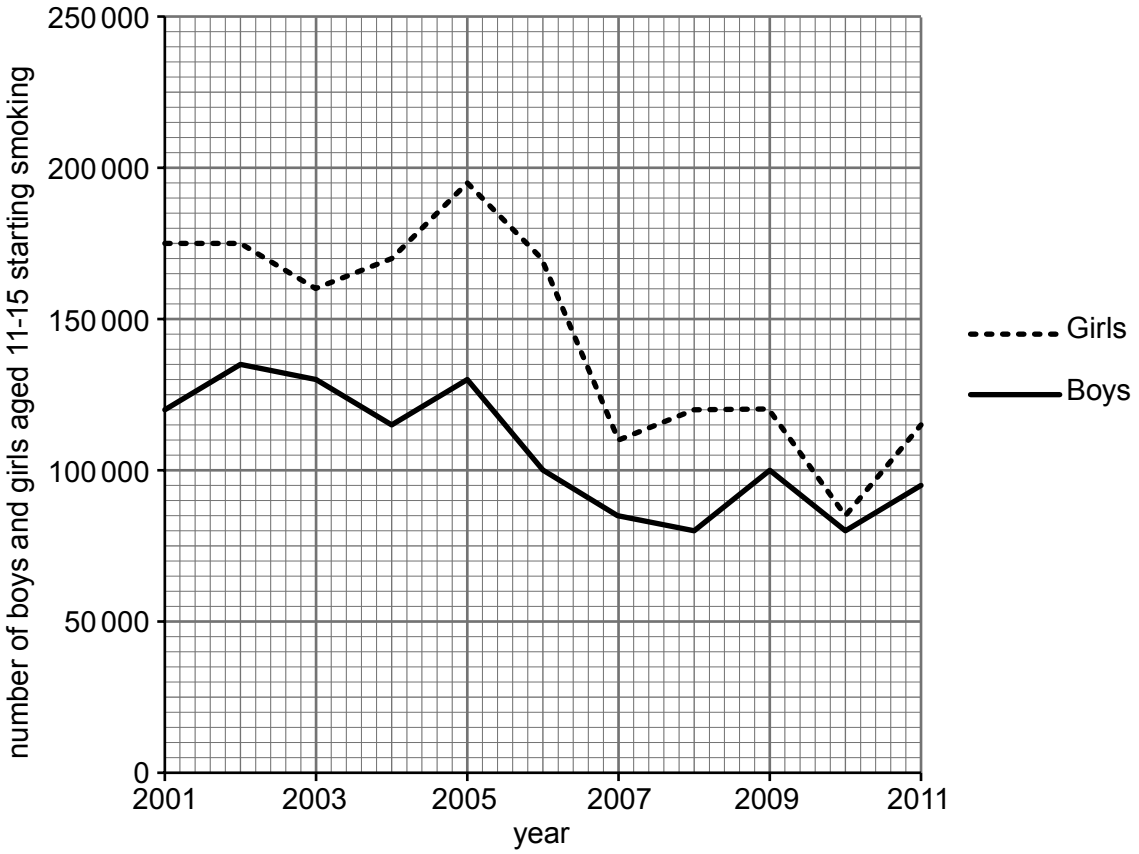
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7. The graph below shows the number of boys and girls aged 11 – 15 who started smoking each year between 2001 and 2011 in the UK.



Cancer Research UK

(a) (i) Give **two** trends which are shown in the graph. [2]

I. .....

II. .....

(ii) In 2009 the population of the UK was estimated at 62 million. In the same year, 102 000 people died in the UK from tobacco smoking related disease.
Calculate the percentage of the UK population who died from tobacco smoking related disease in 2009. Show your working. [2]

Percentage of population = ... **%**

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(b) Cotinine is a chemical found in tobacco smoke. It is found in the saliva and urine of tobacco smokers. Simple test kits are available which can test for the presence of cotinine in saliva and urine.

In 2011 the percentage of 15 year old boys and girls in the UK who admitted smoking tobacco regularly was:

Boys 8% Girls 10%

However, based on cotinine test results of volunteer 15 year old boys and girls, the figures are more likely to be:

Boys 21% Girls 19%

(All data from Cancer Research UK)

Suggest why the admitted levels of smoking amongst 15 year old boys and girls is almost 50% less than the results indicated from the cotinine tests. [1]

.....

.....

.....

(c) Explain how the smoking related disease, emphysema, affects the function of the lungs. [2]

.....

.....

.....

7

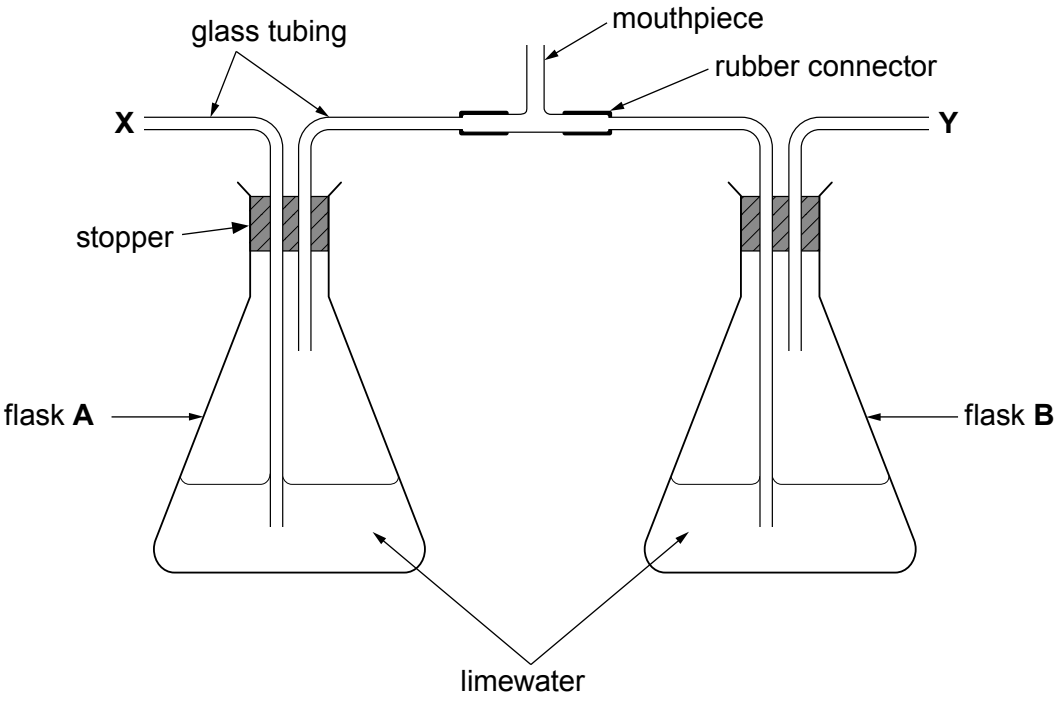
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8. Mair set up the following apparatus in a school laboratory in order to investigate the difference between inspired and expired air.



(a) Draw an arrow at **X** and another at **Y** to show the direction of air flow through the apparatus when air is gently breathed in and out at the mouth piece. [2]

(b) Mair breathed gently in and out through the mouth piece for 1 minute.

(i) Complete the table below to show the expected **appearance** of the limewater after 1 minute. [2]

	flask **A**	flask **B**
appearance of limewater after 1 minute	.....	.....

(ii) Explain the **difference** in the appearance of the limewater after 1 minute. [2]

.....

.....

(c) If Mair had breathed gently in and out through the mouthpiece for 5 minutes, how would the results she obtained have been different? [1]

.....

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9. A student ate a chicken sandwich made from bread, butter and chicken for lunch. Describe fully what happens to the food in the sandwich from the time it enters the **mouth** to the time it leaves the **stomach**. [6 QWC]

.....

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6

END OF PAPER

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GCSE MARKING SCHEME

JANUARY 2016

SCIENCE – BIOLOGY 2
4471/01/02

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INTRODUCTION

This marking scheme was used by WJEC for the January2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

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

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

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Biology 2 Foundation Tier

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)	i		3	four bars correct height;;; (3 = 2marks 2= 1mark)	½ small square tolerance on height		
			ii		3	I woodland/ seashore; II river/farmland; III farmland;			
			iii		1	woodland;			most birds
		(b)	i		1	240 000 **and** 3500;			
			ii		1	loss of habitat/ habitat destruction/ loss of nest sites;	cutting down {hedges/ trees}/ monoculture/ pesticides/ herbicides/ insecticides	farmland destroyed/ deforestation/ more predators/ hunting/ climate change/ pollution/ building	quarrying/ dumping/ landfill/
		Total Mark			9				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
2		(a)	i		3	A cell membrane; B cytoplasm; C cell wall;			
			ii		1	fungi;			
		(b)			1	nucleus;			
		(c)			1	budding;			
		(d)			1	{divide/ split} in <u>two</u>;	binary fission	separate	doubled/ mitosis/ split in half
		Total Mark			7				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
3		(a)	i		1	sugar **and** phosphate;			
			ii	I	1	T C G (any order); **1 mark**			
				II	2	**Any two from:** A-T; C-G; they are in pairs;		triplet code/ double helix	
		(b)			1	C;			
		(c)			1	nucleus;	chromosome		
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)			2	carbon dioxide; oxygen;	CO_2 O_2		CO^2/ CO2 O2/ O^2
		(b)			2	{contains/ has} chlorophyll/ chlorophyll is found in chloroplast; Absorbs light ;	 {traps/ takes in} light		Chlorophyll alone attracts light
		(c)	i		2	(rate) increases then {plateaus/ stays the same}; at 3 a.u. light intensity;			
			ii		2	80 - 50; 30;	Correct answer = 2 marks		
		Total Mark			8				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
5		(a)			1	(ragwort/ weedkiller) are poisonous;	cattle are killed		cattle are harmed
		(b)			2	alien (species); Plume moth;			
		(c)			1	biological (control)/ biocontrol;			bio
		(d)			1	more parts of plant eaten/ it eats all parts of the plant reproduction rate high/ reproduced quickly; it = plume moth	weed beetle ate less parts of the plant / weed beetle only ate leaves and stems/ weed beetle reproduced slower **must be comparative**		
		(e)			1	to check that Plume moth did not {attack/ eat/ destroy/ harm} other {species/ organisms/ animal/ OWTTE}/ did not compete with other (native) {species/ organisms/ plant / animal/ OWTTE}(for resources)/ does not carry disease/ does not become a pest itself;			find out if there are problems
		Total Mark			6				

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Question Number								
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6	**1**	(a)			1	cell is the basic unit of life all living things are made of cells/ new cells are created from old cells (OWTTE);	cells make up all organisms cells divide into new cells	 cells can split and divide	
		(b)			2	**Any two from:** • do not have a cellular structure; • require a host to make new viruses/can only reproduce <u>inside</u> a cell; • do not grow; • do not produce waste; • do not respond to stimuli; • do not have an energy metabolism/ do not respire (OWTTE); • can be crystallised	not made of cells	 do not have metabolism	do not have a nucleus/ membrane/ cell wall/ DNA/ RNA
		(c)			1	light microscope **and** **Reason –** <u>living</u> organisms cannot be observed under the EM/ EM can only observe <u>dead</u> organisms; **Both for 1 mark**			Electrons kill organisms
		Total Mark			**4**				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	**2**	(a)	i		2	{number/ number of boys/ number of girls} <u>starting</u> smoking is decreasing; difference between the number of boys and girls <u>starting</u> smoking is narrowing ;			More girls start smoking than boys/ less boys start smoking than girls
			ii		2	102 000/ 62 000 000 x100; 0.16/ 0.16451613/ 0.165/ 0.2%;	Correct answer = 2 marks		0.17
		(b)			1	smoking seen as anti-social/ smoking now known to affect non-smokers/ do not want {parents/ carers} to know/ smoking under age is illegal;		Passive smoking	
		(c)			2	reduces surface area of {alveoli/ air sac}/ {alveoli/ air sac} {tear/ rip open/ become smooth/ damaged}/ causes lungs to fill up with liquid; reduces oxygen in {blood stream/ body}/ less gas exchange **2nd mark is linked to 1st mark**			
		Total Mark			**7**				

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<table>
<tr><th colspan="2">Question Number</th><th colspan="3" rowspan="2">Sub-section</th><th rowspan="2">Mark</th><th rowspan="2">Answer</th><th rowspan="2">Accept</th><th rowspan="2">Neutral answer</th><th rowspan="2">Do not accept</th></tr>
<tr><th>FT</th><th>HT</th></tr>
<tr><td>8</td><td>3</td><td>(a)</td><td></td><td></td><td>2</td><td>both arrows pointing → 1 mark each ;;</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(b)</td><td>i</td><td></td><td>2</td><td><table><tr><th></th><th>Flask A</th><th>Flask B</th></tr><tr><td>Appearance of limewater after 1 minute</td><td>clear/ colourless/ transparent/ slightly cloudy;</td><td>cloudy/milky/ chalky/ white;</td></tr></table></td><td></td><td></td><td>flask A - no change</td></tr>
<tr><td></td><td></td><td></td><td>ii</td><td></td><td>2</td><td>expired air contains more carbon dioxide than inspired air;
therefore turns (the limewater) {cloudy quicker/ more cloudy};</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(c)</td><td></td><td></td><td>1</td><td>limewater in flask A would also have turned cloudy/limewater in both flasks would have turned {cloudy/ cloudier};
must relate to answer given in table</td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Total Mark</td><td></td><td>7</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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FT	HT	Mark	Answer
9	**4**	6 QWC	**Indicative content** **Mouth** (reference to teeth is not irrelevant) • starch in the bread • is digested to sugars/ glucose/ maltose • by carbohydrase/ amylase • from saliva **Oesophagus/gullet** • food passes along the oesophagus/gullet • by peristalsis/ description of peristalsis **Stomach** (reference to pH is not irrelevant) • protein in chicken • digested to amino acids • by protease **Butter/ fat** • Correct reference to butter not being digested until after the stomach **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)			2	the use of a {living organism/ predator/ animal/ plant/ living thing/ parasite} to {control/ kill/ destroy/ limit}; {alien species / pest/ weed};	alien species (in correct context)		
		(b)	i		2	**Any two from:** • check that target species is being {destroyed/ controlled}; • check that it does not become a pest itself; • ensure that no other species are harmed; • check that it can survive in the environment; • check that it does not carry disease;			affects food chain
			ii	I	1	for every twenty biological control agents {selected/ tested} only one is used/ 1 in {20/21} is successful ;			
				II	1	**any one from:** • risk of {target/pest species} becoming resistant to {chemical control agent/ it}; • (chemical control agent) has many harmful side effects; • (chemical controlled agent) is not very specific/also {kills/ harms} not target species;			affect target species
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			2	both {require/ break down/ use/ need} glucose; both release energy/ produce ATP;	provide energy/ release heat energy	involve glucose	{produce/ create/ make/ generate} energy
		(b)	i		1	18;			
			ii		1	any figure between:1050 - 1100 (cm^3);			
			iii		2	24 x {1240/1250}; (1240) = 29 760 cm^3 (1250)= 30 000 cm^3 ; answer without unit = 1 mark	range of figures1240-1250 Correct answer = 2 marks $30dm^3$		
		(c)			2	**Any two from:** • oxygen reaches {muscles/ blood} quicker/carbon dioxide is removed from {muscles/ blood} quicker; • {more oxygen/greater volume of oxygen} reaches {muscles/ blood} ; • reference to lactic acid/ oxygen debt/ less anaerobic respiration/ more aerobic respiration;			amount of oxygen
		Total Mark			8				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)	i+ ii		1	**both for 1 mark** light **+** temperature;			carbon dioxide/ dark/ cold
		(b)	i		3	**Any three from:** • {least/lowest} glucose (produced); • because no {light/ sunlight}/ it is dark; • so no photosynthesis; • glucose {changed into starch/ used in respiration/ used in energy} ;	lack of light		sun/ less light
			ii		3	{max/ highest} glucose (produced); {high/ most/ more} light; photosynthesis occurs ;			light present
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			3	starch was present in {**A**/ unripe banana}; {sugar/ glucose} was present in {**B/** ripe banana}; starch is {broken down/ digested/ changed} to sugar;			
		(b)	i		3	water moved out of the {banana/ cells/ OWTTE} (by osmosis); from high concentration of water to low concentration of water/ idea of {passing down a gradient or correct solute potential idea}; via Semi Permeable Membrane;			
			ii		2	idea of dynamic equilibrium expressed as equal rate of movement of water in and out/ no net {movement/ flow}; there was no gradient of water concentration/solute potential was equal/ concentrations were equal;			no osmosis similar concentrations
		(c)			1	increase confidence in results;	repeatability/ {identify/ rule out} anomalous results	reliable/ validity	accuracy/ reproducibility/ fair testing
		Total Mark			9				

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Question Number			
FT	HT	Mark	Answer
	9	6 QWC	**Indicative content** • A transect is used. • Stretch a {rope/ tape measure} marked at regular intervals along the length of the field • Identify/ record the plant at each point • Measure/ record the height of each plant • Record {profile/ OWTTE} • Plants are shorter at A than at B because: - More water collects at B than at A - Plants are trampled/ mown/cut at A - Plants at B grown longer towards light/ phototropism - Or other sensible reasons e.g. Wall retains heat so higher temperature/ plants {at B/ by the wall} are protected from the wind **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
		6	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

S15-4471-01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

P.M. TUESDAY, 12 May 2015

1 hour

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

4471 010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

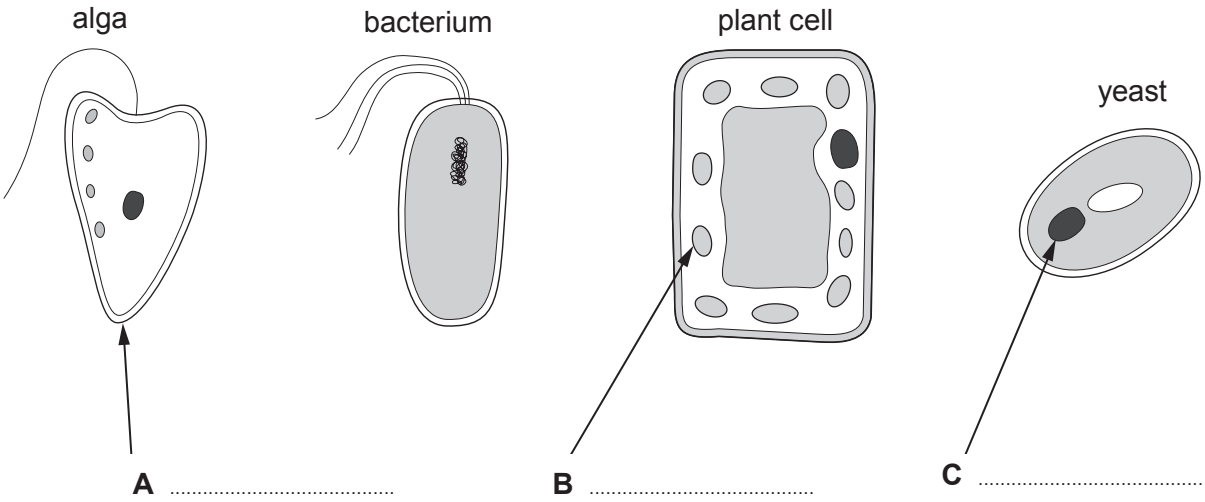
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Answer **all** *questions.*

1. *(a)* The diagrams below show some cells.



(Not drawn to scale)

(i) Name the parts of the cells labelled **A**, **B** and **C** on the diagrams. [2]

(ii) From the diagrams, state which cell [2]

I. is a fungus, ...

II. is a photosynthetic micro-organism, ...

III. reproduces by dividing in two. .....

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(b) In the 19th century, scientists used microscopes to study living cells and put forward the cell theory.

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

According to the cell theory,

all living organisms are composed of many cells;

all cells in a living organism have the same function;

all organisms consist of one or more living cells.

(ii) State **one** reason why the cell theory does **not** apply to viruses. [1]

.....

.....

(iii) Use some of the words below to complete the following sentence. [1]

light microscopes **electron microscopes** **laser imaging**

Modern scientists use ..... when studying living cells but ..... if they are studying dead cells.

4471 010003

7

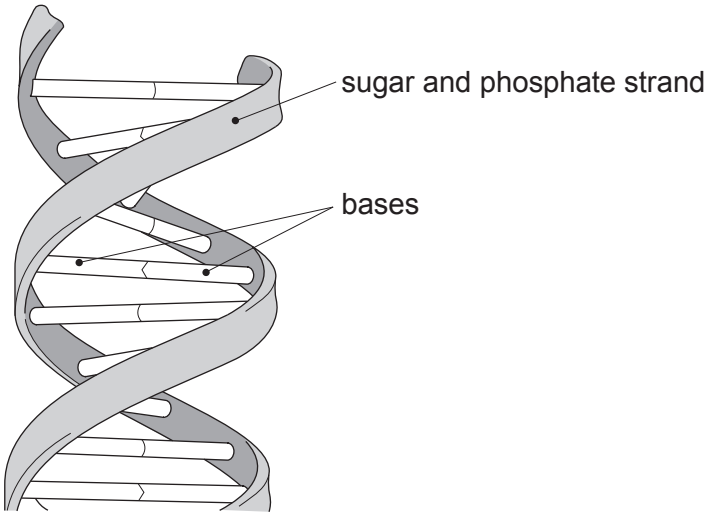
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2. *(a)* The diagram below shows DNA.

Bases A, C, T and G join two strands of sugar and phosphate molecules.

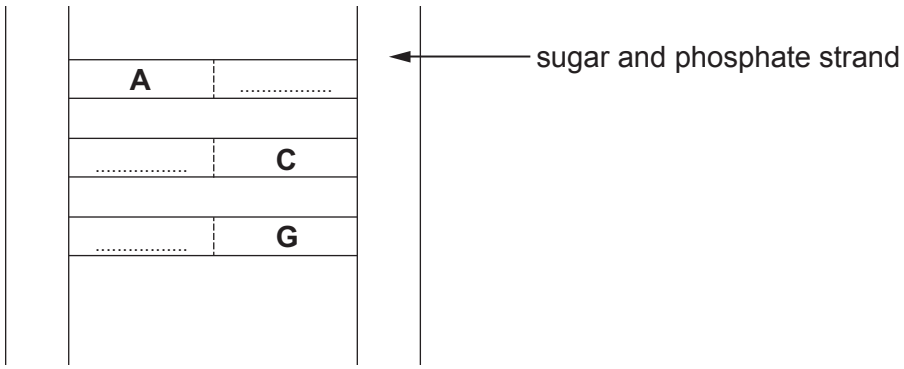


(i) What name is given to the shape of DNA? [1]

Underline your answer

double spiral **double fold** **double helix** **double coil**

(ii) The diagram below shows a very small section of DNA. [2]
Complete the diagram by adding the missing bases.



(b) Use some of the words below to complete the sentence. [1]

salts **amino acids** **minerals** **proteins**

The bases in DNA form a code which is important in building .....

from ..... .

4

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3. *(a)* Complete the table by matching some of the scientific terms below to the information about aerobic respiration in humans. [4]

oxygen **nitrogen** **glucose** **cells**

enzymes **energy** **water**

feature of aerobic respiration in humans	scientific term
where aerobic respiration occurs	.....
gas required for aerobic respiration	.....
waste product of aerobic respiration	.....
control the chemical reactions of respiration	.....

(b) Name the gas which is produced during aerobic respiration and describe how lime water can be used to identify it. [2]

.....

.....

4471 010005

6

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4. Read the information below on bees.

- Bees are insects which feed on nectar from the flowers they pollinate.
- Scientists are concerned because the number of bees in the UK is declining.

Honey bee	Bumble bee	Solitary bee	Bee hive
			

© Annette Love

Bee Facts

	type of bee		
	Honey bee	Bumble bee	Solitary bee
number of species in UK	1	24	260
how the bee lives	hives of 60 000 bees	nests of 200 bees in grassland	nests of 1 bee in grass or bare soil
flowers pollinated by bee	fruit trees, vegetable plants, garden and wild flowers	mainly wild flowers	

Examiner only

Use the information opposite to answer the questions.

(a) Insects which live in groups are called *social insects*. Which types of bees are social insects? [1]

....

(b) (i) Give a reason why solitary and bumble bees decrease in number when more countryside land is used for grazing farm animals. [1]

.....

(ii) In 1980 a bee keeper in west Wales had 8 bee hives. By 2010 he had only 3 bee hives.

Calculate the decrease in the number of his bees during this time.
Show your working. [2]

Decrease in number of bees = ...

(iii) Suggest why honey bees are thought to be more important to humans than the other types of bees. [1]

.....

.....

(c) Conservationists are worried that the loss of bees could reduce biodiversity in the future.

Suggest how the loss of solitary bees could reduce biodiversity. [2]

.....

.....

.....

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7

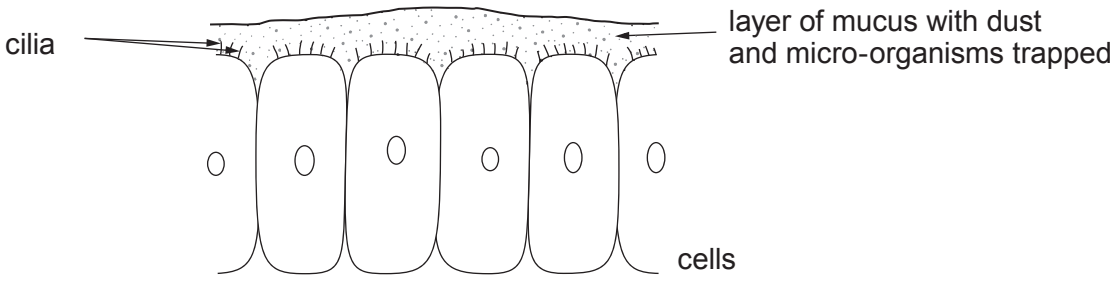
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Turn over.

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5. The diagram below shows some cells from the inner surface of the human lung.



(a) (i) Describe how cigarette smoke affects the cilia and mucus. [2]

.....

.....

.....

.....

(ii) State the substance which is present in cigarette smoke and causes lung cancer. [1]

.....

(b) In the 1960s doctors carried out investigations on men over the age of 35 to see if there was a link between smoking cigarettes and lung cancer. The results are shown in the table below.

number of cigarettes smoked per day	deaths from lung cancer (per 100 000) population)
0	2
5	4
10	8
20	18
40	104

(i) Plot a line graph of the results above on the grid opposite by: [4]

I. choosing a scale for the number of cigarettes smoked per day,

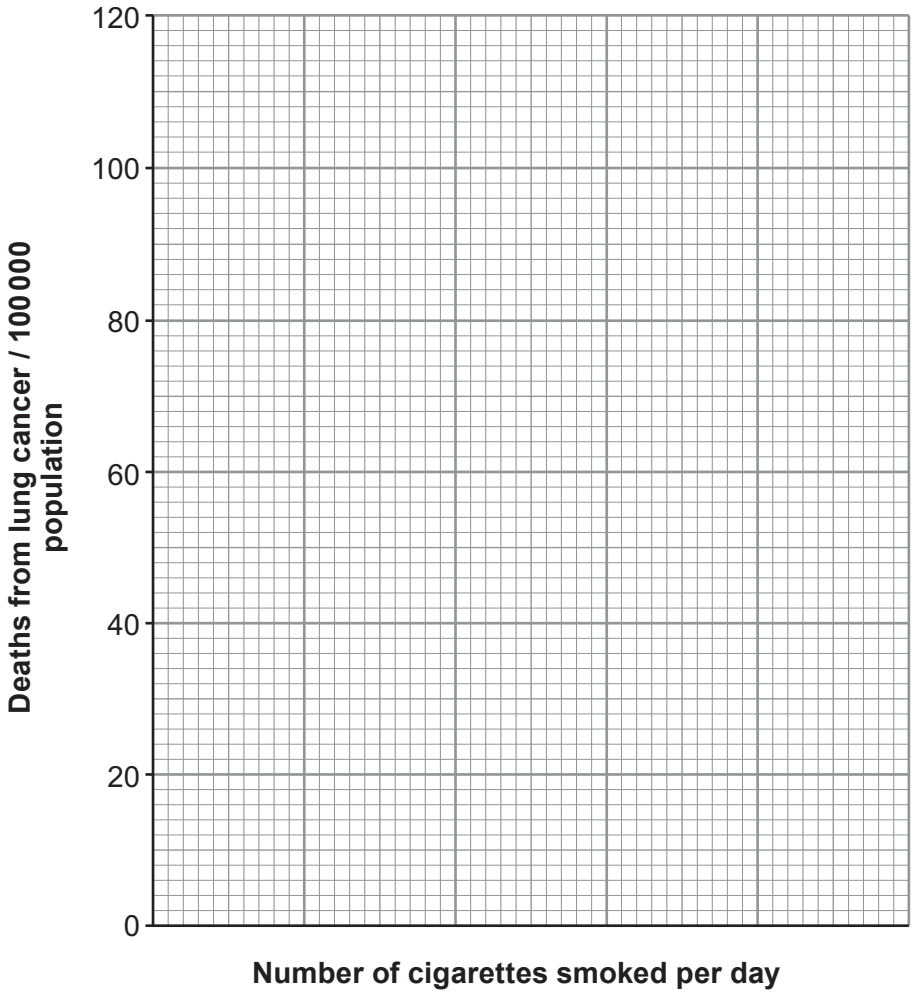
II. plotting the values,

III. using a ruler, drawing a line to join the plots.

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(ii) From your graph, describe in detail how an increase in the number of cigarettes smoked relates to the number of deaths from lung cancer. [2]

.....

.....

.....

(iii) Use your graph to estimate the deaths from lung cancer for people smoking 30 cigarettes a day. [1]

Deaths per 100 000 = ...

(iv) Cigarette manufacturers argued that **this set of results** did not prove that lung cancer was caused by cigarettes and could be caused by other factors. Use the data to suggest a reason for their statement. [1]

.....

(c) In April 2007 the Welsh government banned people from smoking in enclosed public spaces such as cinemas. What was the reason for this ban? [1]

.....

12

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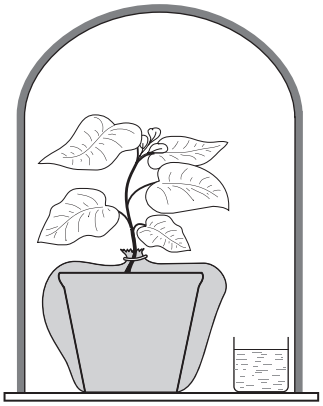
Examiner only

6. *(a)* Complete the word equation for photosynthesis shown below. [2]

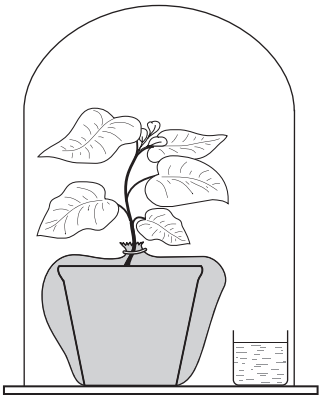
carbon dioxide + ... ⟶ glucose + ...

(b) The diagrams below show four experiments used to investigate the conditions needed for photosynthesis. Four well-watered potted green plants were placed in glass bell jars, which were sealed onto greased glass plates. The soil in each pot was covered with a polythene sheet. Each apparatus was then subjected to different environmental conditions.

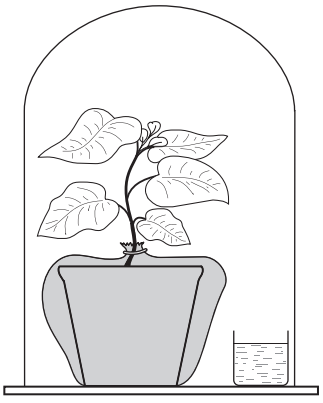
Experiment A
- Bell jar covered in thick black paper
- Beaker contains a chemical that **produces** carbon dioxide



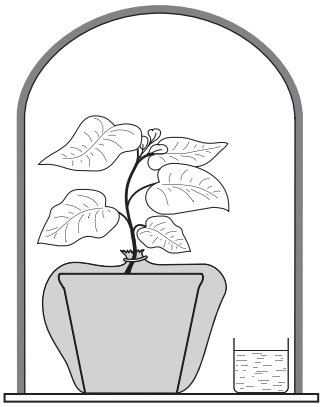
Experiment B
- Beaker contains a chemical that **produces** carbon dioxide



Experiment C
- Beaker contains a chemical that **absorbs** carbon dioxide



Experiment D
- Bell jar covered in thick black paper
- Beaker contains a chemical that **absorbs** carbon dioxide



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(i) After 3 days, leaves from each of the four plants were tested for starch. Complete the table below by placing a ✓ or a **X** in each box to show the presence or absence of starch. [2]

experiment	presence or absence of starch ✓ or **X**
A	
B	
C	
D	

(ii) The results from which **two** experiments should be compared to show that

I. carbon dioxide is needed for photosynthesis, [1]

....

II. light is needed for photosynthesis? [1]

....

6

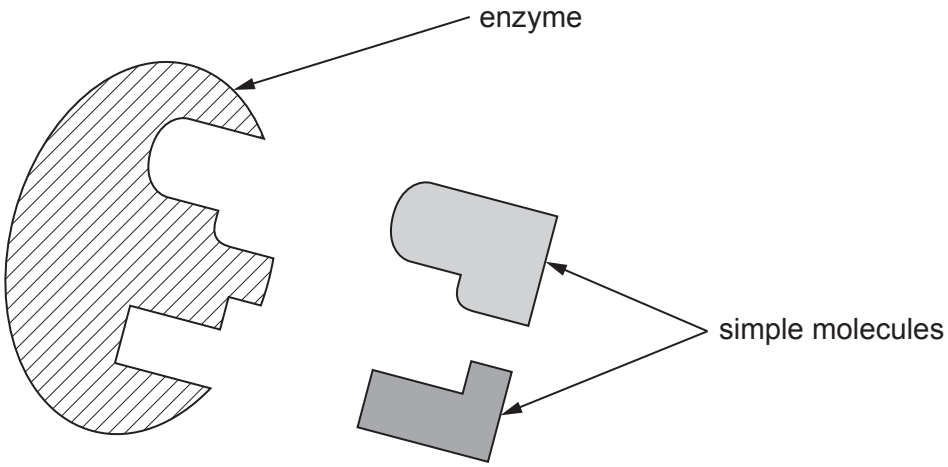
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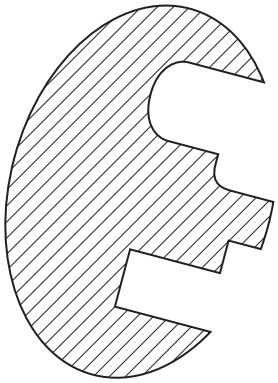
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7. *(a)* (i) The diagram shows an enzyme which builds up complex molecules from simple molecules.



Complete the diagram below to show the next stage in the reaction between this enzyme and the two simple molecules shown above. [2]



(ii) What name is given to this **model** of enzyme action?

[1]

.....

(iii) Explain how boiling would affect the action of the enzyme shown in the diagrams above. [2]

.....

.....

.....

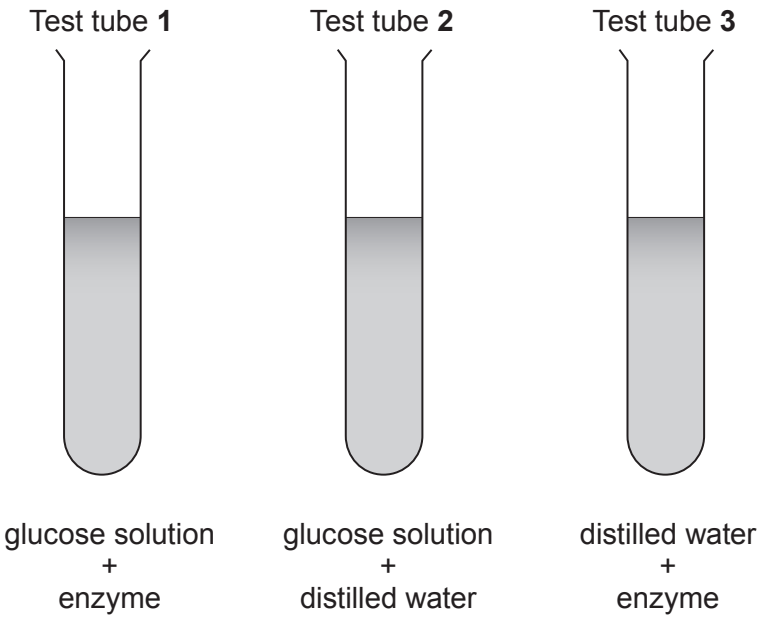
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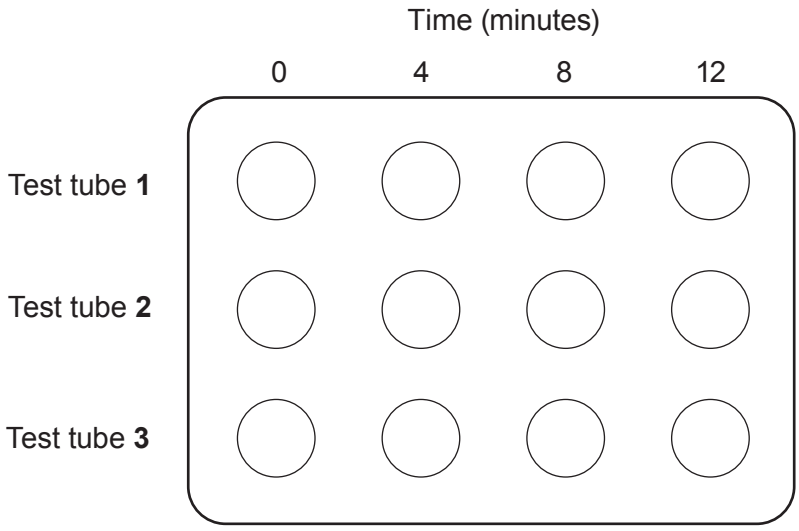
Examiner only

(b) Potatoes contain an enzyme which converts glucose molecules into starch molecules. In the following experiment three test tubes were set up as shown in the diagram below.



At the start of the experiment, and at four minute intervals, samples from each of the test tubes were added to each of the cavities in a spotting tray and then iodine solution was added to each sample.

Complete the diagram below by shading the cavities you would expect to show the presence of starch when tested with iodine solution. [3]



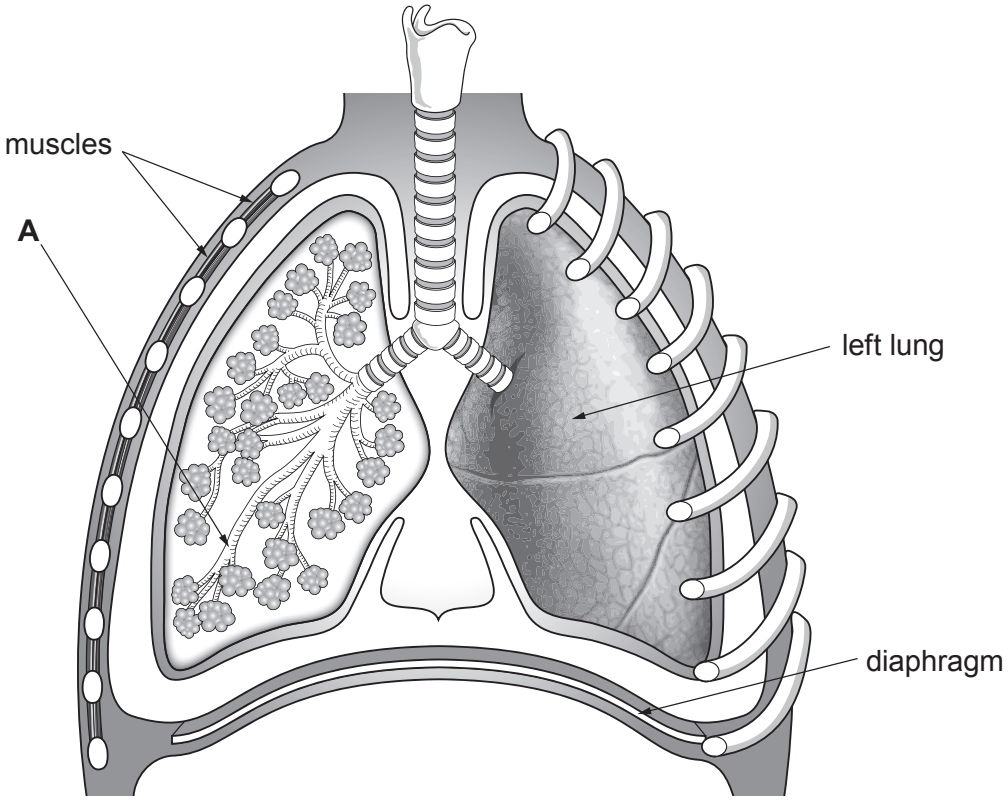
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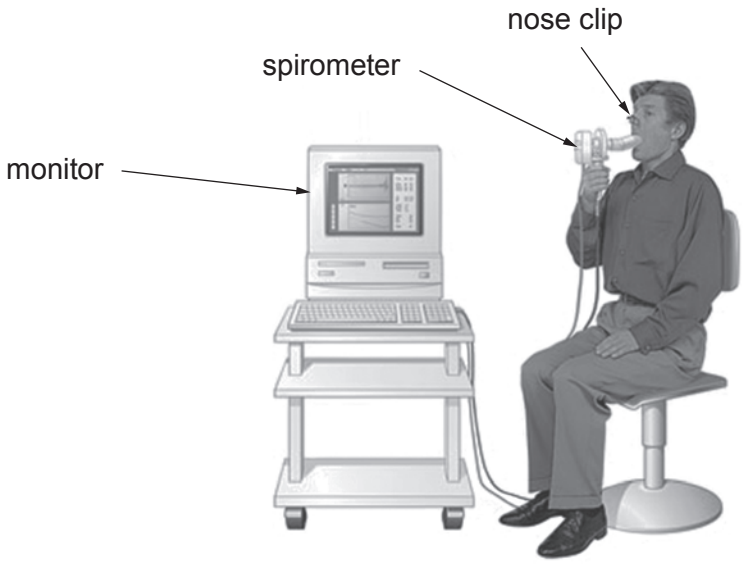
8. The diagram below shows the human respiratory system.



(a) Name structure **A** on the diagram. [1]

.....

(b) A person's breathing rate was measured on a spirometer for 120 seconds.

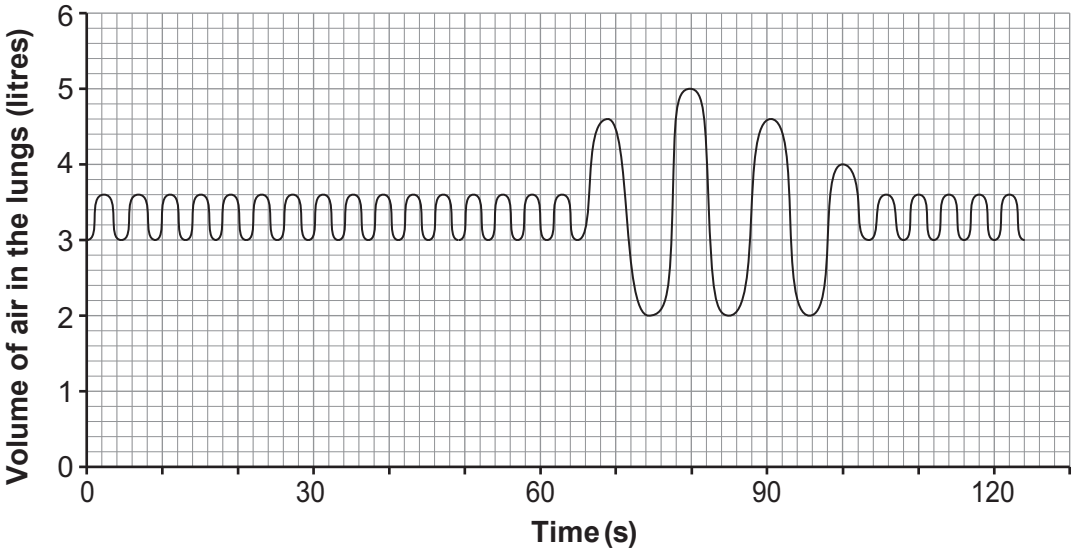


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The person breathed normally, then took deep breaths and then breathed normally again. A graph of this breathing pattern was printed and is shown below.



Use the graph to:

(i) calculate the normal breathing rate for this person, [1]

normal breathing rate = ... breaths per minute

(ii) calculate the difference between the volume of air inspired during a single normal breath and the **second** deep breath taken. [2]

difference in volume = ...

4

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9. Describe, in detail, how you would show that living peas produce heat. The apparatus and materials for this investigation are listed below. Your account must refer to the order in which you set up the equipment, including a suitable control. **Diagrams will not gain credit in your answer**.

[6 QWC]

2 Thermos (vacuum) flasks
2 thermometers
cotton wool
liquid disinfectant
living peas
dead peas

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END OF PAPER

6

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

SUMMER 2015

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INTRODUCTION

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

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

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

	Page
B1	1
B2	19
B3	34

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)	i		2	A Cell wall B Chloroplast C Nucleus *3 correct = 2 marks* *2 correct = 1 mark* *0/1 correct = 0 marks*	A: cellulose wall		
			ii		2	1 yeast 2 alga 3 bacteria/ alga *3 correct = 2 marks* *2 correct = 1 mark* *0/1 correct = 0 marks*			Letters instead of names
		(b)	i		1	all organisms consist of one or more living cells;			
			ii		1	A virus is not a cell;	has genes and protein coat <u>only</u> / no cytoplasm/ no cell membrane/ <u>only reproduces</u> inside <u>cell</u>		No nucleus/ it requires a host
			iii		1	light microscopes **and** electron microscopes; (in order)	laser imaging as alternative for light microscope		
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		*(a)*	i		1	Double helix;			
			ii		2	T,G,C *3 correct = 2 marks* *2 correct = 1 mark* *0/1 correct = 0 marks*			
		(b)			1	Proteins **<u>and</u>** amino acids;			
		Total Mark			4				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
3		(a)			4	Cells; Oxygen; Water; Enzymes;			
		(b)			2	carbon dioxide; (Lime water)turns {cloudy/ milky/ white};	CO_2 cream		CO^2
		Total Mark			6				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
4		(a)			1	Honey (bee) **and** bumble (bee);			
		(b)	i		1	{Loss of/less} nectar/ food (from wild flowers)/ {Loss of/less} nest sites/ {Loss of/less} habitat;			Fewer wild flowers/ wild flowers eaten by other animals Loss of space
			ii		2	480 000 **and** 180 000 OR 5 x 60 000; = 300 000; Correct answer = 2 marks			percentages
			iii		1	honey bee pollinates {food plants/ veg/ fruit}/ honey bee produces {food/ honey};			
		(c)			2	(loss of solitary bees) results in loss of {a number of/ many/ 260} species; (no pollination) – loss of species of wild flowers;			
		Total Mark			7				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)	i		2	paralyse cilia/ cilia unable move; mucus becomes {clogged/ dried}/ mucus builds up/ mucus thicker;	Mucus production increases	cilia {harmed/ don't work}/ mucus increases	cilia killed
			ii		1	tar;			
		(b)	i		1 2 1	suitable scale, correctly labelled; plotting must start at *y* axis all plots correct (½ small square tolerance);; not extrapolated (all correct = 2 marks, 1 error = 1 mark, >1 error = 0 marks) line quality; drawn with ruler			
			ii		2	Increase in number of cigarettes smoked increases <u>number of deaths</u> (from lung cancer); Small increase to <u>20</u> then a sharp increase;			
			iii		1	60;	Ecf from graph		
			iv		1	Some lung cancer deaths for 0 cigarettes/ some people who do not smoke die from lung cancer;			
		(c)			1	<u>Reference to {dangers/ harm}</u> of {passive smoking/ second hand smoke /secondary smoking};	Passive smoking makes people ill		second hand smoke **affects** people
		Total Mark			12				

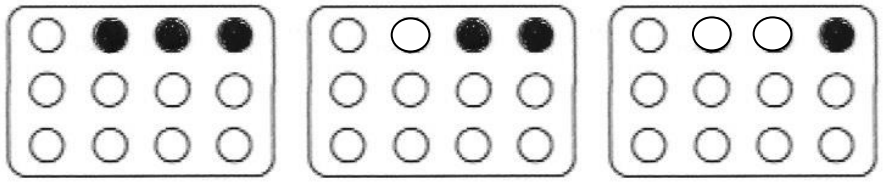
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<tr><th>FT</th><th>HT</th></tr>
<tr><td>6</td><td>1</td><td>(a)</td><td></td><td></td><td>2</td><td>Water;
Oxygen;</td><td>H_2O
O_2</td><td>Sunlight or Chlorophyll on arrow</td><td>H2O
O2</td></tr>
<tr><td></td><td></td><td>(b)</td><td>i</td><td></td><td>2</td><td>All correct = 2 marks
1 error = 1 mark
> 1 error = 0 marks
<table><tr><th>Apparatus</th><th>Presence or absence of starch
✓ or ×</th></tr><tr><td>A</td><td>×</td></tr><tr><td>B</td><td>✓</td></tr><tr><td>C</td><td>×</td></tr><tr><td>D</td><td>×</td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>ii</td><td>I</td><td>1</td><td>B and C;</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>II</td><td>1</td><td>A and B;</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Total Mark</td><td>6</td><td></td><td></td><td></td></tr>
</table>

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
7	**2**	(a)	i		2	both substrate molecules having entered the enzyme; an attempt to make them connect;			
			ii		1	Lock and Key;		Enzyme substrate complex	
			iii		2	(Boiling) alters the shape of the {enzyme/active site}/ denatures enzyme; so the molecules do not fit into enzyme/ active site;			
		(b)			3	1 mark for each correct row;;;  **NB only allow marks if some cavities shaded**			
		Total Mark			8				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	**3**	(a)			1	Bronchiole;	bronchioles		
		(b)	i		1	15;			
			ii		2	3 – 0.6 = 2.4 litres/ l;; [NB unit required for 2 marks] Correct readings but incorrect answer = 1 mark 2.4 but no units = 1 mark No mark for correct unit only	L for litres		
		Total Mark			4				

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Question Number			
FT	HT	Mark	Answer
9	**4**	6 QWC	*Indicative content:* ▪ use of disinfectant to wash both sets of peas ▪ (fill) a Thermos flask with these living peas ▪ ref to dead peas **acting as control** ▪ same {mass/ volume/ number} of peas should be used in both flasks ▪ place a thermometer into the peas ▪ place/ put cotton wool into the neck of the flask ▪ record temperature at {regular intervals/ every hour/ every day/ stated times} ▪ compare temperatures in both flasks **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

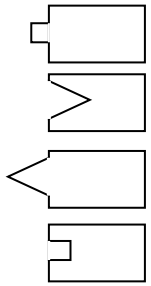
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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)			1	Peristalsis;	phonetic spelling		
		(b)	i		2	(Mass of food remaining undigested) increases until pH5; {levels off/ plateaus} at pH5; It increases until pH 5 where it levels off (2 marks)			
			ii		1	3;			
			iii		2	Stomach; Protein;			
		Total Mark			6				

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	6	(a)	i		2	 Each shape needs an oblong + an indentation or a protrusion. *4 shapes correct = 2 marks* *3 shapes correct = 1 mark* *0/1/2 shapes correct = 0 marks*			
			ii		2	Cytosine Adenine Thymine Guanine **Spelling must be correct** *4 names correct = 2 marks* *3 names correct = 1 mark* *0/1/2 names correct = 0 marks*			
		(b)			2	Three bases form a <u>code</u>/ a triplet <u>code</u>; (Code) determines the {order/ sequence} of the amino acids;			
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)	i		1	6;			
			ii		1	Anaerobic;			
			iii		2	At zero min/ between 0-2/ at beginning/ before exercise starts; most aerobic respiration is occurring; 2nd mark linked to 1st	Least/ lowest lactic acid produced	Oxygen debt	
		(b)			1	Muscle;			
		Total Mark			5				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			1	Active {transport/ uptake};			
		(b)			2	Oxygen is needed; For respiration/ release of energy/ to make ATP; 2nd mark is linked to 1st			
		(c)			3	Water passes from where it is in high concentration to where it is in low concentration / Water passes from where solute concentration is low to where solute concentration is high ; Via a semi permeable membrane (or other correct description of membrane i.e. semi/ partially) ; Indication of where the higher concentration of water/ solute is;		SPM	
		Total Mark			6				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(a)	i		1	Transect (correct spelling);			
			ii		2	Quadrat (correct spelling); Tape measure/ {Tape/ rope} marked at (2) m intervals;			Ruler/ meter stick
		(b)			2	(2/25) x 100 = 8% Method; Answer; Correct answer on its own = 2			
		(c)			2	There is <u>less</u> light/ water/ minerals/ ions/ nutrients; Because of {<u>more/ most} competition</u> from the parent population;			Parent plant takes **all** (named resource) space
		Total Mark			7				

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Question Number			
FT	HT	Mark	Answer
	10	6 QWC	Indicative content • Harmful effects on cilia and mucus • Tar/ carcinogens and lung cancer • Smoke inhalation causes coughing • Which can result in emphysema leading to shortness of breath due to alveoli damage • Smoking is less/ not socially acceptable now because of proof of harmful effects • Passive smoking • Attempts at reduction include ▪ stopping adverts, ▪ banning smoking in public places, ▪ warnings on packets and increase in cost ▪ stopping the display of cigarettes in shops **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
Total Mark		6	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

W15-4471-01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

A.M. WEDNESDAY, 7 January 2015

1 hour

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

4471 010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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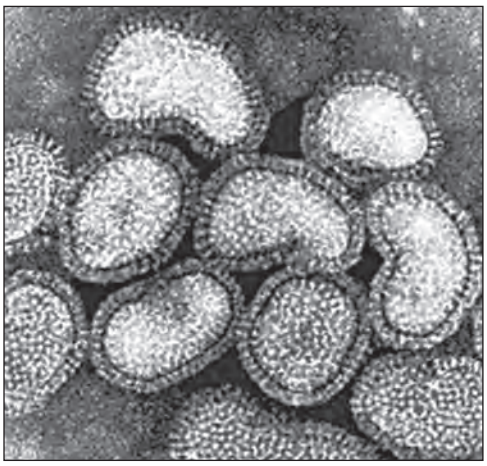
Examiner only

Answer **all** *questions.*

1. *(a)* Complete the table below which shows features of some microorganisms. Place a tick (✓) for the features which are present and a cross (x) for the features which are absent. *The first row has been done for you.* [3]

features	bacteria	algae	yeast
cell wall	✓	✓	✓
nucleus			
chloroplast			
reproduction by budding			

(b) The photograph below shows some viruses at a very high magnification.



(i) How does the size of a virus compare with that of a bacterium? Underline your answer. [1]

Viruses are smaller than bacteria.

Viruses are larger than bacteria.

Viruses are equal in size to bacteria.

(ii) Give **one** reason why a virus is *not* thought to be a living cell. [1]

.....

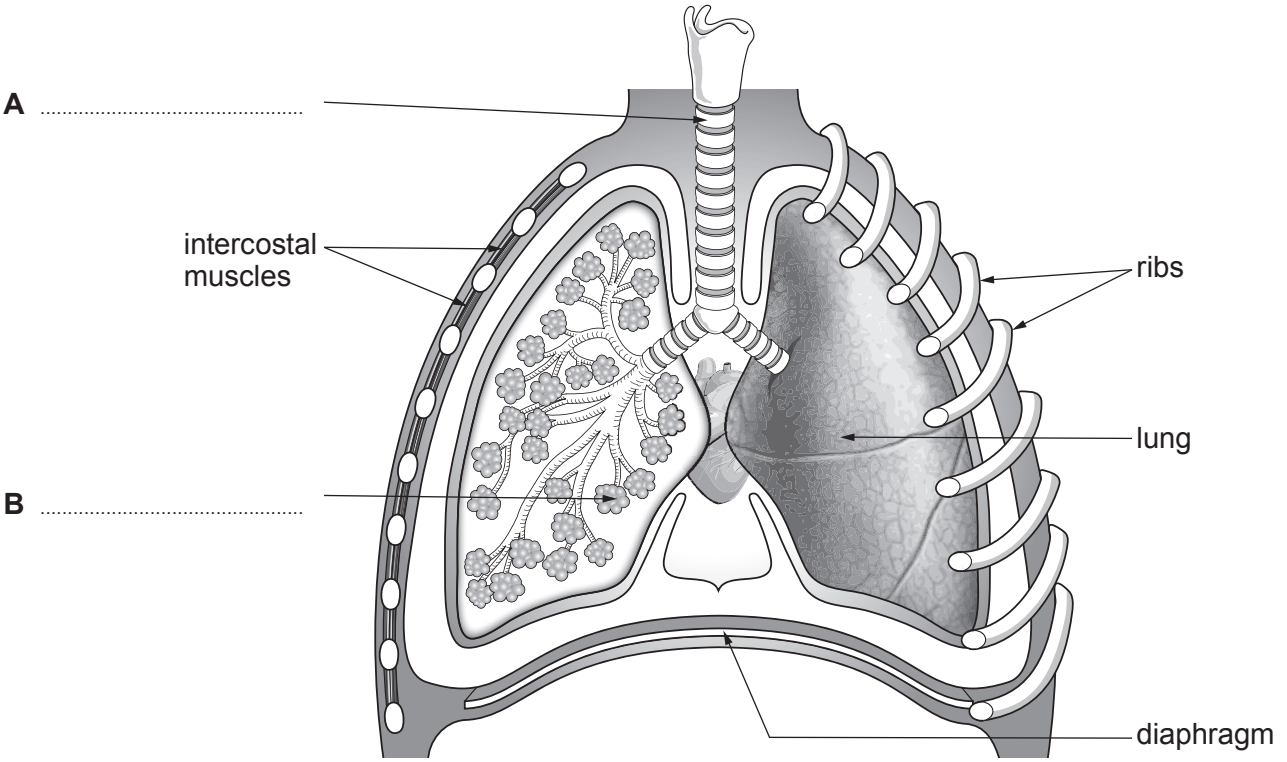
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2. The diagram shows a section through the chest of a human.



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

(b) While a person is breathing in, the volume of the lungs increases.

(i) Describe the movements of the diaphragm and ribs as they bring about the increase in volume. [2]

Diaphragm .....

.....

Ribs .....

.....

(ii) How does the *pressure* in the lungs change when the volume increases? [1]

.....

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5

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Turn over.

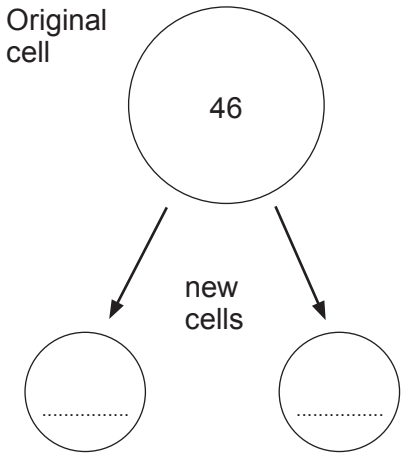
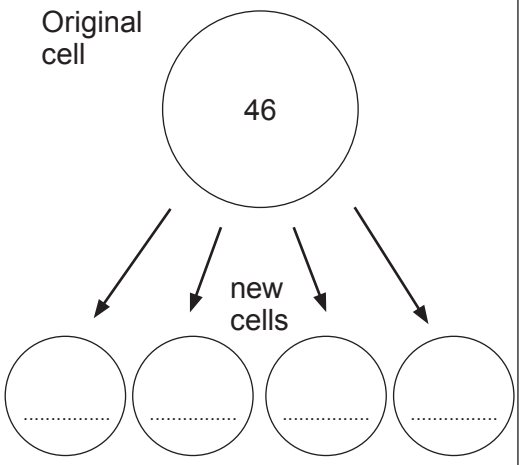
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3. *(a)* (i) Which part of a living cell contains chromosomes? [1]

.....

(ii) Complete the table below about cell division in human cells by writing on the dotted lines. [4]

Type of division	MITOSIS	MEIOSIS
Number of chromosomes in cells		
Function of division	.....	formation of sex cells
Genes in new cells	identical	.....

(iii) What is the scientific term used for sex cells such as sperm and eggs? [1]

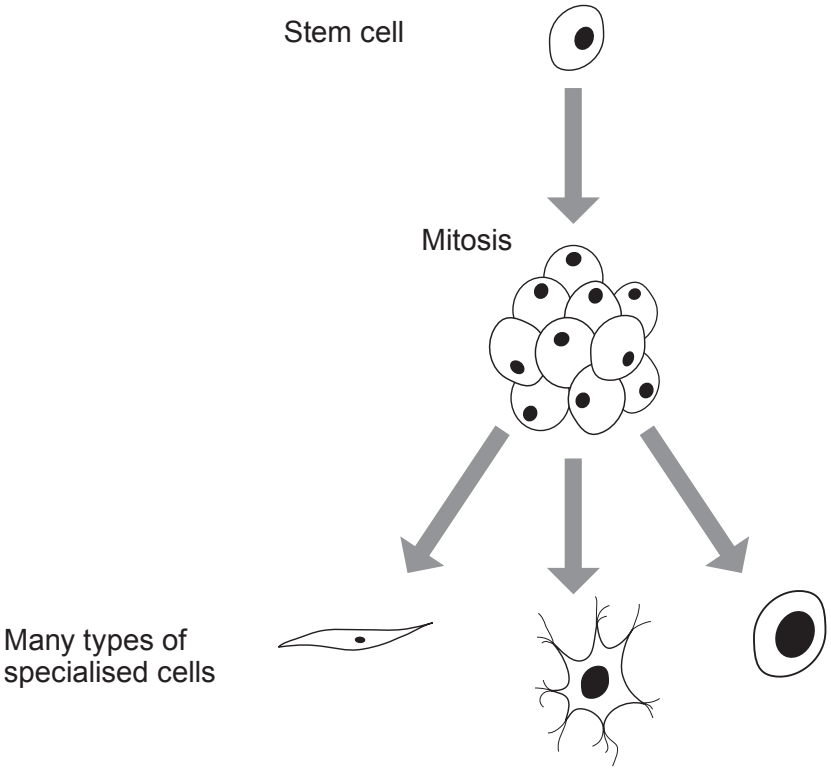
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(b) Stem cells divide by mitosis and new specialised cells develop.



(i) Suggest **one** way doctors can use stem cells to treat patients. [1]

.....

(ii) Stem cells from embryos can be used in medical research. Explain why some people object to this. [2]

.....

.....

9

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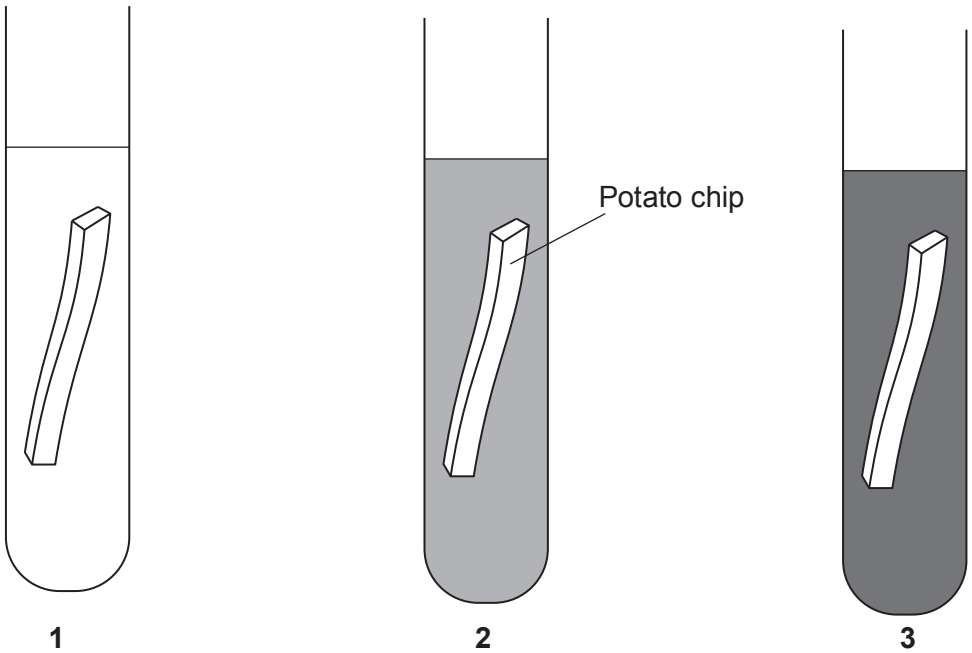
Examiner only

4. *(a)* Complete the sentence using some of the words below. [2]

low **fully permeable** **high** **semi-permeable**

During osmosis, water moves from a region where it is in a ..... concentration to a region where it is in a ..... concentration, through a ..... membrane.

(b) Ceri and Sajid investigated osmosis in potato chips.
They set up three test tubes containing blackcurrant squash and water as shown in the diagram below. Blackcurrant squash contains sugar.
A potato chip of exactly the same size and mass was added to each tube.



1 pure water

2 weak solution of blackcurrant squash

3 strong solution of blackcurrant squash

(i) State the number of the tube which contained the **lowest** concentration of **water**. [1]

.....

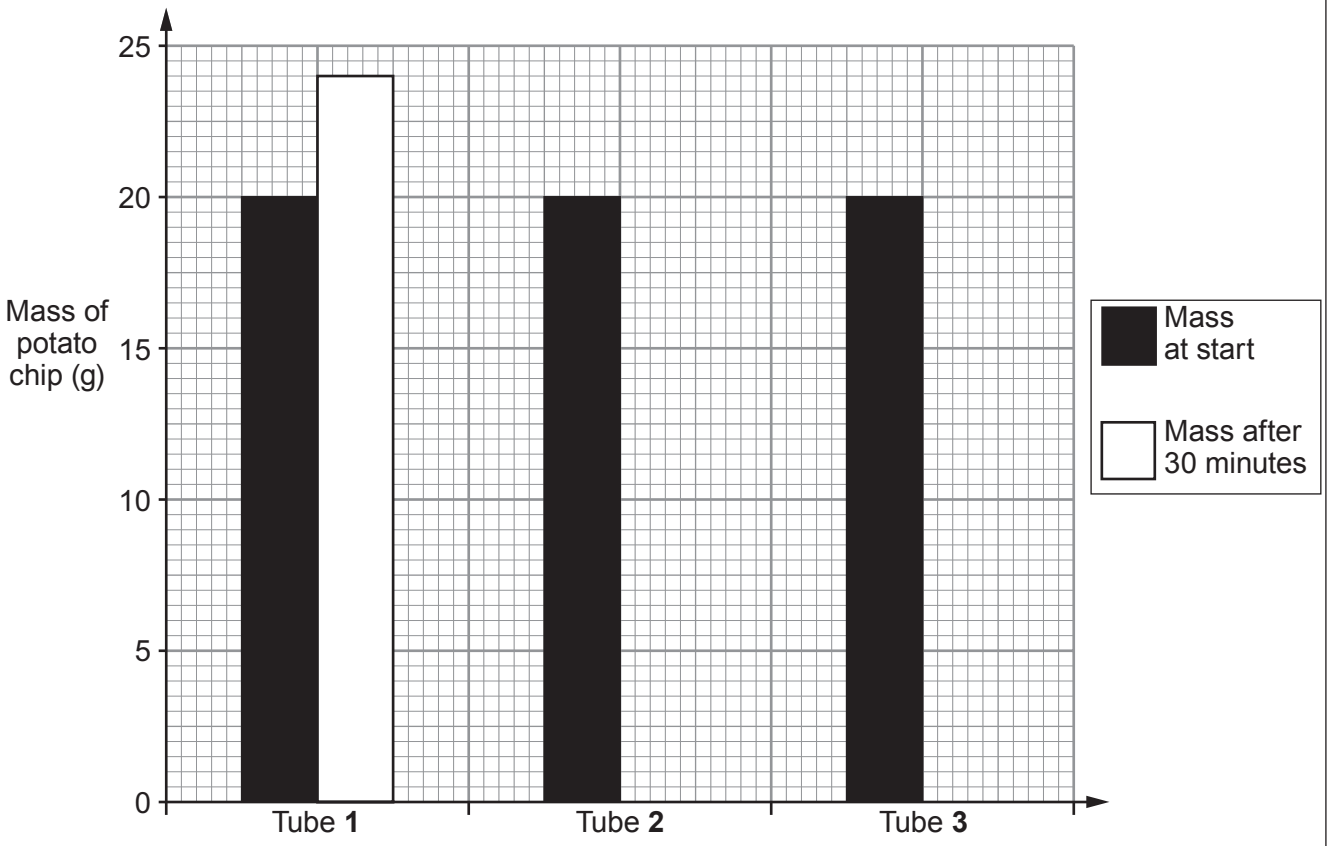
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After 30 minutes they removed the potato chips and recorded the mass of each.

Tube	Mass of potato chips at start (g)	Mass of potato chips after 30 minutes (g)
1	.....	.....
2	.....	20
3	.....	15



(ii) Use the bar chart to **complete** the results table above. [1]

(iii) **Complete** the bar chart for tubes **2** and **3**. [1]

(iv) State the number of the tube in which the concentration of water in the chips was the **same** as that in the solution, giving a reason for your answer. [1]

Number of tube .....

Reason .....

.....

(v) Explain why the potato chip in tube **1** gained mass. [2]

.....

.....

.....

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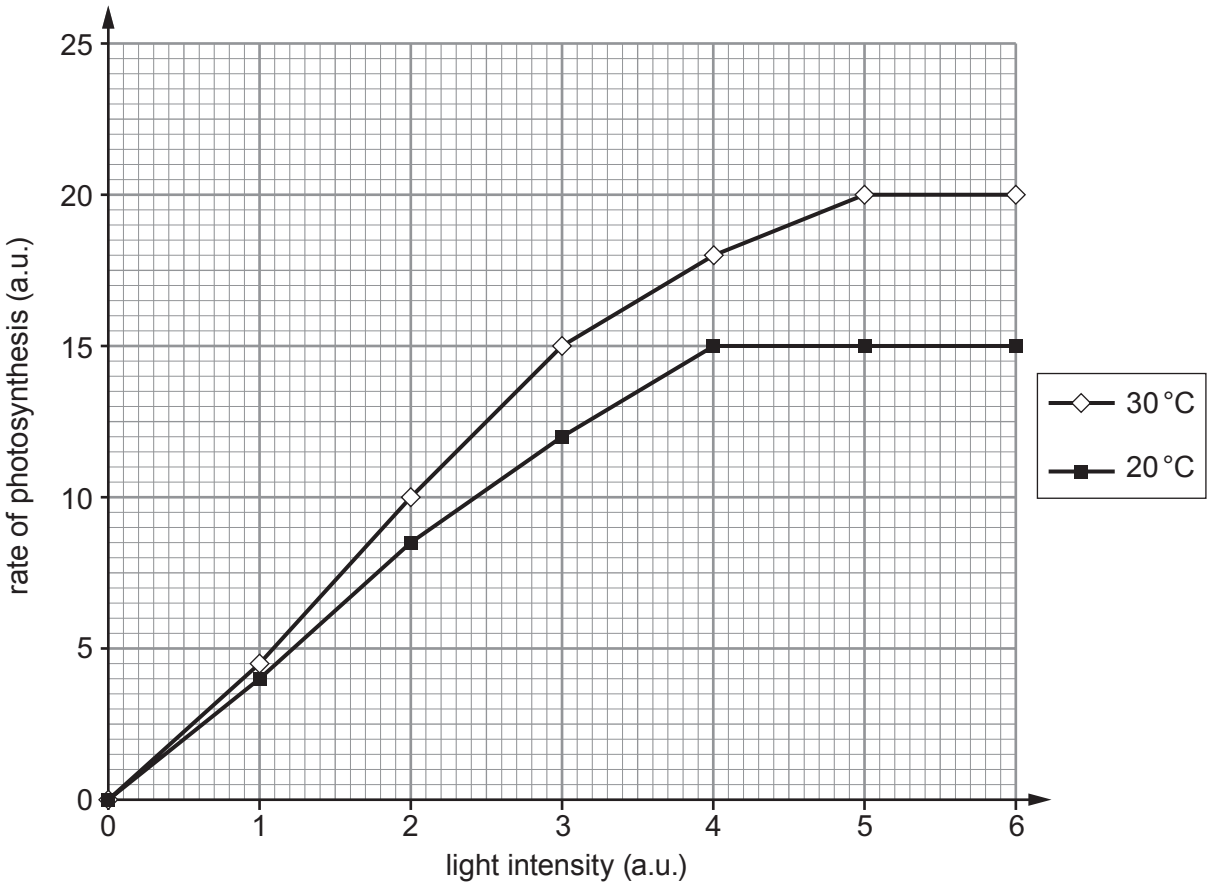
5. *(a)* (i) Complete the following equation for photosynthesis in green plants.

..... + water $\xrightarrow{\text{light}}$ glucose + ... [1]

(ii) Name the chemical substance which absorbs the light needed for photosynthesis. [1]

.....

(b) A scientist investigated the rate of photosynthesis at different light intensities and temperatures. The results are shown in the graph.



Use the graph to:

(i) Describe in detail how light intensity affected the rate of photosynthesis at **20 °C**. [2]

.....

.....

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(ii) Calculate the difference in the rate of photosynthesis between 20 °C and 30 °C at a light intensity of 3.5 a.u. [2]

difference in rate of photosynthesis ..... a.u.

(iii) Name **one** *other* environmental factor which can affect the rate of photosynthesis. [1]

.....

(c) Complete the table to show **two** ways in which plants use the glucose produced in photosynthesis. [2]

substance produced from glucose	how the substance is used in a green plant
.....	storage
cellulose	.....

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9

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6. The black-faced lion tamarin *(Leontopithecus caissara)* is a species of monkey living in the rainforests of South America.



(a) The black-faced lion tamarin is classified as Critically Endangered on the IUCN red list and listed on Appendix 1 of CITES. There are only about 400 individuals remaining in the wild.



(i) On the sliding scale above suggest what will happen to the black-faced lion tamarin unless measures are taken to conserve the species. [1]

.....

(ii) If conservation measures fail, state what will happen to the biodiversity of the habitat in which the black-faced lion tamarin lives. [1]

.....

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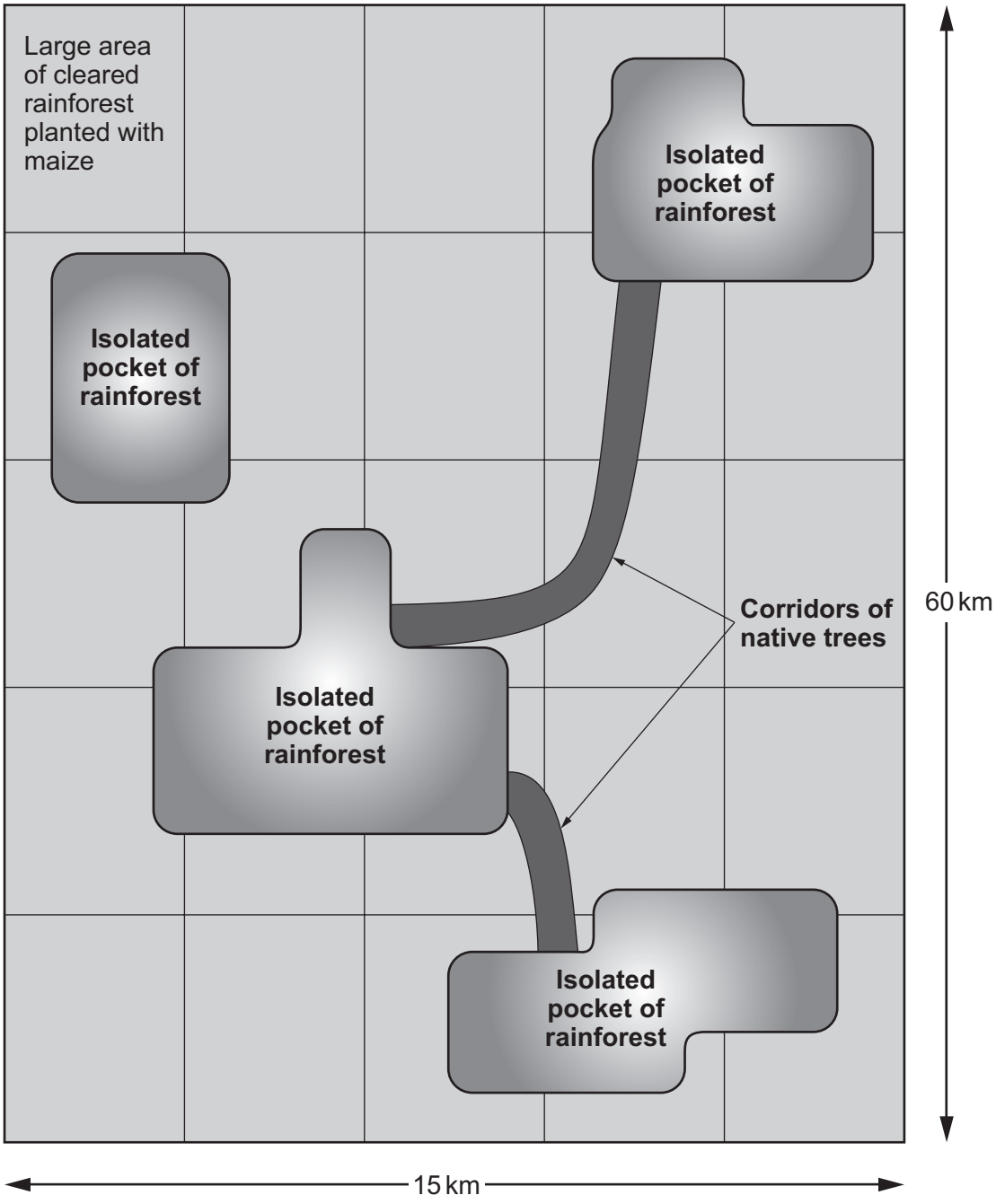
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(b) The rainforest habitat of the black-faced lion tamarin has been cleared to grow maize. Small populations of the monkey now live in isolated pockets of rainforest. The local people are being paid to start local plant nurseries and to plant corridors of native trees which link up the isolated pockets of rainforest.

The diagram shows an aerial view of 900 km^2 of rainforest which has been cleared and planted with maize.



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(i) Suggest **one** reason why the local people are prepared to give up some of their farmland in order to create the corridors of native trees. [1]

.....

(ii) Suggest ways in which the corridor system shown in the diagram opposite can be improved. [2]

.....

.....

.....

(iii) How will the corridor system help conserve and increase the numbers of the black-faced lion tamarin in the rainforest? [2]

.....

.....

.....

(c) State **one** *other* way in which endangered species can be conserved. [1]

.....

8

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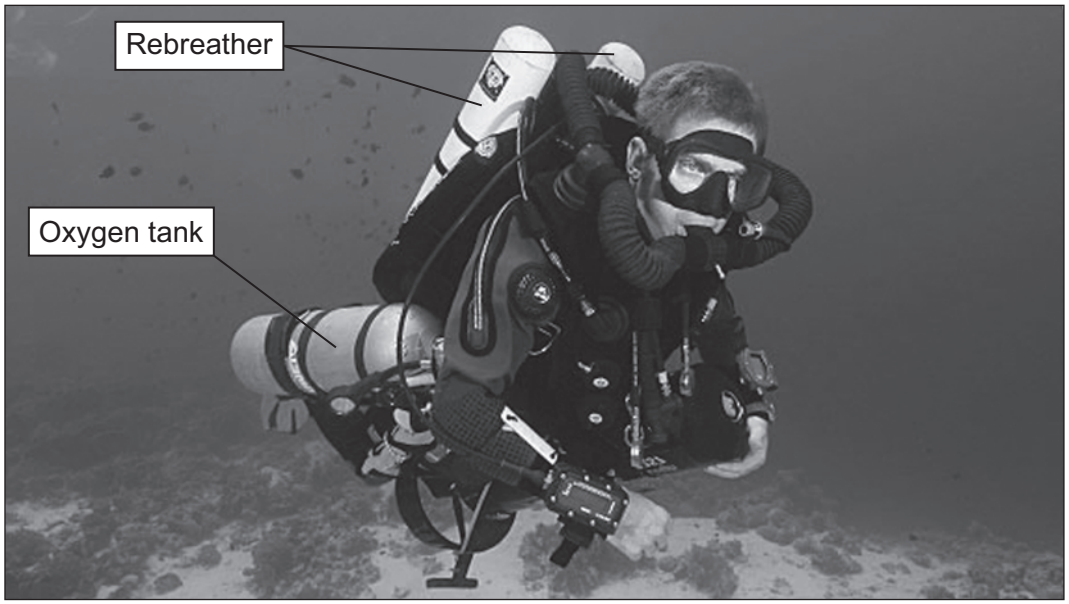
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7. Look, no bubbles!

SCUBA diver wearing a rebreather



In standard SCUBA equipment when you breathe in through the mouthpiece you get a lungful of fresh air from the tank on your back. When you breathe out, the expired air goes out from the equipment into the water in the form of bubbles.

Modern SCUBA equipment contains a rebreather. This allows you to breathe the same air many times and produces no bubbles.

(a) (i) Complete the following table to show the composition of inspired and expired air. [2]

gas	inspired air (%)	expired air (%)
oxygen	.....	16
carbon dioxide	.....	4
nitrogen	79	.....
water vapour	varies	1

(ii) Use the table to state why it is possible for a diver to use a rebreather. [1]

.....

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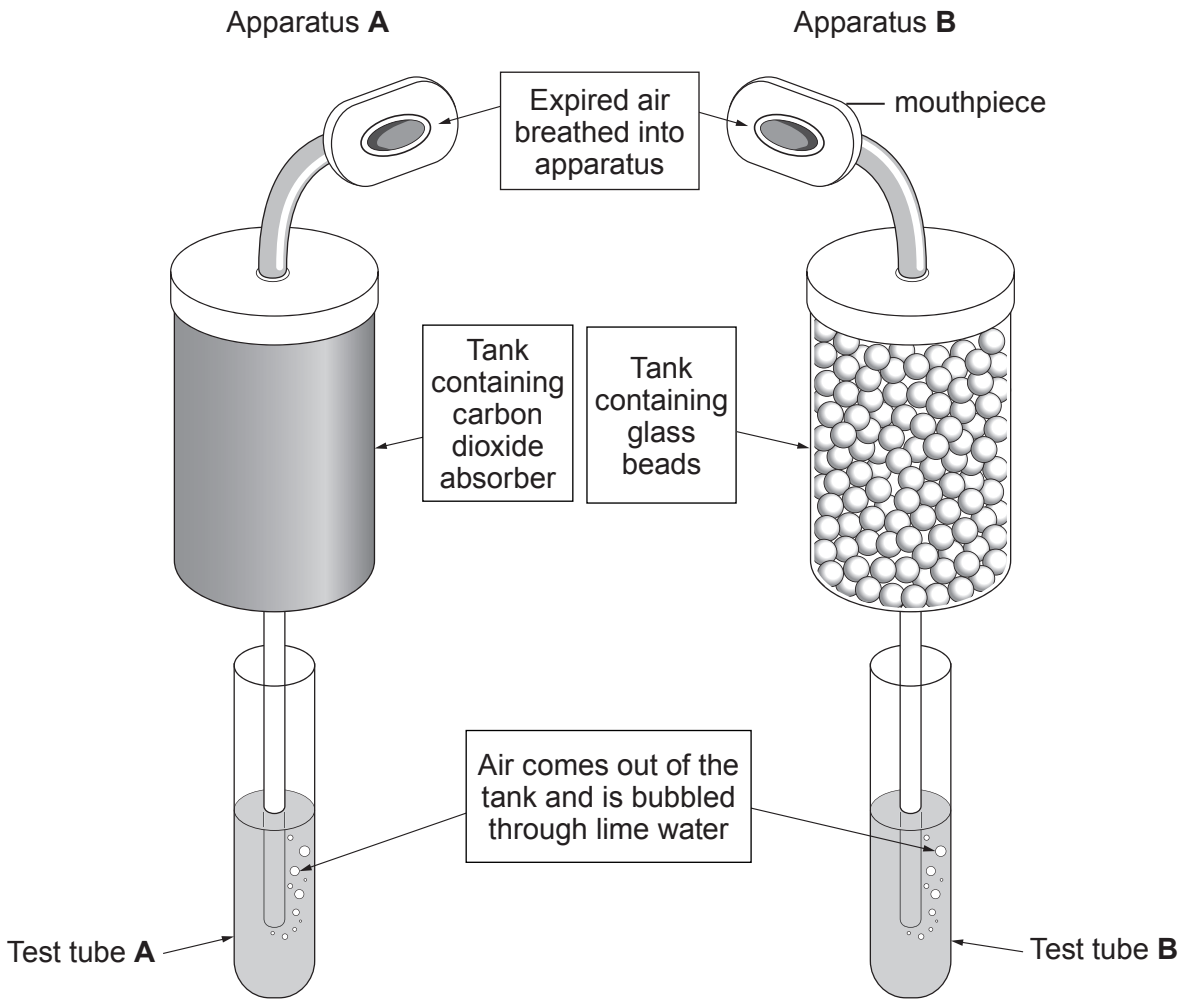
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(iii) Expired air contains 4% carbon dioxide. This concentration of carbon dioxide in air is poisonous. Rebreathers also contain a tank which absorbs the carbon dioxide making the air rebreathable for the diver.
Suggest the name of the chemical compound which absorbs the carbon dioxide. [1]

.....

A scientist tested the air coming out of the tank using apparatus **A** and **B** as shown below.



(b) What result would you expect to see in test tubes **A** and **B** after bubbling the expired air through lime water for 2 minutes? [2]

Test tube **A**

.....

Test tube **B**

.....

(c) Apart from not producing any bubbles, suggest **one** *other* advantage to a diver using a rebreather. [1]

.....

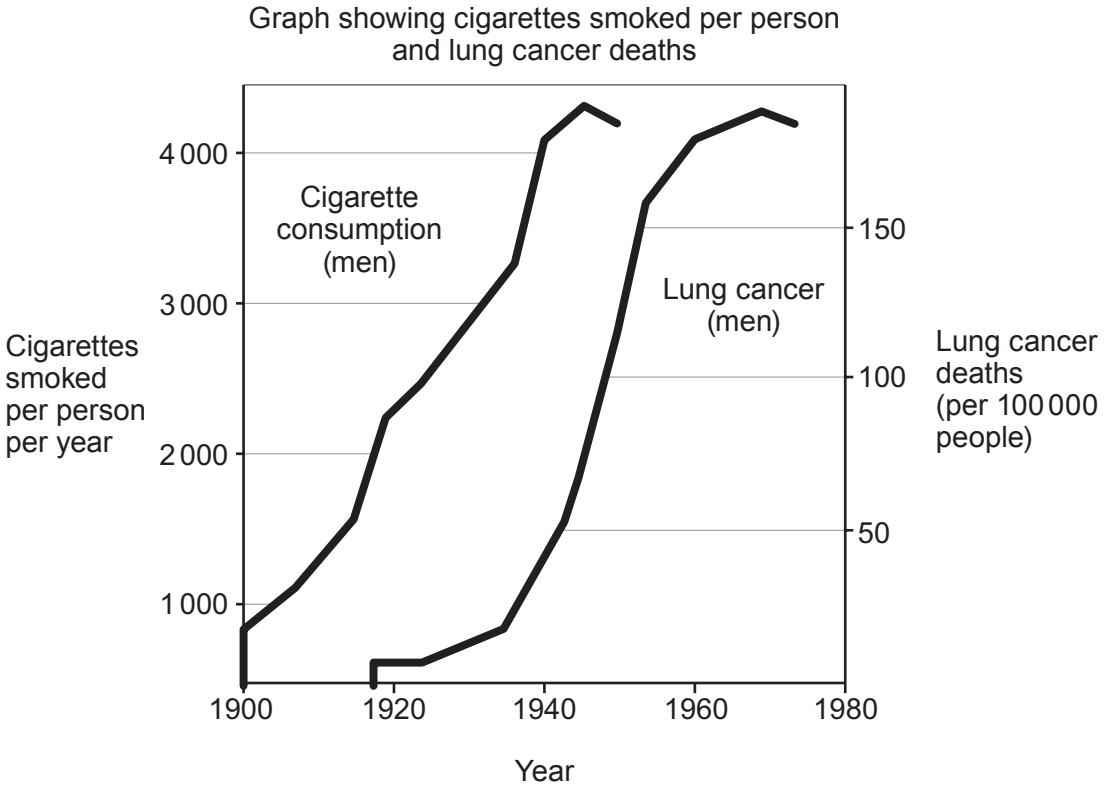
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8. The major rise in cigarette smoking amongst the UK population occurred at the start of the 20th century.



(a) From the graph, describe fully the relationship between cigarette smoking and lung cancer deaths in men. [2]

.....

.....

.....

(b) The link between smoking and lung cancer was first made by Sir Richard Doll, Professor of Medicine at the University of Oxford. Use the information in the graph to suggest when he first made the public aware of the link between cigarette smoking and lung cancer. [1]

.....

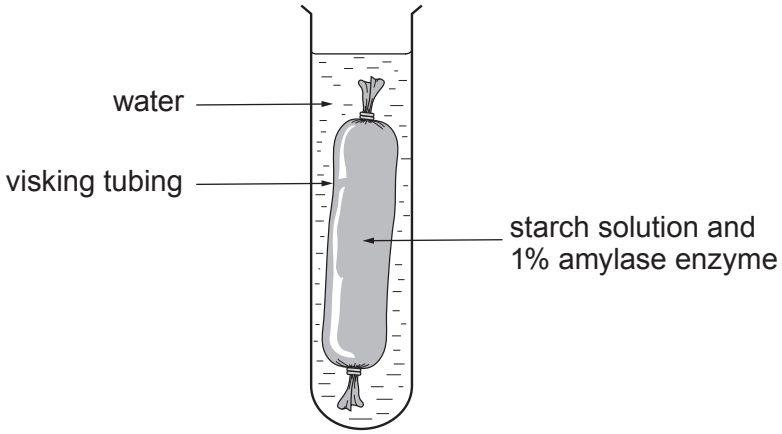
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9. An experiment was set up using visking tubing as a model gut. This is shown in the following diagram. The visking tubing was filled with a starch solution and 1% amylase enzyme. After 30 minutes the water surrounding the visking tubing was tested and found to contain glucose but no starch.



Explain why glucose appeared in the water surrounding the visking tubing but no starch was found. Include in your account a description of how the water was tested for glucose using Benedict's solution and for starch using iodine solution giving the expected observations.

[6 QWC]

.....

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END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

JANUARY 2015

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INTRODUCTION

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

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

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

	Page
UNIT B1	1
UNIT B2	18

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GCSE BIOLOGY - B2

JANUARY 2015 MARK SCHEME

<table>
<tr><th colspan="3">Question</th><th>Marking details</th><th>Marks Available</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><th>Features</th><th>Bacteria</th><th>Algae</th><th>Yeast</th></tr>
<tr><td>Cell wall</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>nucleus</td><td>×</td><td>✓</td><td>✓</td></tr>
<tr><td>Chloroplast</td><td>×</td><td>✓</td><td>×</td></tr>
<tr><td>Reproduce by budding</td><td>×</td><td>×</td><td>✓</td></tr>
</table>
1mark per correct row;;;
Assume blank = ×
</td><td>3</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Smaller;</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Cannot reproduce alone/needs a (living) cell for reproduction;
Accept – no cell membrane/no cytoplasm
NOT needs a cell to survive</td><td>1</td></tr>
<tr><td colspan="3"></td><td>Question 1 total</td><td>[5]</td></tr>
</table>

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Question			Marking details	Marks Available
2	*(a)*		A trachea/cartilage ring; NOT windpipe B alveoli/ alveolus; Accept air sac	2
	(b)	(i)	(Diaphragm) down/flattens; NOT contract (can be neutral) (Ribs) up and out/ribcage expands;	2
		(ii)	Decreases	1
			Question 2 Total	**[5]**

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<table>
<tr><th colspan="3">Question</th><th>Marking details</th><th>Marks Available</th></tr>
<tr><td>3</td><td>(a)</td><td>(i)</td><td>Nucleus;</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><td>46,46;</td><td>23,23,23,23;</td></tr><tr><td>Growth/replacement of {worn out/damaged/old} cells/repair damaged tissue;
NOT producing new cells</td><td></td></tr><tr><td></td><td>Different/ non identical;</td></tr></table></td><td>4</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Gametes;</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Repair tissue/replace damaged tissues/{treat/cure} disease(named disease e.g. bone marrow transplants/ Parkinson’s/blindness/repairing {tendon/joint injury}/spinal cord repair);</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Involves {destruction of/damaging} embryos/loss of potential life;
Leading to ethical/religious/moral objection;
2nd point linked to 1st point</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td>Question 3 Total</td><td>[9]</td></tr>
</table>

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Question			Marking details	Marks Available
4	*(a)*		High **and** low; (1) both for one mark Semi-permeable; (1)	2
	(b)	(i)	3/ the strong solution of blackcurrant squash;	1
		(ii)	All readings correct (20 (column 2) + 24 (column 3));	1
		(iii)	2 bars of correct height in correct position;	1
		(iv)	2 **and** no change in <u>mass</u>/the potato chip was still 20g after 30 minutes; NOT weight	1
		(v)	Water concentration was higher outside the chip; Water {passes in/is absorbed}/chip gains water; Marks can be linked in either direction	2
			Question 4 Total	**[8]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	{Carbon dioxide/CO_2} **and** {oxygen/O_2};	1
		(ii)	Chlorophyll;	1
	(b)	(i)	Increases then {steady/plateau/reference to constant}; (increases) up to 4 a.u.;	2
		(ii)	Two correct readings (13.5 & 16.5); Correct calculation (3 a.u.); Correct answer = 2 marks Allow one mark for two correct readings if answer incorrect	2
		(iii)	{Carbon dioxide/CO_2}; NOT light/ temperature	1
	(c)		Starch; (formation of) cell walls;	2
			Question 5 total	**[9]**

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Question			Marking details	Marks Available
6/1	*(a)*	(i)	extinct in the wild/ extinct;	1
		(ii)	It will be {reduced/lower/smaller}/ there will be fewer species/less diverse;	1
	(b)	(i)	Because they are receiving payment/they do not want the monkey to become extinct/ stop it becoming extinct;	1
		(ii)	Any **two** from • Link up the remaining isolated pocket of rainforest (OWTTE); • Extend the corridors outside the area shown in the diagram (OWTTE); • {Widen/ thicken} corridors/ increase area of corridor; NOT larger • More than one corridor to each area;	Max 2
		(iii)	Any **two** from: monkey can extend its range/increased habitat/more {area/space} to live in/can {move/spread} to different areas; breed with other monkeys outside its own pocket of rainforest; correct ref to gene pool; increase food {source/variety}/less competition for food; escape predation; isolated population have more chance of dying from disease;	Max 2
	(c)		Any **one** from: SSSIs; captive breeding programme; NOT breeding in zoos/wildlife parks alone National parks; seed banks; {wildlife/nature} reserve; Legislation on deforestation;	Max 1
			Question 6/1 Total	**[8]**

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<table>
<tr><th colspan="3">Question</th><th>Marking details</th><th>Marks Available</th></tr>
<tr><td>7/2</td><td>(a)</td><td>(i)</td><td>All correct 2 marks 1 error 1 mark, 2 errors 0 marks
<table>
<tr><td></td><td>Inspired air (%)</td><td>Expired air (%)</td></tr>
<tr><td>Oxygen</td><td>21</td><td>16</td></tr>
<tr><td>Carbon dioxide</td><td>0.03/0.04</td><td>4</td></tr>
<tr><td>Nitrogen</td><td>79</td><td>79</td></tr>
<tr><td>Water vapour</td><td>varies</td><td>1</td></tr>
</table></td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(16%) oxygen in {expired air/air breathed out};</td><td>1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Sodium hydroxide/potassium hydroxide/soda lime;
Accept Sofnolime (trade name in diving community)</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>(The lime water in test tube A {remains/is}) {clear/colourless};
NOT no change/does not go cloudy/stays the same
(The lime water in test tube B would turn) milky/cloudy;</td><td>2</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Any one from
Can {remain submerged/stay down} for longer;
Smaller tank needed;

Question 7/2total</td><td>Max 1

[7]</td></tr>
</table>

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Question			Marking details	Marks Available
8/3	*(a)*		The more cigarettes smoked the higher deaths. The more cigarettes smoked higher {incidence/ chances} of lung cancer (OWTTE); {lag/delay/gap} {between commencement of/ time that they smoke/ smoking/ cigarette consumption} and possibility of (death from) lung cancer (OWTTE); Accept the more cigarettes smoked, the higher the deaths from lung cancer and these are roughly 20 years apart = 2 marks	2
	(b)		Accept any year between 1943 & 1947;	1
			Question 8/3 total	**[3]**

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Question			Marking details	Marks Available
9/4			**Indicative content:** amylase digests/breaks down starch to glucose {pores/holes} in visking tubing/visking tubing is selectively permeable too small for starch molecules/particles to pass through/or ref to molecule size big enough to allow glucose molecules/ particles to diffuse through/or ref to molecule size water heated strongly/boiled with Benedict's reagent positive colour change (reference blue to green/orange/red) iodine solution added to water remains brown **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question 9/4 Total**	6 **[6]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	Peristalsis;	1
		(ii)	Muscles contract; and push/force the food along; 2nd mark is linked to 1st mark	2
	(b)		• Washing-up liquid emulsifies the milk fat/ OWTTE; • Increasing the surface area for the action of enzymes/ lipase; • enzyme digests (milk) fat into fatty acids (and glycerol) which {lower pH/ more acidic}; 2nd mark linked to 1st mark, 3rd mark is independent	3
			Question 5 Total	**[6]**

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Question			Marking details	Marks Available
6	*(a)*		Any 2 from: (James) Watson; (Francis) Crick; (Maurice) Wilkins; (Rosalind) Franklin Correct spelling for all names. If first name is attempted it must relate correctly to the second name.	2
	(b)		TAGACATGTC	1
	(c)		3	1
			Question 6 Total	**[4]**

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Question			Marking details	Marks Available
7	*(a)*		Alien/exotic;	1
	(b)		Any **two** from: • All the types of food eaten/ effect on biodiversity or wildlife/ if it would become a pest itself/ make sure it does not eat non target species; • If it survives/ reproduces (in Wales); • If it carries disease/ parasites; • If it has predators;	2
			Question 7 total	**[3]**

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<table>
<tr><th colspan="3">Question</th><th>Marking details</th><th>Marks Available</th></tr>
<tr><td>8</td><td>(a)</td><td>(i)</td><td>Stem (cells);</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><th>Function of cell division</th><th>Part of cell which controls cell division</th><th>Number of chromosomes in each cell</th></tr>
<tr><td>increases the number of cells; ✓</td><td>cytoplasm</td><td>twice as many as in the cells in Stage 1</td></tr>
<tr><td>increases the size of each cell</td><td>nucleus; ✓</td><td>same number as in the cells in Stage 1; ✓</td></tr>
<tr><td>keeps the number of cells the same</td><td>cell membrane</td><td>half as many as in the cells in Stage 1</td></tr>
</table>
</td><td>3</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Destruction of {embryonic cells/ embryos/ potential life} ;</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Question 8 total</td><td>[5]</td></tr>
</table>

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Question			Marking details	Marks Available
9	*(a)*		There is less lactic acid (in blood) (than A); There is a faster {removal/ break down} of {lactic acid/payback of oxygen debt}; NOT faster return to normal	2
	(b)	(i)	3:1;	1
		(ii)	Should show some of each but more than 50% aerobic respiration; Accept alternative key if labels correct	1
	(c)		Glucose is completely broken down; Releases more energy/produces more ATP; NOT produces more energy	2
			Question 9 Total	**[6]**

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Question			Marking details	Marks Available
10	*(a)*		• Osmosis; • Movement of water into potato; • From where water is in high concentration to low concentration/ down concentration gradient; • Via semi permeable membrane; *3rd marking point linked to 2nd marking point*	4
	(b)		Water {<u>molecules/ particles</u>} {move faster at higher temperature/ have more energy};	1
	(c)		{Rate of/ volume} water passing in equals {Rate of/volume} of water passing out/no net {movement/flow} of water; NOT concentration of water is the same inside and outside the potato/dynamic equilibrium	1
			Question 10 Total	**[6]**

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Question			Marking details	Marks Available
11			**Indicative content** plants use chlorophyll to absorb light energy. convert carbon dioxide and water into glucose and oxygen glucose can be changed to starch and stored used to make cellulose/ proteins light, temperature and carbon dioxide are limiting factors **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question 11 Total**	6 **[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

A.M. TUESDAY, 13 May 2014

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**4**	
3.	**5**	
4.	**6**	
5.	**13**	
6.	**7**	
7.	**6**	
8.	**5**	
9.	**6**	
Total	**60**	

4471
010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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Answer **all** *questions.*

1. Read the information about cocoa.

- Chocolate is made from cocoa obtained from the pods of the cocoa tree.
- Many trees are killed by disease, pests and climate change.
- Every year 3.7 million tons of cocoa are produced. 70% is produced in Africa. The rest is produced equally in South America and Asia.
- By 2015 four million tons of cocoa will be needed to meet the demands of the chocolate industry.
- A mould causes the pods to rot. Farmers use either chemical pesticides or the fungus, *Trichoderma,* to kill the mould.



healthy cocoa pods



cocoa pods with pod rot

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

(a) (i) State **two** factors which can cause cocoa trees to die. [1]

1. .....

2. .....

(ii) Why will the loss of cocoa trees be a problem for farmers in the future? [1]

.....

(b) Calculate the **percentage (%)** of cocoa that is produced in Asia. [1]

..... %

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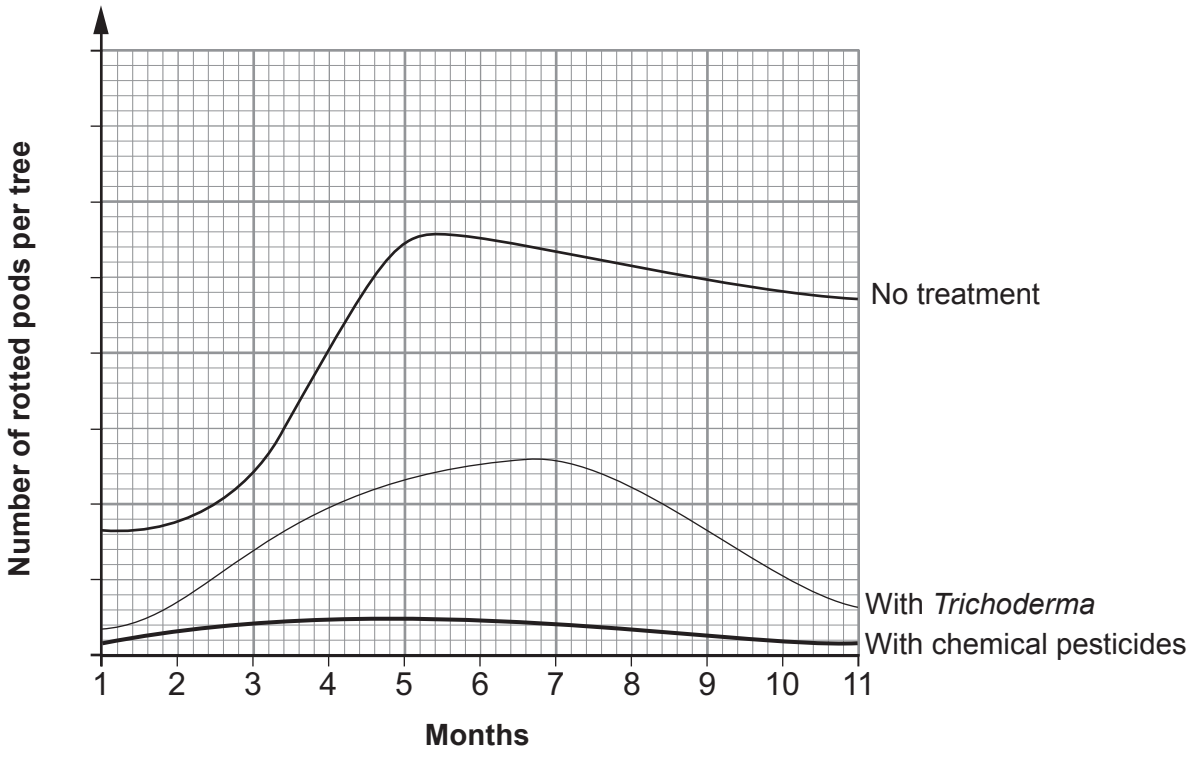
Examiner only

(c) (i) What type of organism is *Trichoderma*? Underline your answer. [1]

plant animal microbe

(ii) What term is used for the process which uses a living organism to kill a pest? [1]

.....



(d) (i) From the graph above, what is the evidence that *Trichoderma* can control pod rot? [1]

.....

.....

(ii) State **one** advantage of this type of pest control compared with using chemicals. [1]

.....

(iii) Why may some farmers prefer to use chemical pesticides to kill the mould? [1]

.....

4471 010003

8

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Turn over.

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2. The diagrams below show part of a DNA molecule with a small section in detail.

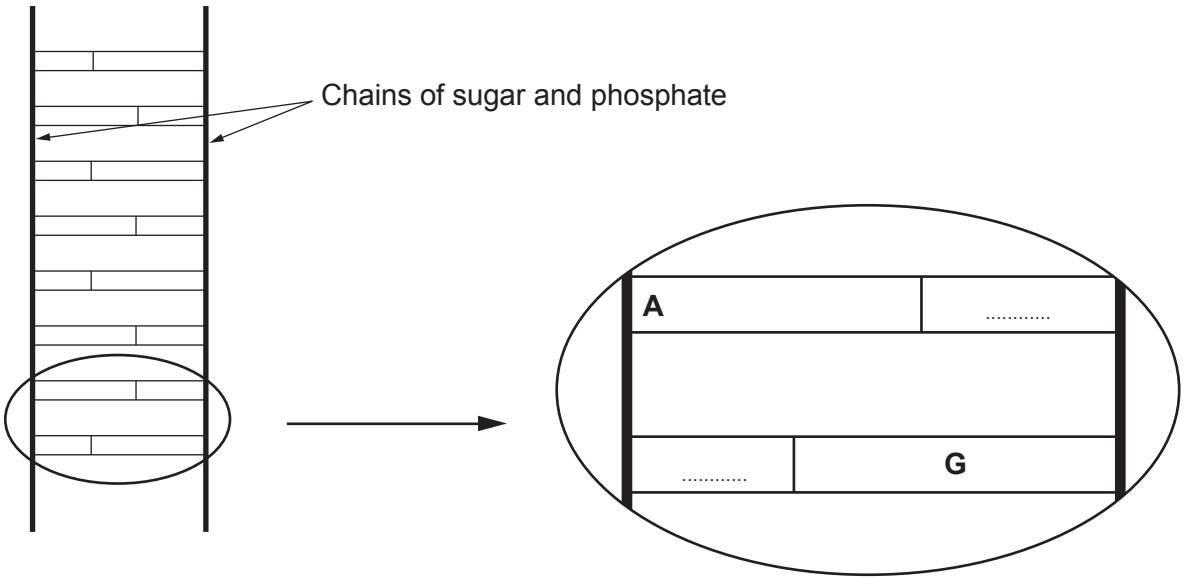


Diagram **1** Diagram **2**

(a) Molecules known as **A**, **T**, **C** and **G** join the chains of sugar and phosphate as shown in the diagrams.

(i) What is the general name for these molecules? [1]
Underline your answer.

bases acids proteins

(ii) Fill in the two missing letters on the dotted lines in Diagram **2**. [1]

(b) (i) Which part of a living cell contains DNA? [1]

.....

(ii) The diagrams show DNA as a ladder-like structure.
How is the **shape** different in a living cell? [1]

.....

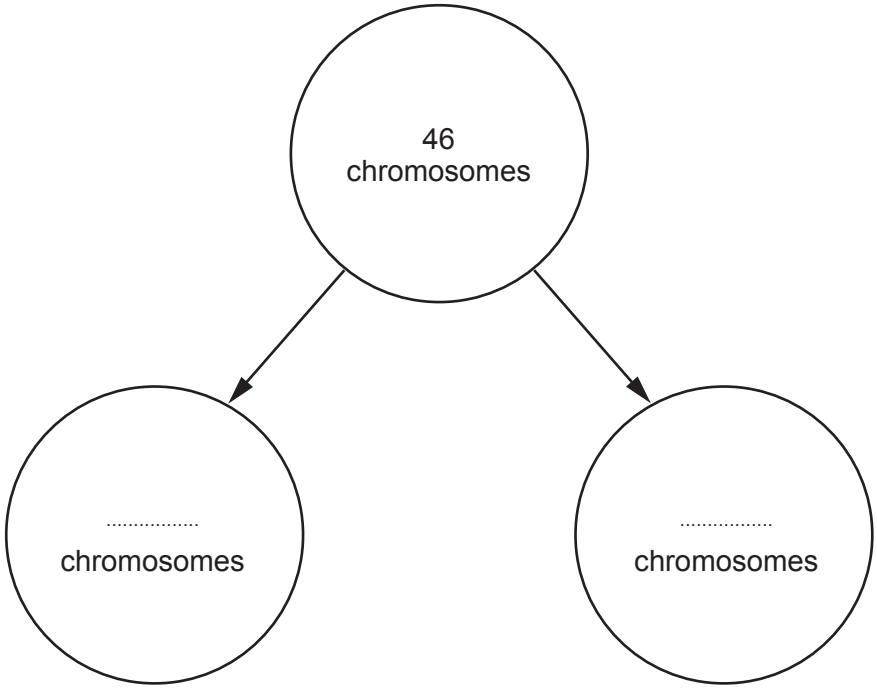
4

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3. The diagram below shows a human cell dividing by mitosis to form two new cells.



(a) (i) Complete the diagram above by writing the number of chromosomes in each of the **two** new cells. [1]

(ii) Mitosis enables organisms to grow. State **one** *other* function of mitosis. [1]

.....

(b) (i) Complete the table which compares mitosis with meiosis. [2]

	mitosis	meiosis
number of new cells from each division	two	.....
genes in new cells compared to original cell	.....	different

(ii) What is the scientific term for the sex cells (eggs and sperm) which are produced by meiosis? [1]

.....

5

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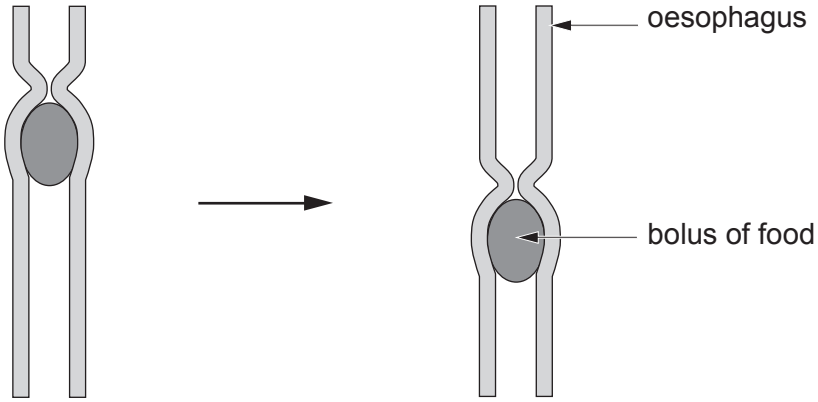
Turn over.

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4. The diagram below shows some food passing through part of the human digestive system.



(a) (i) Name the process by which the food is moved. [1]

.....

(ii) Food passes through different parts of the digestive system.
Which letter, **A**, **B**, **C** or **D** shows the correct order? [1]

A stomach → oesophagus → large intestine → small intestine

B oesophagus → stomach → small intestine → large intestine

C stomach → small intestine → large intestine → oesophagus

D oesophagus → small intestine → stomach → large intestine

Answer .....

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(b) Complete the table below about the digestion of food. [3]

food	enzyme	digested food
.....	carbohydrase	glucose
fat	.....	fatty acids and .....

(c) State a function of the *large* intestine. [1]

.....

6

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Turn over.

5. *(a)* Complete the sentence below. [2] Examiner only

Enzymes, which are made of ..... , control the rate of

..... reactions in living cells.

(b) Students investigated the activity of the enzyme amylase, at different pH values. They used the same volumes of solutions and the same time at each pH.

Results of investigation

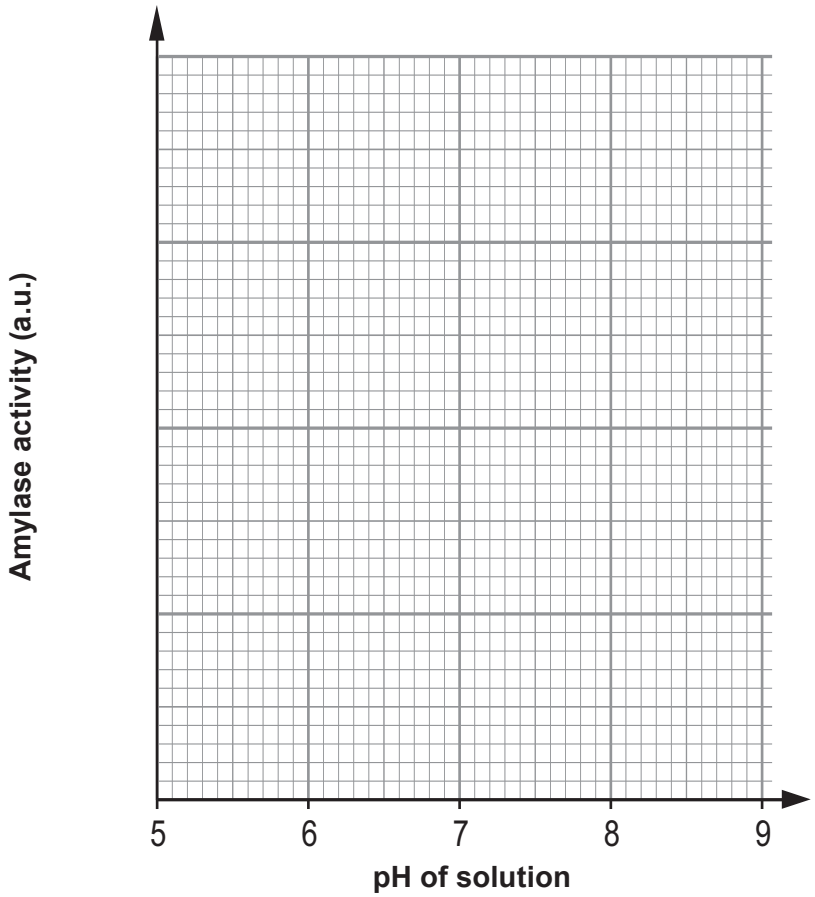
pH of solution	amylase activity (a.u.)
6.0	18
6.5	27
7.0	52
7.5	66
8.0	50
8.5	21

(i) Draw a line graph of the results of the investigation on the grid below by [4]

I. choosing a suitable scale for the amylase activity;

II. plotting the results onto the grid;

III. joining your plots with a ruler.



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(ii) I. From the graph opposite, describe in detail the effect of pH on the activity of amylase. [2]

.....

.....

.....

II. Calculate the difference in activity of amylase between pH 6.2 and pH 7. Show your working. [2]

Answer ..... a.u.

(iii) The students did not keep the temperature constant during their investigation. Why did this prevent their investigation from being a fair test? [1]

.....

.....

(c) Biological washing powders contain enzymes and are often used in the home. Explain the advantage of these powders. [2]

.....

.....

.....

13

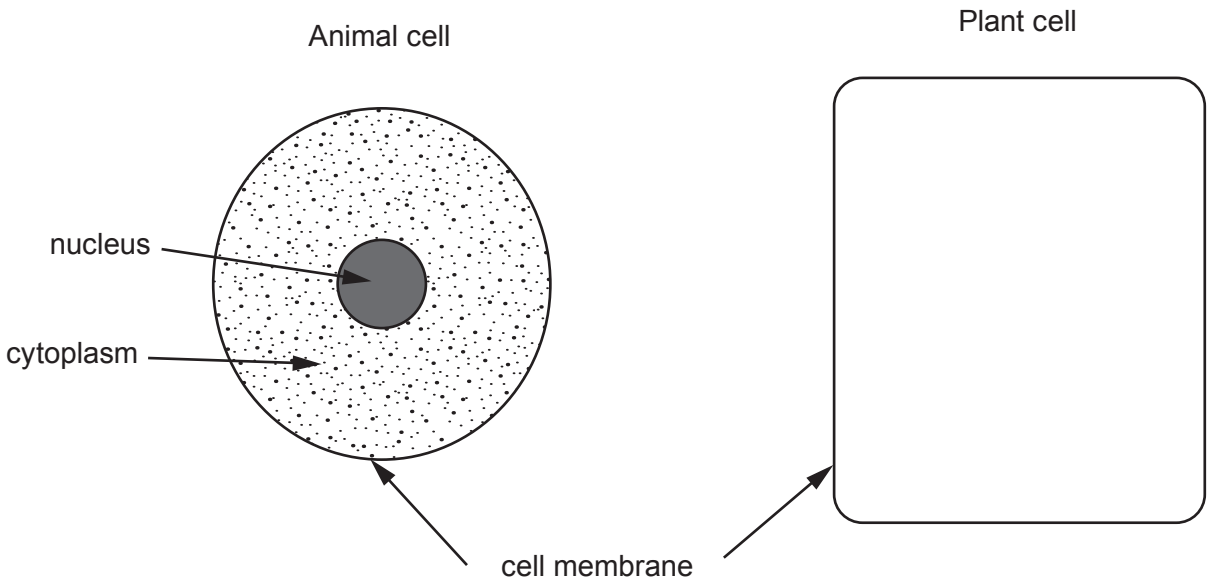
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6. *(a)* (i) The diagrams below show an animal cell and the **cell membrane** of a plant cell. Complete the drawing of the plant cell. *No labels are required.* [2]

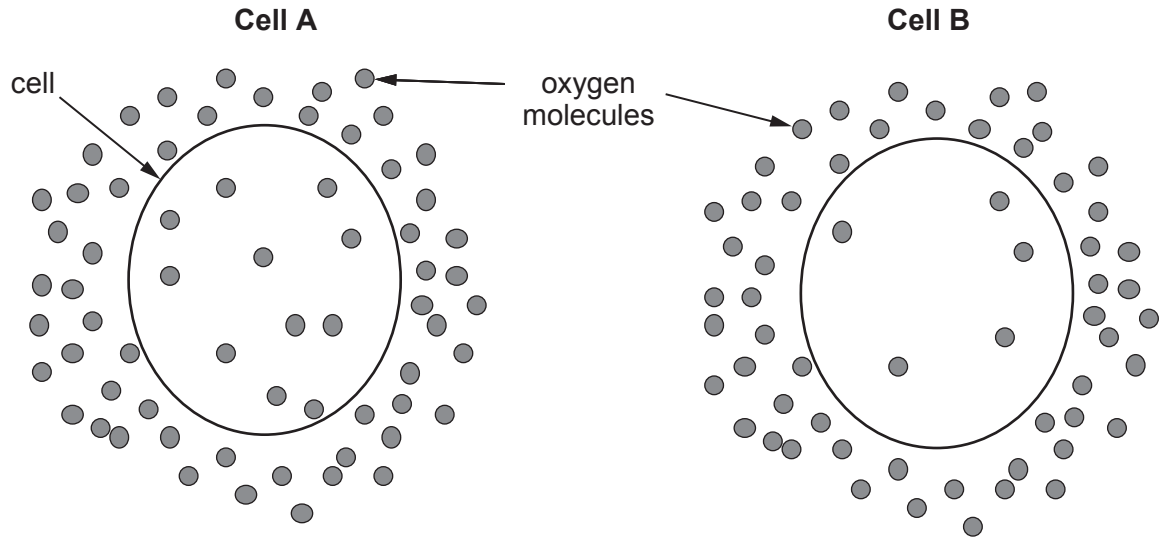


(ii) State the function of the cell membrane. [1]

.....

.....

(b) The diagrams below show two cells which are carrying out respiration. Oxygen molecules are shown inside and outside both cells.



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(i) Answer the following questions by placing a tick [✓] in the correct box. [3]

I. In cell **A** the oxygen molecules move:

into the cell ☐

out of the cell ☐

no net movement. ☐

II. In cell **B** the oxygen molecules move:

into the cell ☐

out of the cell ☐

no net movement. ☐

III. Into which cell would there be the greater net movement of oxygen:

cell **A** ☐

cell **B**? ☐

(ii) Name the process by which the oxygen molecules are moving. [1]

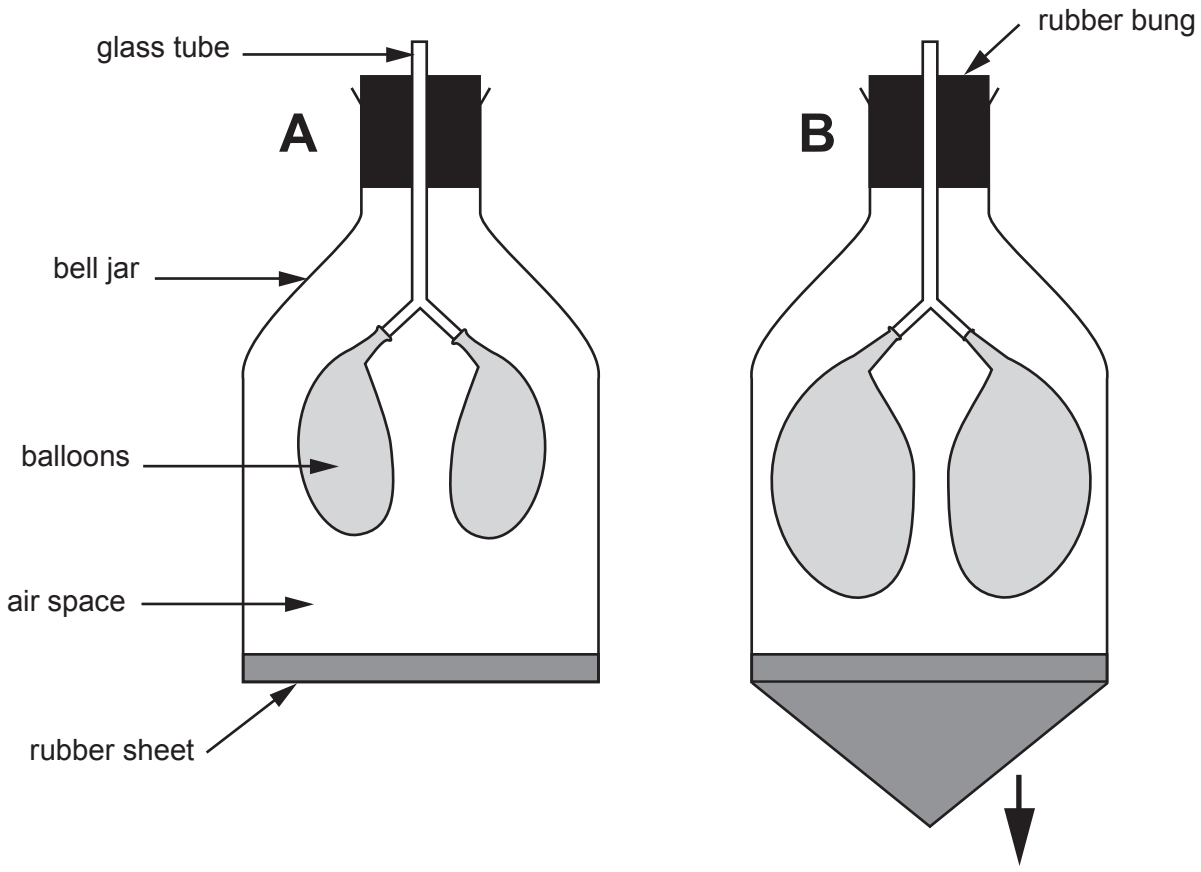
.....

7

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7. The model below represents the human thorax (chest) during expiration and inspiration.



(a) Complete the following sentences by using one of the following choices. [4]

the same **greater** **less**

(i) Compared to diagram **A**, the 'lung' volume in diagram **B** is ..... .

(ii) Compared to diagram **A**, the 'lung' pressure in diagram **B** is ..... .

(iii) Compared to diagram **A**, the 'thoracic' volume in diagram **B** is ..... .

(iv) Compared to diagram **A**, the 'thoracic' pressure in diagram **B** is ..... .

(b) Give reasons why the bell jar model above is not a true representation of the human thorax. [2]

.....

.....

.....

6

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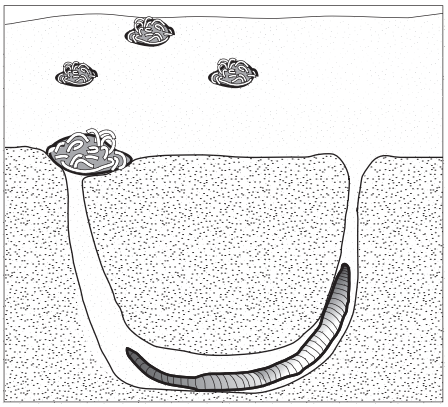
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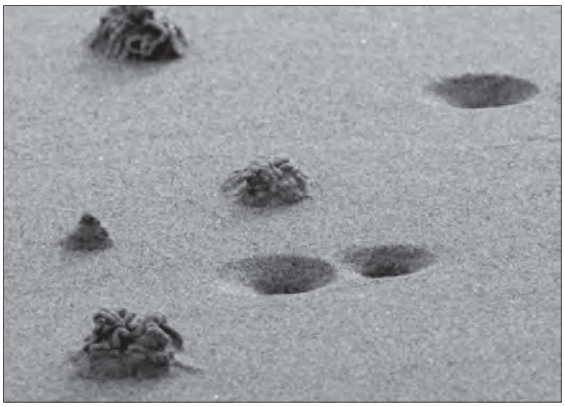
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8. Lugworms *(Arenicola marina)* live in burrows in the sand on beaches. At one end of the burrow is a hole and at the other end is a mound of sand, called the cast, which the lugworm has removed from the burrow. Each burrow is occupied by one lugworm only.

Burrow in section



Surface view



© Alan Gravell

Owen was asked by his teacher to estimate the number of lugworms, on a section of Whiteford Beach on Gower, by counting the number of casts.

Owen decided to use 1 m^2 quadrats to estimate the number of lugworms present in an area of the beach measuring 80 m × 40 m.

(a) Which of the following methods would be the correct way for Owen to use the quadrats to sample the number of lugworms? [1]

Tick (✓) the correct answer.

method	tick (✓)
Place the quadrats where there are lots of casts	
Place the quadrats randomly within the sample area	
Place the quadrats carefully so as not to damage the casts	

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(b) Owen counted the number of casts in 10 quadrat samples.
The table below shows his results.

quadrat number	number of casts
1	5
2	7
3	1
4	11
5	4
6	6
7	9
8	4
9	13
10	2
Mean	.....

(i) Complete the table above by calculating the mean number of casts per quadrat of Owen's samples. [1]

(ii) Estimate the number of lugworms in the section of the beach by using the following equation: [2]

Estimated number of lugworms = Mean number of casts per quadrat × Area of section of beach

Estimated number of lugworms .....

(c) Suggest why this method of sampling would **not** be suitable for estimating the population of earthworms in an area of grassland. [1]

.....

.....

5

TURN OVER FOR QUESTION 9.

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9. Describe the method involved in testing a leaf for the presence of starch.
Each of the stages involved in the method should be described in sequence and the reason for carrying out each stage should be included.
Your description must include reference to the colour changes shown by the leaf and what these changes indicate. [6 QWC]

.....

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6

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE-BIOLOGY

SUMMER 2014

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INTRODUCTION

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

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

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

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GCSE SCIENCE - BIOLOGY

B2

MARK SCHEME - SUMMER 2014

Question			Marking details	Marks Available
1	(a)	(i)	Any two **for one mark** Disease; Pests/fungus/mould; Climate change; *NOT pod rot*	1
		(ii)	Insufficient/ not enough to meet demand (for chocolate)/OWTTE; *NOT decrease unqualified* Accept suitable reference to loss of income/ less money	
	(b)		15%;	1
	(c)	(i)	Microbe ;	1
		(ii)	Biological control/ biocontrol;	1
	(d)	(i)	Fewer rotted pods than untreated; Answer must be comparative	1
		(ii)	Does not affect other organisms/ does not damage biodiversity;	1
		(iii)	Very few rotted pods/ more effective at controlling pod rot/ less rotted pods than with {Trichoderma/ biological control}/ better at killing the mould;	1
			Question 1 total	**[8]**

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Question			Marking details	Marks Available
2	(a)	(i)	Bases;	1
		(ii)	T and C in correct positions;	1
	(b)	(i)	Nucleus; Accept chromosome	1
		(ii)	Twisted/ helix; NOT coil	1
			Question 2 total	**[4]**

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Question			Marking details	Marks Available
3	(a)	(i)	On diagram 46 **and** 46;	1
		(ii)	Replace worn out cells/ repair damages tissue;	1
	(b)	(i)	Four; Identical/ same;	2
		(ii)	Gametes;	1
			Question 3 Total	**[5]**

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Question			Marking details	Marks Available
4	(a)	(i)	Peristalsis;	1
		(ii)	B;	1
	(b)			3

Food	Enzyme	Digested food
Starch/ carbohydrate;	carbohydrase	glucose
fat	**Lipase;**	fatty acids and **Glycerol;**

	(c)		Absorbs water;	1
			Question 4 Total	**[6]**

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Question				Marking details	Marks Available
5	(a)	(i)		Protein; Chemical;	2
	(b)	(i)	I	linear scale; must include number at origin and encompass all readings	1
			II	plots;; +/- ½ small square -1 if line taken back to origin	2
			III	line;	1
		(ii)	I	Increase then decrease; Optimum pH7.5 (from data/ graph) ;	2
			II	Correct readings **from their graph** = 1 mark Correct answer **from their graph** = 1 mark If answer correct but no calculation = 2 marks	2
		(iii)		Temperature affects enzyme activity; Accept reference to varying more than one variable not being a fair test	1
	(c)			Work at {lower/ low} temp (than non- enzyme powders }; Uses less energy/ more economic/ less costly; NOT cleans better or eq.	2
				Question 5 Total	**[13]**

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Question			Marking details	Marks Available
6/1	(a)	(i)	A line drawn **outside** cell membrane; Nucleus, vacuole & chloroplasts (not dots) (all needed) correctly drawn; Must be able to distinguish the three different organelles	2
		(ii)	{Controls/regulates/selects} {the movement of substances /what} into and out of cell; *NOT protect cell/maintain shape*	1
	(b)	(i)	I Into the cell ✓; II Into the cell ✓; III Cell B ✓;	3
		(ii)	Diffusion;	1
			Question 6/1 Total	**[7]**

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Question			Marking details	Marks Available
7/2	(a)	(i)	Greater;	1
		(ii)	Less;	1
		(iii)	Greater;	1
		(iv)	Less;	1
	(b)		Any **two** from Answers must compare bell jar and human The {diaphragm/rubber sheet} in bell jar model is pulled down during inspiration, whereas in the thorax the diaphragm is flattened. (OWTTE); The (wall of the) bell jar is {rigid/does not move}, whereas (the wall of the) {thorax/chest/ribs/ribcage} is {flexible/moves} (and moves during breathing). (OWTTE); Accept {thorax/ ribcage} expands *NOT ribs expand* The bell jar cavity is filled with air, whereas the thoracic wall is filled with body fluid. (OWTTE); In the bell jar there's a large space around the 'lungs'/balloons in the thorax the space is very small. (OWTTE);	2
			Question 7/2 total	**[6]**

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Question			Marking details	Marks Available
8/3	(a)		Place the quadrats randomly within the sample area;	1
	(b)	(i)	Mean = 6.2;	1
		(ii)	Estimated no of lugworms = 6.2 x 3200; = 19 840; Allow ECF from (b)(i) (If answer is correct award 2 marks directly)	2
	(c)		Any ref to evidence not available on surface (to count)/hidden by grass/ {casts/holes/burrows} are <u>hidden by the grass</u>/ earthworms move/ earthworms do not stay in one burrow/ Accept ref to 3D aspect of population of earthworms ie there can be many earthworms at the same vertical point in the soil;	1
			Question 8/3 total	**[5]**

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Question	Marking details	Marks Available
9/4	*Indicative content:* Drop leaf in boiling <u>water</u> to {kill the leaf/ burst the chloroplasts/ {burst/destroy} cell membranes/ to get rid of waxy cuticle} Boil the leaf in ethanol/alcohol/methanol to remove the <u>chlorophyll</u> Place the leaf in water to soften it Spread the leaf on a white tile (or any suitable surface) Add iodine solution to the leaf surface to test for starch If <u>leaf</u> turns {blue-black/ black} starch is present 5 – 6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. 3 – 4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. 1 – 2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. 0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.	6
	Question 9/4 Total	**[6]**

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Question			Marking details	Marks Available
5	(a)		Lipase {digests/ breaks down/hydrolyses} fat (in milk) to fatty acids (and glycerol); Fatty acids {decrease pH/ cause it to become acid}; 2nd mark only given if 1st mark awarded	2
	(b)	(i)	0.135;	1
		(ii)	Bile breaks large globules of fat into smaller globules/ bile emulsifies fat; (accept 'pieces', 'chunks', lumps' of fat but *NOT molecules*) Increasing the surface area for (the action of) {lipase/ enzyme}; More fatty acids produced/ fatty acids produced faster; 3rd mark only awarded if 2nd mark awarded	3
			Question 5 Total	**[6]**

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Question			Marking details	Marks Available
6	(a)	(i)	2;	1
		(ii)	4;	1
		(iii)	3;	1
	(b)			Max 4

1st	F
2nd	**E**
3rd	**D**
4th	**C**
5th	**A**
6th	**B**

4 or 5 correct = 4 marks

3 correct = 3 marks

2 correct = 2 marks

1 correct = 1 mark

	(c)	(i)	22;	1
		(ii)	9;	1
			Question 6 total	**[9]**

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Question			Marking details	Marks Available
7	(a)	(i)	(Rate of) uptake of iodine decreased; to zero; No effect on uptake of water;	3
		(ii)	(Process of) {active transport/ active uptake}; Requires energy; Energy release from respiration is stopped (by chemical);	3
	(b)		Osmosis;	1
			Question 7 total	**[7]**

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Question			Marking details	Marks Available
8	(a)	(i)	Adenine Thymine Cytosine Guanine -1 for each error	2
		(ii)	Amino acids;	1
	(b)		Mitosis; results in genetically identical cells/ same {chromosome/ genes}; NOT similar	2
	(c)		Liver because it has the most active genes; Genes control protein production; Enzymes are proteins; 3rd mark only awarded if 2nd mark awarded	3
			Question 8 Total	**[8]**

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Question	Marking details	Marks Available
9	Indicative content	6

Correct explanation for concentrations e.g.

- 0.0% - water passes in from where it is in high concentration/ water potential to where it is in low concentration/ water potential via Semi Permeable Membrane
- 0.9% - water passes in and out at the same rate.
- 3.0% - correct explanation for decrease in size i.e. opposite to explanation for 0.0%.
- A correct comment on bursting or shrivelling i.e. at extremes of concentration range - membrane is affected.

Top band must have correct explanation for the three concentrations.

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

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

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

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

Question 9 Total **[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

A.M. WEDNESDAY, 8 January 2014

1 hour

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

4471
010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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Answer **all** *questions.*

1. *(a)* Some different types of cells are listed below.

1. Bacterial
2. Yeast
3. Plant
4. Animal
5. Algal

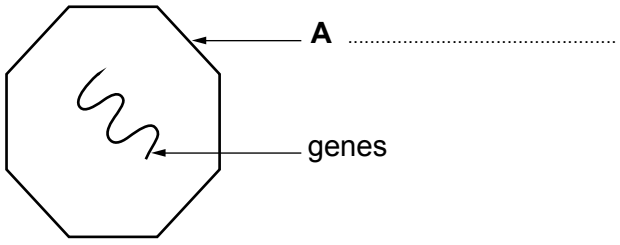
(i) From the list above, name **two** types of cells which are micro-organisms. [2]

....

(ii) Use numbers from the list above to complete the table below. You may use numbers more than once. *One row has been done for you.* [3]

Features of cell	Cells with these parts present
has chloroplasts	3 5
has a cell wall	....
has a nucleus	....
has cytoplasm but no nucleus	.....

(b) (i) The diagram shows a virus. Complete label **A**. [1]



(ii) How does a virus reproduce?
Underline **one** answer from the three choices shown below. [1]

by budding;

by multiplying inside a host cell;

by dividing into two.

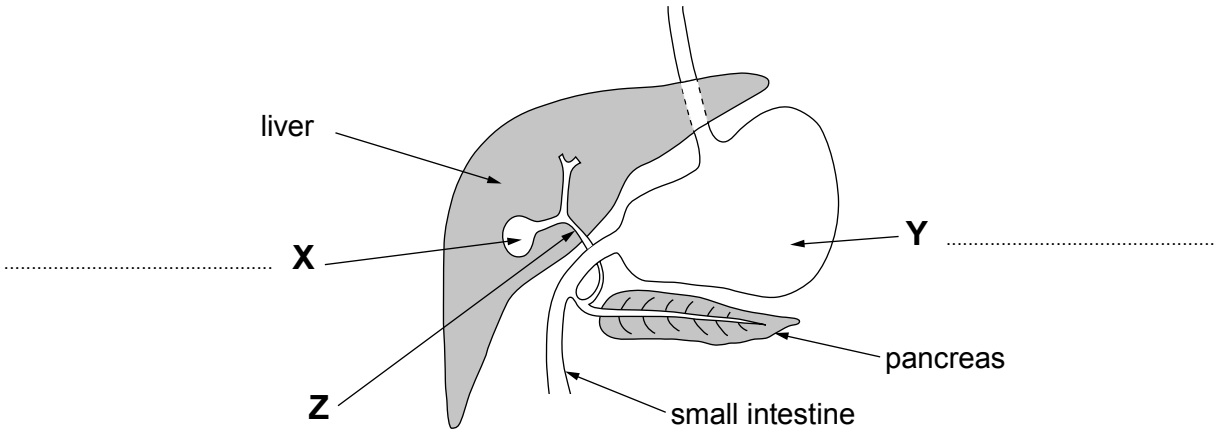
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2. The diagram below shows the liver and some other parts of the digestive system.



(a) Complete labels **X** and **Y** on the diagram above. [2]

(b) (i) Fats are digested in the small intestine. Complete the sentence below. [3]

The liver secretes a substance called ..... . This helps the enzyme named ..... to digest fats into fatty acids and ..... .

(ii) State the function of structure **Z** shown on the diagram above. [1]

.....

6

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Turn over.

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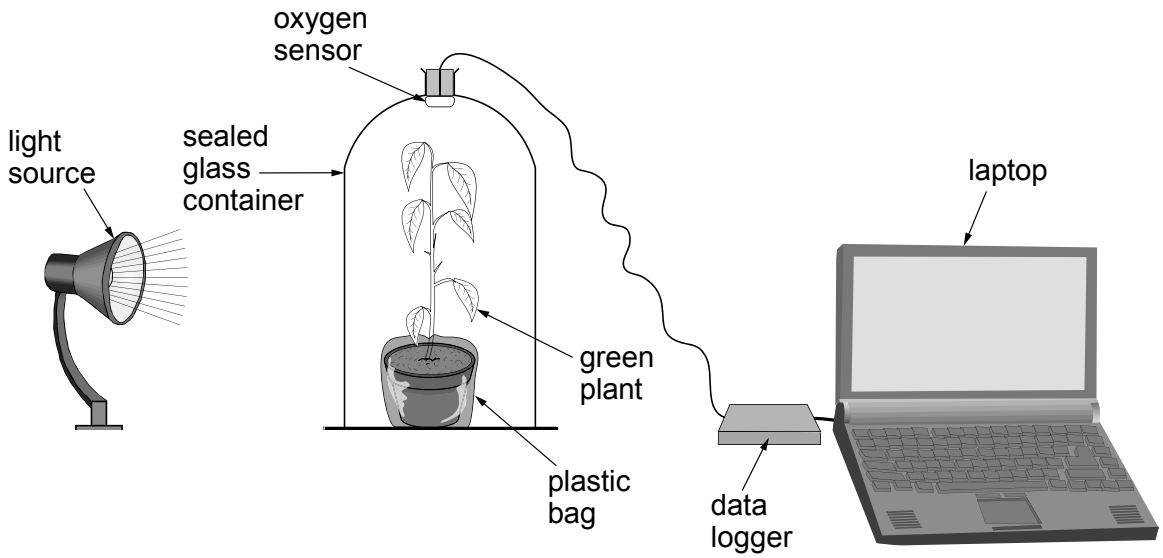
3. *(a)* (i) Complete the word equation for photosynthesis below.

..... + ... $\xrightarrow{\text{light}}$ glucose + oxygen [2]

(ii) Name the substance in plant cells which absorbs light. [1]

.....

(b) Students investigated photosynthesis in a plant. They used a data logger to monitor the oxygen given out by the plant at different light intensities, as shown in the diagram below. They used the same plant for the same time at each light intensity.



The results of the investigation are shown in the table below.

Light intensity (a.u.)	Oxygen level (a.u.)
10	5
15	7
20	11
25	20
30	29
35	34

(i) Draw a line graph of the data above on the grid opposite by:

I. choosing a suitable scale for light intensity; [1]

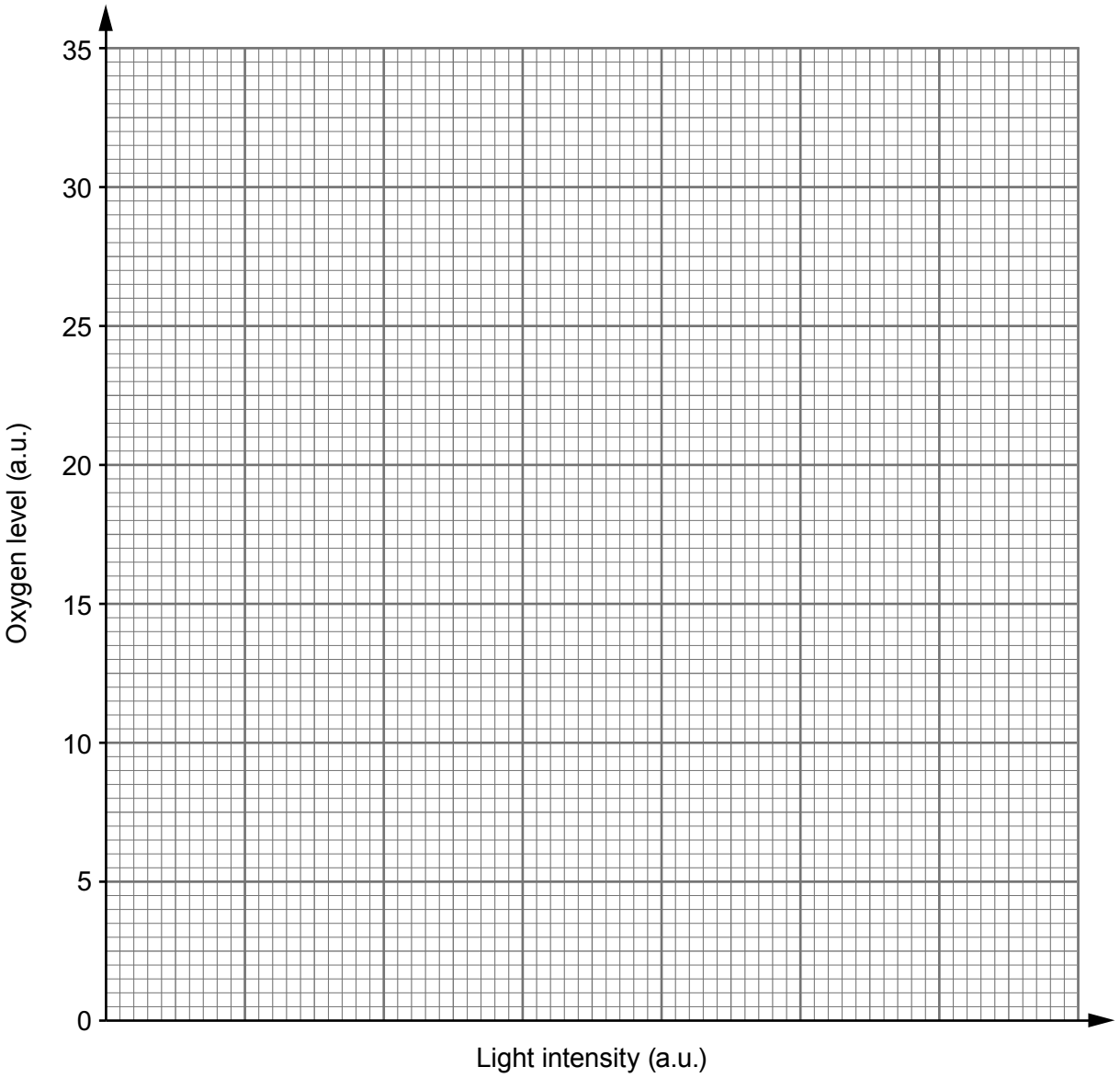
II. plotting the points shown above; [2]

III. joining your plots, using a ruler. [1]

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(ii) Use your graph to answer the following questions.

I. How does the concentration of oxygen change as light intensity increases? [1]

.....

II. Which change in light intensity shown below causes the greatest change in the oxygen concentration? **Circle** the correct answer. [1]

12 – 15 a.u. 22 – 25 a.u. 32 – 35 a.u.

(iii) State **one** way in which the students tried to make their investigation a fair test. [1]

.....

(c) State **one** way in which the glucose produced in photosynthesis is used in plant cells. [1]

.....

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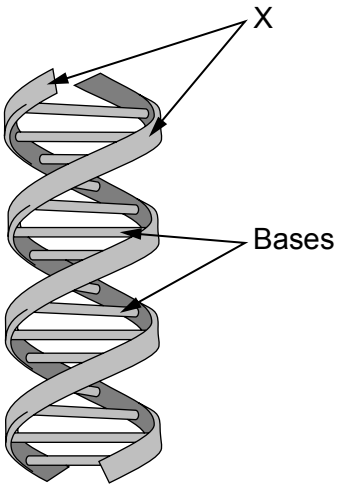
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4. *(a)* Which part of a plant cell contains DNA? Underline your answer. [1]

vacuole nucleus cytoplasm cell membrane

(b) The diagram below shows a small section of DNA.



Use the information in the diagram above and your own knowledge to answer the following questions. Underline the correct answer for **each** question.

(i) Which molecules make up the two strands labelled **X**? [1]

sugar and protein

phosphate and protein

sugar and phosphate

phosphate and salt

(ii) There are four bases A, G, T and C. How are they paired in DNA? [1]

A with T and G with C

A with G and C with T

A with C and G with T

A with A, C with C, T with T and G with G

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(iii) What term is used to describe the structure of DNA? [1]

double coil

double helix

double spiral

single helix

(c) Complete the sentence below. [1]

The order of the bases A, G, T and C in DNA forms a code which controls how

..... are linked together to form different .....

5

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Turn over.

5. Control of Red Spider Mite

- Red spider mites are pests on crops, such as tomatoes, growing in greenhouses in the UK.
- They feed on the leaves and destroy the plants.
- Predatory mites feed on red spider mites.



Tomato plants in a greenhouse



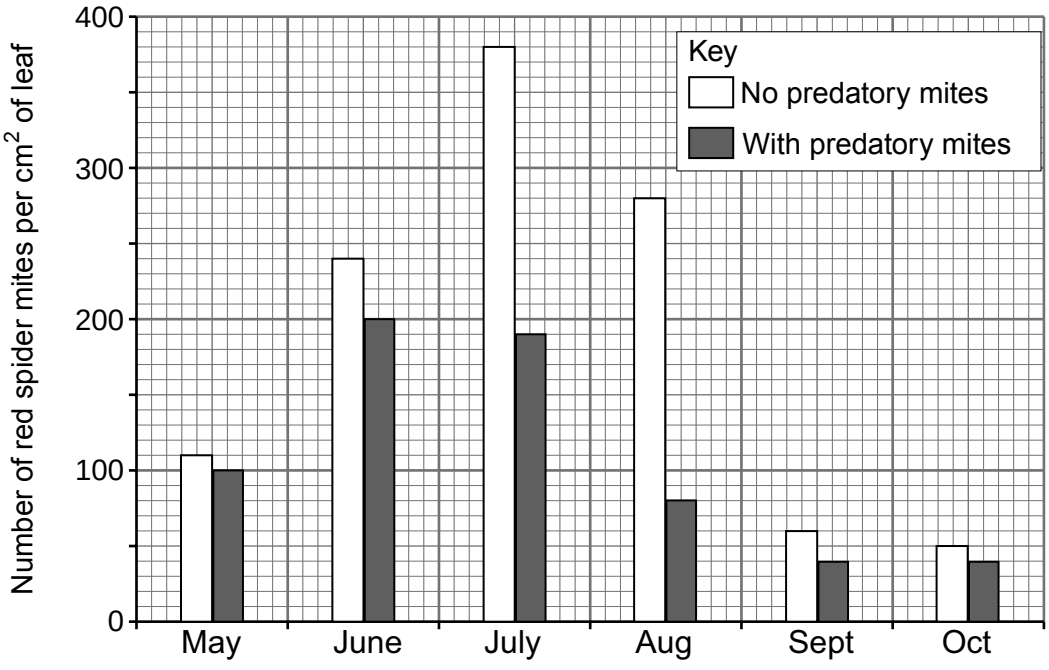
red spider mite



predatory mite

Photographs not to scale

Scientists investigated the use of predatory mites to control red spider mites on tomato plants in a greenhouse. The bar chart below shows their results.



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(a) What term is used for this type of pest control? [1]

.....

(b) Use the bar chart opposite to answer the following questions.

(i) Complete the table below to state the month when the numbers of red spider mites are highest. State the numbers present. [2]

	Month when numbers of red spider mites are highest	Number of red spider mites present (per cm^2 leaf)
No predatory mites present		
With predatory mites present		

(ii) What is the effect of predatory mites on numbers of red spider mites? [1]

.....

(iii) During which month does the predatory mite have the greatest effect on numbers of red spider mite? State the reason why you chose this month. [1]

Month .....

Reason .....

.....

(c) (i) Suggest **one** fact about the predatory mites that the scientists would have to check before using them to protect tomato plants. [1]

.....

.....

(ii) What could the scientists do to be more confident of their results? [1]

.....

.....

7

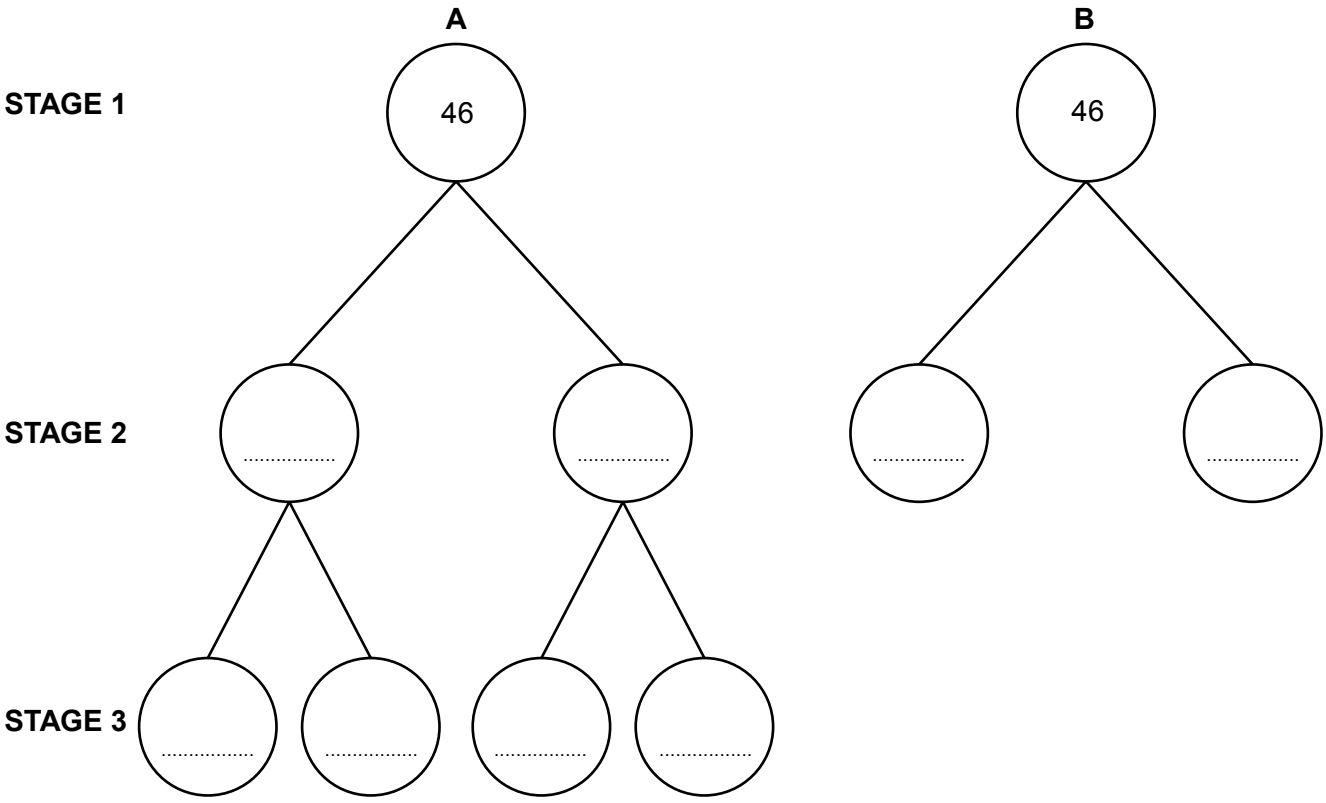
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Turn over.

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6. The diagram below shows the two **different** types of cell division **A** and **B**, which occur in the human body.



(a) Name the type of cell division shown in diagram **A**. ..... [1]

(b) The cells in **STAGE 1** each contain 46 chromosomes. Complete the diagram by writing in the number of chromosomes found in ***each*** of the cells in **STAGE 2** and **STAGE 3**. [2]

(c) The cells drawn in **STAGE 3** develop into specialised cells. What name is given to these cells? [1]

.....

(d) Complete the sentence below by placing a **circle** around the correct word. [1]

All the cells in **STAGE 3** are genetically **identical / different**.

(e) Name **one** process during which the type of cell division shown in diagram **B** would occur. [1]

.....

6

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7. Some students wanted to estimate the number of dandelions on a school playing field. The playing field was too large to count every dandelion so they sampled a 10m × 10m area of the field using a quadrat.



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(a) The stages the students used in their sampling technique are listed below in the **WRONG ORDER**. Write the numbers **1**, **2**, **3** and **4** in the table below to show the correct order. [3]

Stage in the sampling technique	Number
Calculate the number of dandelions on the playing field	
Repeat the sampling 10 times	
Select a random sampling method	
Drop the quadrat and count the number of dandelions	

(b) Why is it important that when the students sample in the chosen area of the field it is done randomly? [1]

.....

4

8. Sian and Rhys were investigating the use of visking tubing as a model gut.
The following is an extract from their notebook showing the method they used.

(i) Soak a piece of visking tube in water for 10 minutes.

(ii) Tie a knot in one end of the visking tube.

(iii) Fill the visking tube with starch solution and tie the open end of the tubing.

(iv) Suspend the visking tubing in a beaker of water.

(v) Test the water in the beaker every 15 minutes for the presence of starch and glucose.

(vi) After 45 minutes inject amylase enzyme into the visking tubing.

(vii) Continue to test the water for starch and glucose every 15 minutes.

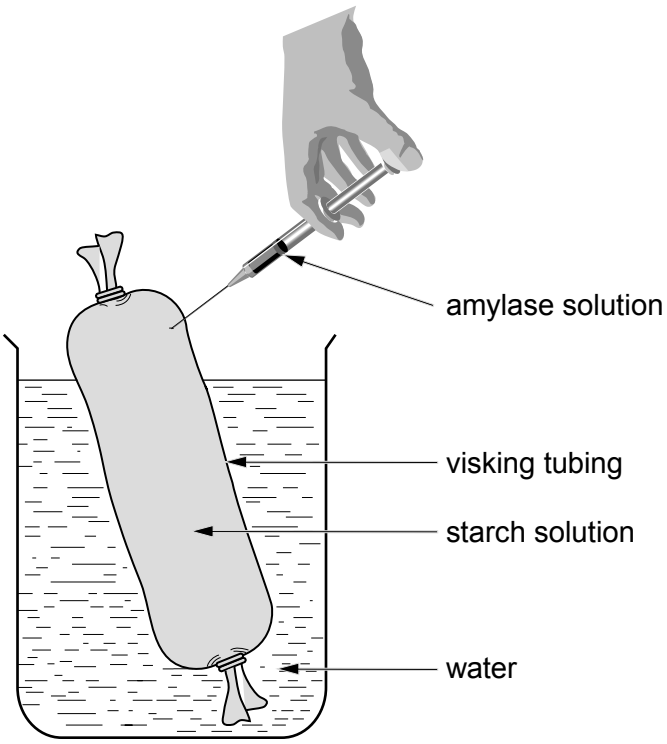


Table of results.

Amylase added →

Time (minutes)	Starch present	Glucose present
0	No	No
15	No	No
30	No	No
45	No	No
60	No	Yes
75	No	Yes
90	No	Yes

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(a) After the amylase was added, glucose was present in the sampled water. Explain this result. [3]

.....

.....

.....

.....

.....

.....

(b) State why starch was not found in the sampled water. [1]

.....

.....

(c) In the model gut shown opposite, what does the water surrounding the visking tubing represent in the living body? [1]

.....

(d) Complete the following table about food tests. [2]

Substance tested for	Reagent used	Colour of reagent	Colour with positive result
	Iodine solution		blue-black
Glucose		blue	

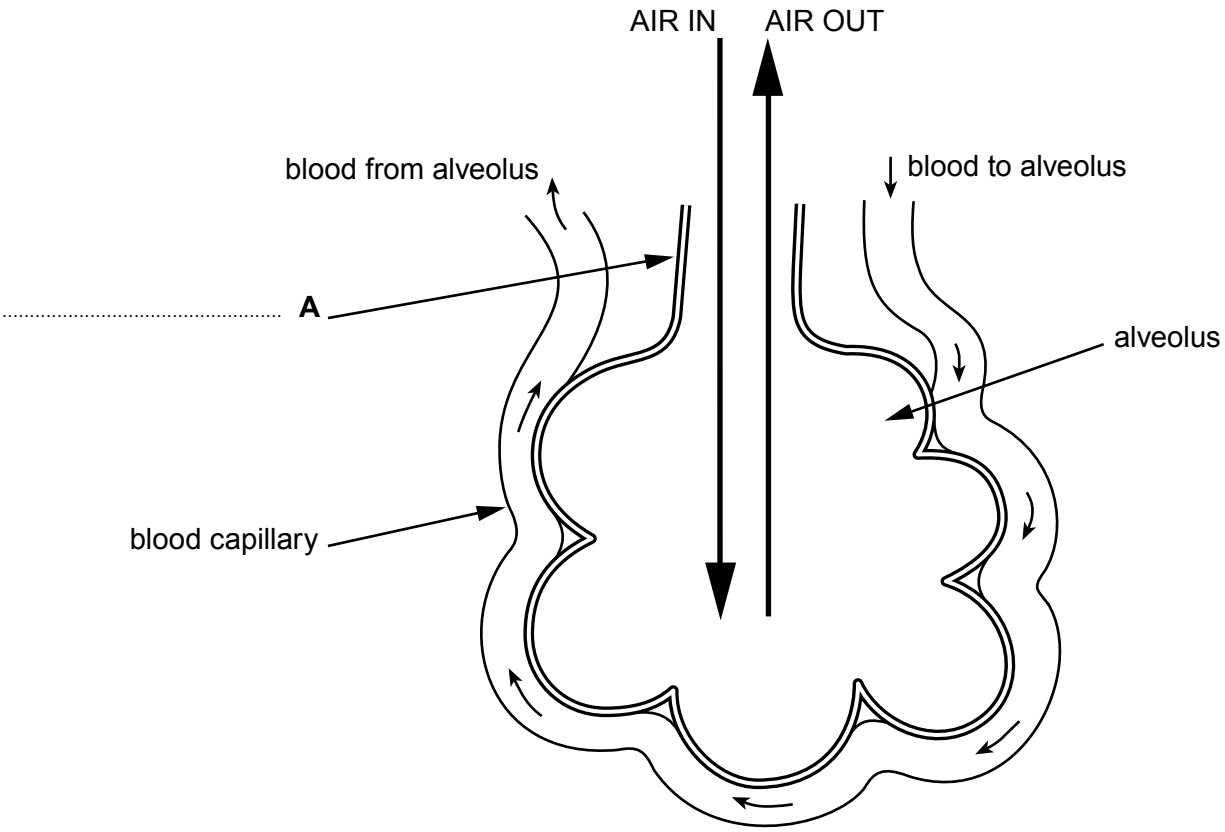
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9. The diagram shows an alveolus and its blood supply.



(a) Complete label **A** on the diagram above. [1]

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(b) Explain how gas exchange takes place between the alveolus and blood capillary. Include in your answer a description of how the alveolus is adapted to help this gas exchange. [6 QWC]

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7

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

JANUARY 2014

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INTRODUCTION

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

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Question			Marking details	Marks Available
1	*(a)*	(i)	Any two from Bacteria(l); Yeast; Alga(l);	max 2
		(ii)	1235; can be in any order 2345; can be in any order 1;	3
	(b)	(i)	Protein (coat);	1
		(ii)	By multiplying inside a host cell;	1
			Question 1 total	**[7]**

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Question			Marking details	Marks Available
2	*(a)*		X - gall bladder; Y - stomach;	2
	(b)	(i)	Bile; Lipase; Glycerol;	3
		(ii)	carries bile (into small intestine)/bile {travels/passes/flows/ transported} through/bile flows through; NOT releases bile/this is the bile duct/connects gall bladder to intestine/carries bile to pancreas	1
			Question 2 total	**[6]**

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Question			Marking details	Marks Available
3	*(a)*	(i)	Carbon dioxide CO_2; NOT Co Water/H_2O;	2
		(ii)	Chlorophyll;	1
	(b)	(i)	I suitable scale;	1
			II all plots correct; (tolerance +/- 0.5 small square) 1 error = 1 mark, 2 errors = 0 mark	2
			III line quality;	1
		(ii)	I rises/increases;	1
			II 22-25	1
		(iii)	Same plant/same time; NOT – ref to repeating/reliability	1
	(c)		Respiration/{release/ for}energy/cellulose/cell wall/(storage as) starch/ protein; NOT {create/produce/make} energy NOT food/growth (this could be neutral)	1
			Question 3 Total	**[11]**

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Question			Marking details	Marks Available
4	*(a)*		Nucleus;	1
	(b)	(i)	Sugar and phosphate;	1
		(ii)	A with T **and** G with C;	1
		(iii)	Double helix;	1
	(c)		Amino acids **+** Proteins;	1
			Question 4 Total	**[5]**

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Question			Marking details		Marks Available
5	*(a)*		Biological (control); Accept bio control		1
	(b)	(i)	*No mites present* *With mites present*	July 380; (reject 380**cm^2**) June 200; (reject 200**cm^2**)	2
		(ii)	Reduces/decreases;		1
		(iii)	August – greatest difference in number/OWTTE;		1
	(c)	(i)	Check whether it {affects/causes} {disease/damage} to {other organisms/ tomatoes} / does not become a pest itself; NOT disease unqualified/causes disease to humans		1
		(ii)	Further work – need for repetition/check for repeatability/do it {again/ multiple times/three times}; NOT reproducibility *Q refers to same scientists*		1
			Question 5 Total		**[7]**

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Question		Marking details	Marks Available
6/1	*(a)*	Meiosis (correct spelling required);	1
	(b)	STAGE 2 - 23, 23, 46, 46; STAGE 3 – 4 cells each containing 23;	1 1
	(c)	Gametes/sex cells/sperm/eggs/ova; NOT daughter cells	1
	(d)	Different;	1
	(e)	Growth/cell replacement/repair (of damaged) {<u>tissues/cells</u>}; NOT asexual reproduction/mitosis/bacterial reproduction/ replication/ cloning	1
		Question 6/1 Total	**[6]**

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Question		Marking details	Marks Available
7/2	*(a)*	4 3 1 2 3 or 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark	3
	(b)	Make reference to {avoiding bias/validity}; NOT {fair test/reliability} (could be neutral)/ not to favour an area/give a true result	1
		Question 7 Total	**[4]**

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Question		Marking details	Marks Available
8/3	*(a)*	• Amylase digested/ broke down/hydrolysed; NOT turn/change	1
		• Starch to glucose;	1
		• which {diffused/ passed/ small enough to go} through the {visking tubing/membrane} (into the water); *	1
		*Only accessed if second marking point awarded	
	(b)	Starch <u>molecule</u> <u>too big</u> to pass through {<u>visking tubing/ membrane</u>};	1
	(c)	Blood/blood stream;	1
	(d)	1 mark for each correct row	2

Substance tested for	Reagent used	Colour of reagent	Colour with positive result
Starch	Iodine	**Yellow-brown/ Orange/orange-brown/ yellow-orange NOT red/ yellow**	blue- black
Glucose	**Benedict's**	blue	**green/yellow/ orange/ /brown/brick red NOT red**

Question 8/3 Total **[7]**

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Question		Marking details	Marks Available
9/4	*(a)*	Bronchiole	1
	(b)	**Indicative content:** Air breathed in contains more oxygen than blood arriving at the alveolus. Oxygen dissolves in moisture (accept water) lining alveolus. Oxygen diffuses into blood through the thin alveolus wall. Blood in capillary arriving at alveolus contains more carbon dioxide than air in alveolus. Carbon dioxide diffuses into alveolus. Large surface area of alveolus means increased gas exchange. **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.	6
		Question 9/4 Total	**[7]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	Liver – arrow **&** name;	1
		(ii)	Gall bladder – arrow **&** name;	1
	(b)	(i)	Bile breaks {down/ up} large {lipid/fat/oil} drop(let)s <u>into</u> small drop(let)s; Accept bile emulsifies lipid/fat/oil **NOT** large molecules into small molecules Ref to pH is neutral for <u>increased/bigger/larger surface area</u> for enzyme/lipase action;	2
		(ii)	All {lipid/ olive oil} digested/enzyme working flat out;	1
		(iii)	Glycerol;	1
			Question 5 total	**[6]**

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Question		Marking details	Marks Available
6	*(a)*	Enzyme –substrate complex;	1
	(b)	Active site is {changed/distorted/altered}/bonds in active site are broken; {Substrate/amino acid} cannot {fit/join/lock }; NOT match	2
	(c)	Temperature; pH; NOT PH/Ph Concentration of substrate; Concentration of enzyme; Reject amount/volume/mass	Max 2
		Question 6 total	**[5]**

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Question		Marking details	Marks Available
7	*(a)*	Carbon dioxide/CO_2	1
	(b)	As temperature increases salt concentration increases; as water is evaporated; (only awarded if 1st mark awarded)	2
	(c)	• Osmosis; (reject if salt water or salt or solutions are moving)	1
		• (When salt concentration is high) – water is lost;	1
		• Correct statement about water potential/water moves {from where it is in high concentration to where it is in low concentration/ down a concentration gradient} (related to animals/surrounding solution);	1
		• Correct mention of selectively permeable membrane/ other correct form of words;	1
		Question 7 total	**[7]**

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Question	Marking details	Marks Available
8	• Active transport/uptake;	1
	• Requires <u>both</u> oxygen and glucose;	1
	• For respiration/release of energy;	1
	• Rate of uptake of glucose follows rate of uptake of cadmium/Rate of uptake of cadmium follows rate of uptake of glucose/the more the rate of uptake the more glucose is used;	1
	Question 8 Total	**[4]**

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Question		Marking details	Marks Available
9	*(a)*	$\frac{200 \times 200}{20}$;	2
		Answer = 2000;	
		2 marks for correct answer	
	(b)	20/ number recaptured;	1
	(c)	Sample {size/area} may be too small/sample from only one part of lake; Sampling needs to repeated (and averaged); Immigration; Predation may have reduced numbers marked/differential predation due to dye/dye makes fish more visible to predators; The dye adds bias to recapture/ dye makes fish easier to see to recapture; (ignore ref to time given to sampling)	Max 3
	(d)	Line rises <u>from February</u>, peaks in {March/April} + then drops;	1
		one mark for 12 month scale; (accept letters/numbers for names of months)	1
		Question 9 Total	**[8]**

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Question	Marking details	Marks Available
10	**Indicative content** Similarities: both break down glucose and release energy. Differences: muscle cells produce lactic acid and no carbon dioxide during anaerobic respiration. Aerobic respiration produces water and carbon dioxide. Aerobic uses oxygen and anaerobic does not. Anaerobic creates oxygen debt, aerobic does not. Aerobic is more efficient because it releases more energy per glucose molecule than anaerobic because it completely breaks down glucose. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit	
	Question 10 Total	**[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/01

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
FOUNDATION TIER

A.M. TUESDAY, 14 May 2013

1 hour

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

4471 010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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Answer **all** *questions.*

1. Read the information about the palm trees.



Xaté Palm Tree



Preparing Xaté leaves for sale



Bouquet

- Xaté Palm trees grow in rain forests in Belize, Central America. Many trees are dying.
- Every year millions of palm leaves are cut and sold to florists, in Europe, for making bouquets.
- Palm trees grow slowly, producing only two leaves each year. If too many leaves are cut the tree cannot survive.
- The International Union for the Conservation of Nature (IUCN) is concerned about this endangered species and the animal species that feed on it.
- Conservationists at Bangor University have set up Project Darwin. Through this project, farmers in Belize will grow palm trees in special areas to provide leaves for the floral industry.

From this information.

(a) (i) Why are Xaté palm leaves sent to Europe? [1]

.....

(ii) Suggest why so many Xaté palm trees are dying. [1]

.....

(b) How will biodiversity in rainforests be affected in the future if palm trees continue to die? Give a reason for your answer. [1]

Answer .....

.....

Reason .....

.....

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(c) Why will it take many years for Project Darwin to be effective? [1]

.....

(d) The IUCN wants to ban the sale of Xaté leaves completely.
Suggest why people in Belize may not want this to happen. [1]

.....

5

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Turn over.

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2. *(a)* (i) During digestion in the human body, large food molecules are broken down. Draw lines joining the large food molecules to the smaller molecules into which they are broken down. [2]

Large food molecules	**Smaller molecules**
protein	glucose
starch	fatty acids and glycerol
fats	amino acids

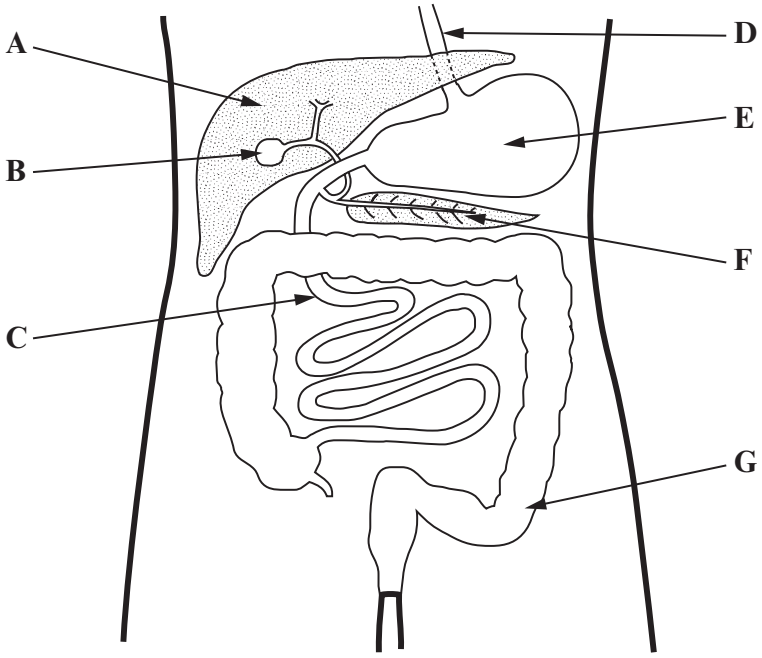
(ii) Why is it necessary for these large food molecules to be broken down? [1]

.....

(iii) State the function of carbohydrate foods in the human body. [1]

.....

(b) The diagram below shows part of the digestive system in the human body.



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From the diagram opposite.

(i) Give the letters which show [1]

I. the pancreas, ...

II. the large intestine. .....

(ii) Give the **two** letters which show where protein is digested. [1]

....

(c) Complete the table below to show the test solutions used to identify food substances. [2]

Food Substance	Test solution
glucose	.....
.....	biuret

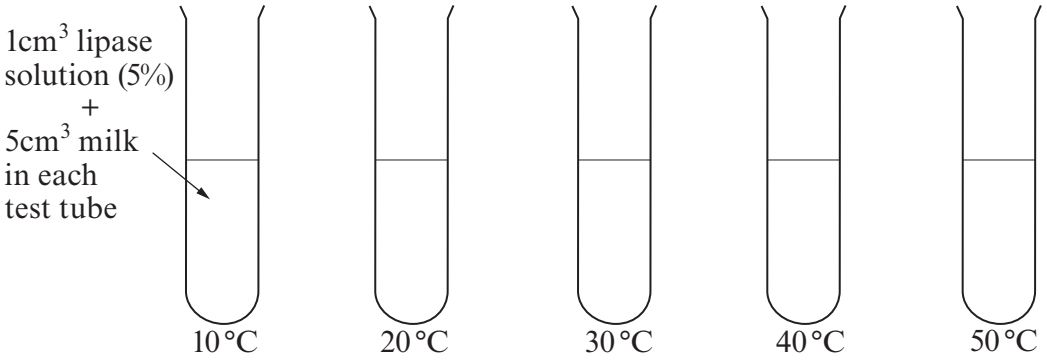
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3. Students investigated the activity of the enzyme lipase, in milk at different temperatures.

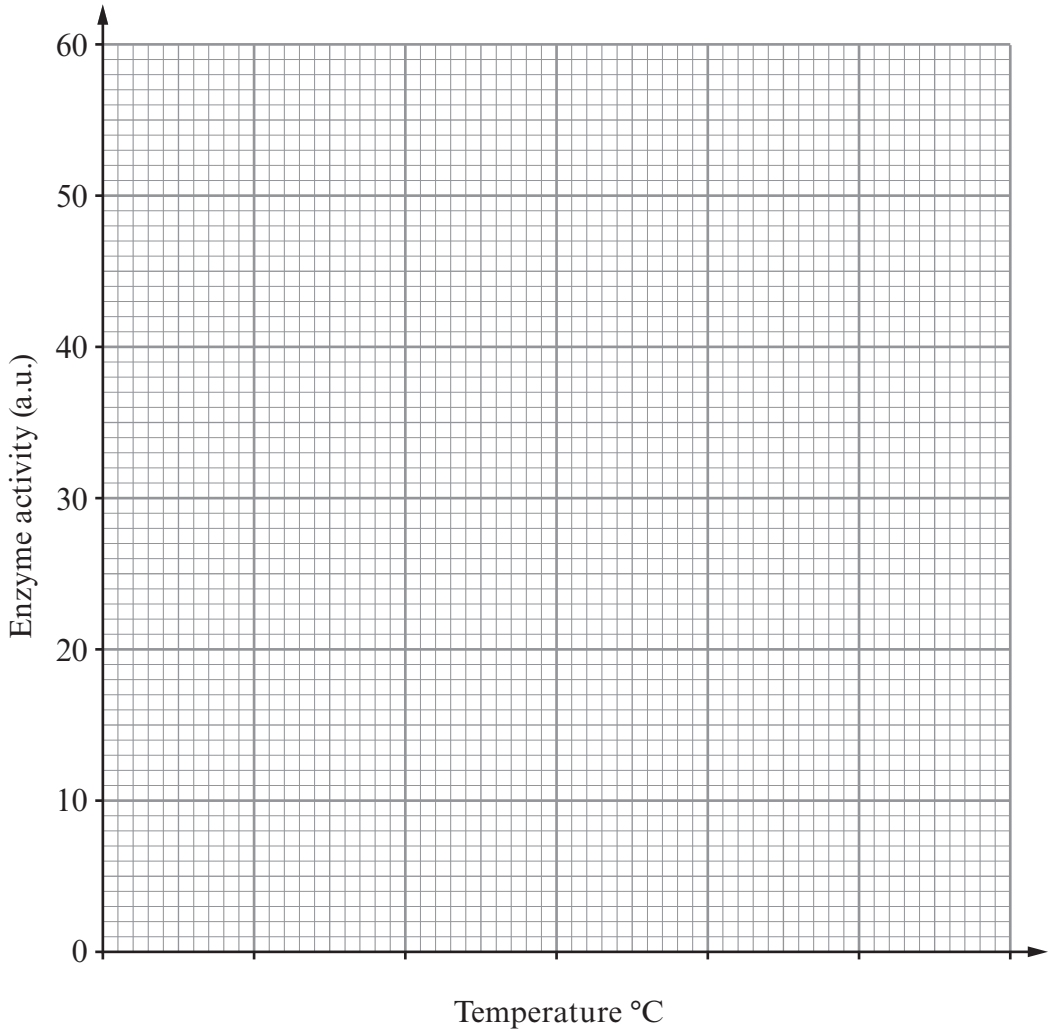
They set up a test tube for each temperature as shown in the diagram below.



Results of investigation

Temperature (°C)	Enzyme activity (a.u.)
10	15
20	32
30	48
40	54
50	36

Graph of results



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(a) Plot the results onto the grid opposite by:

(i) choosing a scale for the temperature axis; [1]

(ii) plotting the results for enzyme activity shown in the table opposite; [2]

(iii) joining your plots with a ruler. [1]

(b) From your graph.

(i) Describe how the activity of the enzyme changes between the temperatures of 25 °C and 45 °C. [1]

.....

.....

(ii) Calculate the change in enzyme activity between 15 °C and 35 °C.
Show your working. [2]

..... a.u.

(c) The students set up a control test tube using boiled lipase.

(i) State the volumes of boiled lipase solution and milk which should be used in this tube. Give a reason for your answer. [2]

boiled lipase solution ..... cm^3

milk ..... cm^3

Reason .....

.....

(ii) Give the reason why there was no enzyme activity in the control tube. [1]

.....

.....

(d) On which substance in milk does lipase act? Underline your answer. [1]

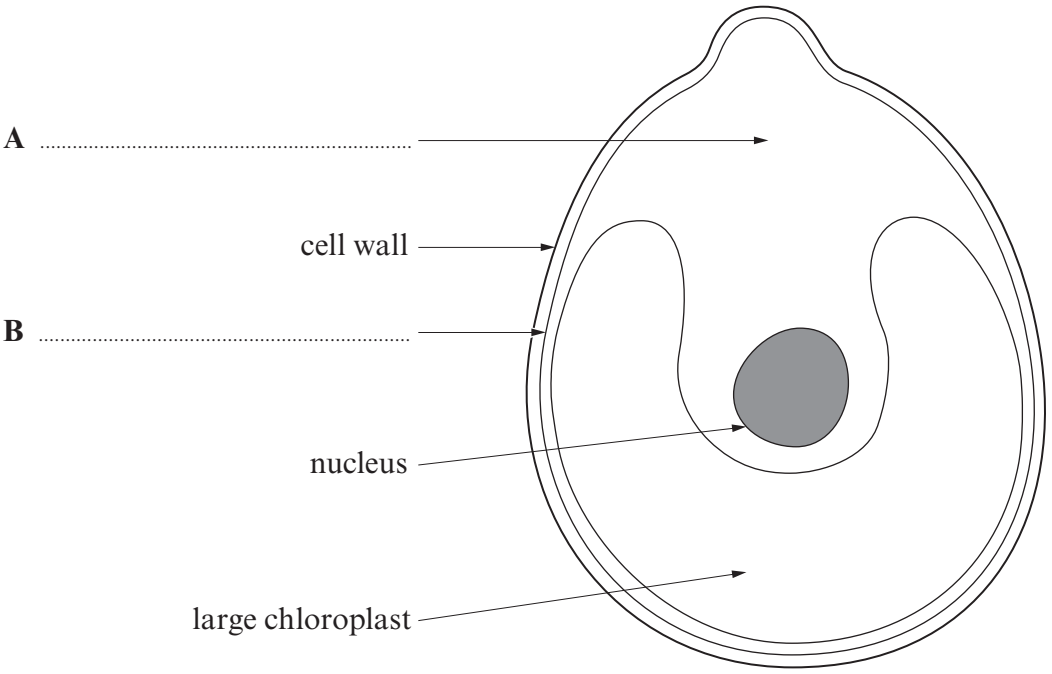
protein sugar fat calcium

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4. The diagram below shows an algal cell.



(a) Complete labels **A** and **B** on the diagram above. [2]

(b) (i) Complete the table. [3]

Part of algal cell	Function
nucleus	.....
.....	photosynthesis
cell wall	.....

(ii) I. Name **one** part of the algal cell, shown in the diagram above which is **not** present in an animal cell. [1]

.....

II. Name **one** part of the algal cell, shown in the diagram above which is **not** present in a bacterial cell. [1]

.....

7

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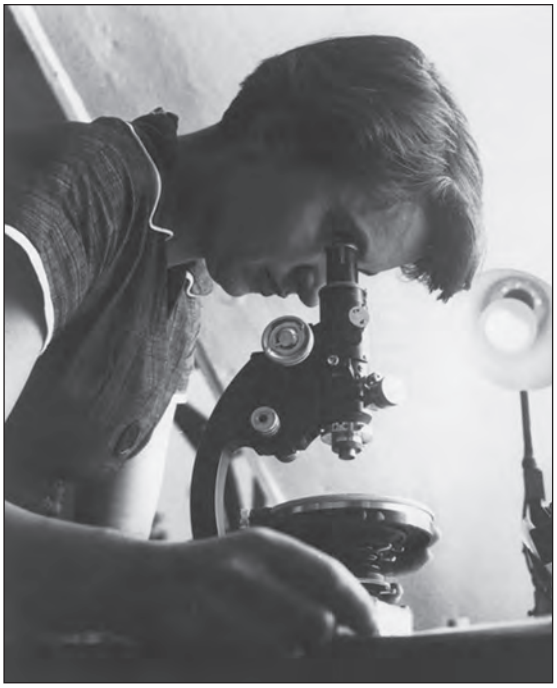
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5. *(a)* The photograph below shows a scientist who worked on the structure of DNA in the 1950s.



© Henry Grant Collection/Museum of London

Rosalind Franklin

How was the structure of DNA discovered?
Choose one of the following statements to answer the question. [1]

A by one scientist using a number of different techniques

B by many scientists using a number of different techniques

C by many scientists using the same technique

D by one scientist using one technique

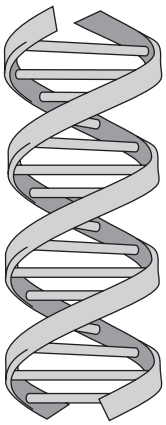
Letter .....

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The diagram below shows part of a DNA molecule.



DNA

(b) Complete the sentences about DNA using some of the words below. [3]

phosphate bases amino acids helix sugar

DNA is made up of two long chains of alternating ..... and ..... molecules which are joined by the ..... A, T, C and G. DNA is twisted to form a double ..... .

(c) Why is the order of the molecules A, T, C and G in DNA important in the production of proteins? [1]

.....

.....

5

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6. Barack Obama, the President of the United States of America, supports research into the use of embryonic stem cells. However Newt Gingrich, who was hoping to become President, said in February 2012, that he would ***'ban embryonic stem cell research if he became President'***.



Barack Obama



Newt Gingrich

(a) Suggest why some people support embryonic stem cell research, whereas others do not. [2]

.....

.....

.....

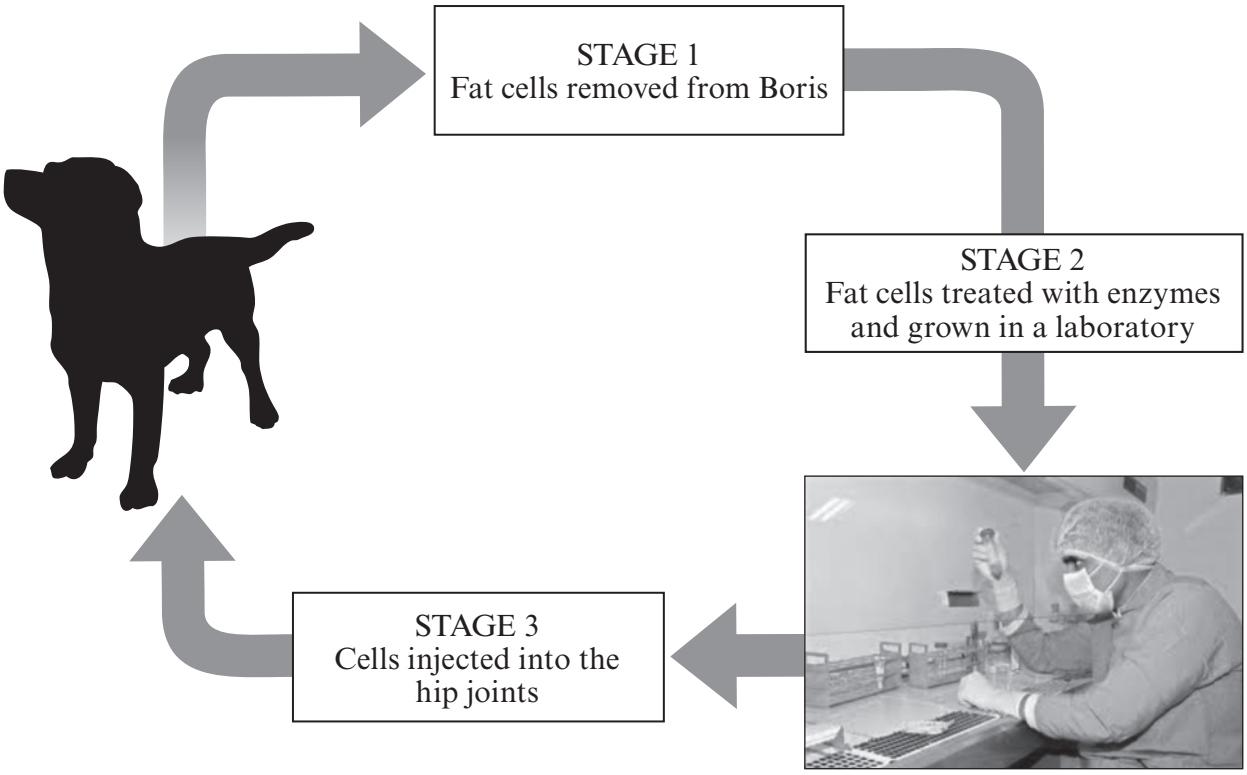
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(b) In December 2010, a dog named Boris was treated for severe arthritis of the hip joints in a veterinary clinic in West Michigan, USA. Some of the stages in the treatment are shown below.



Three months after treatment Boris was examined at the veterinary centre. His hips were found to have greatly improved and X-rays of the hip joints showed evidence of repair of the joint tissues.

(i) State what type of cells are injected in STAGE 3 in the diagram above. [1]

.....

(ii) State **one** advantage of this method of treatment over the use of embryonic stem cells. [1]

.....

.....

4

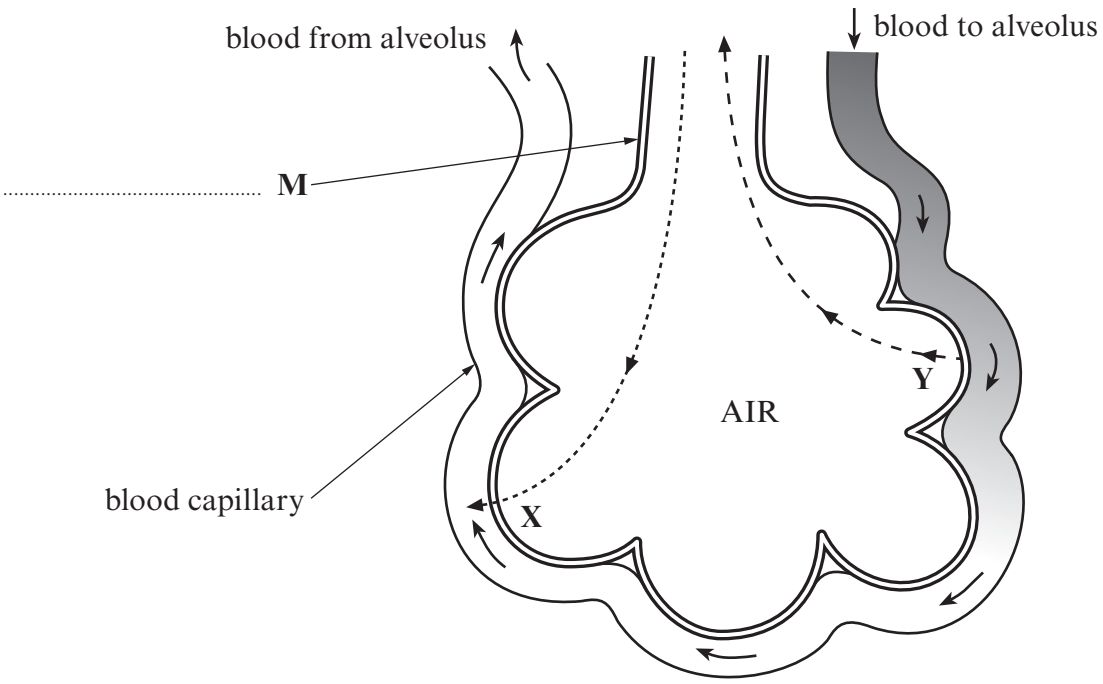
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7. The diagram shows an alveolus.



(a) (i) Label structure **M** on the diagram above. [1]

(ii) Name gas **Y** shown on the diagram above. ..... [1]

(b) Explain how gas **X** passes from the alveolus into the blood capillary. [2]

.....

.....

.....

.....

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(c) Complete the table below to show the differences between inspired and expired air. [2]

Gas	Inspired air (%)	Expired air (%)
oxygen	21	.....
carbon dioxide	.....	4
nitrogen	79	79
water vapour	varies	1

6

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8. A plant was destarched. A leaf on the plant was treated as shown in diagram **M** below. The plant was then placed in bright sunlight for 6 hours. The leaf was removed and tested for starch. The result is shown in diagram **N**.

Diagram **M**

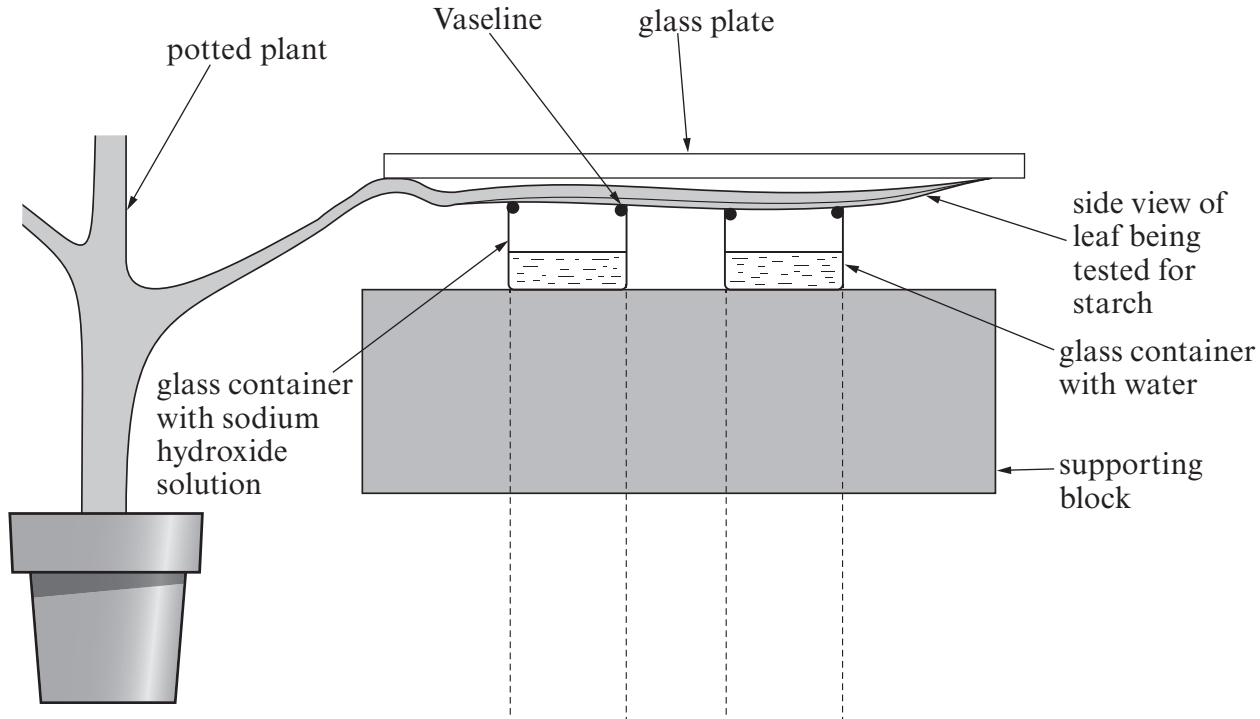
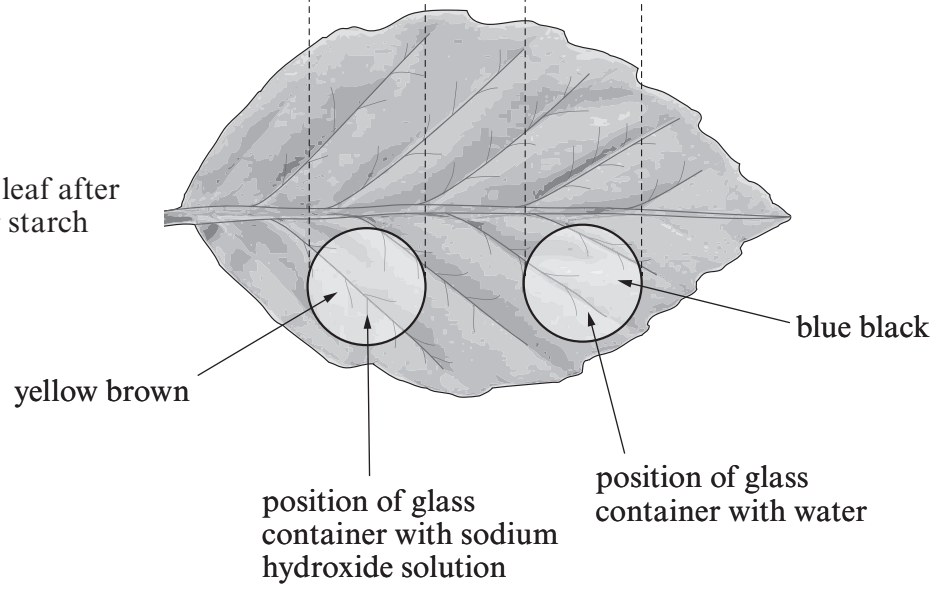


Diagram **N**

surface view of leaf after being tested for starch



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(a) State what the investigation shown opposite demonstrates. [1]

.....

.....

(b) (i) How would you completely remove all the chlorophyll from the leaf before testing for starch? [1]

.....

.....

(ii) Name the chemical used to test for starch. [1]

.....

(iii) Explain why part of the leaf in diagram **N** is yellow-brown in colour. [3]

.....

.....

.....

.....

.....

(c) What was the purpose of the glass container with water? [1]

.....

(d) Why is it only possible to form a valid conclusion for this investigation if the glass plate and containers allow light through? [1]

.....

.....

8

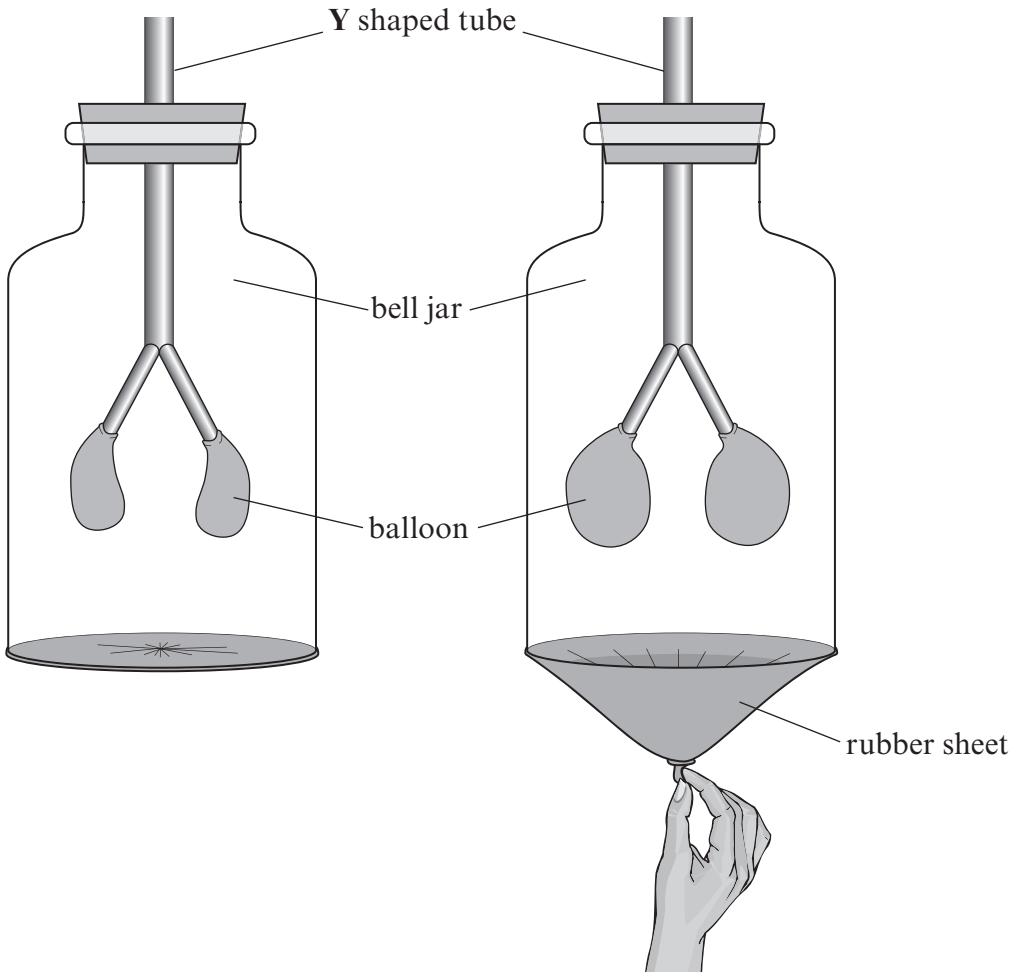
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9. Explain how the bell jar model shown below can be used to illustrate **inspiration** (breathing in). In your explanation you must state which organs in the body are represented by the balloons and rubber sheet in the model. [6 QWC]



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6

END OF PAPER

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GCSE MARKING SCHEME

BIOLOGY

SUMMER 2013

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INTRODUCTION

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

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

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

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Science - Biology

B2

Question			Marking details	Marks Available
1	*(a)*	(i)	Selling to florists/ floral industry/ bouquets;	1
		(ii)	Cutting too many leaves/ cutting too often/ removing too many leaves; NOT cutting down	1
	(b)		(Decrease) loss of (animal) species/ species becoming extinct/ less or fewer species; Reject animals haven't got enough food/ numbers decreasing/ species will die/ not enough food to feed all the species Reject type instead of species	1
	(c)		(Palm) tree slow growing/ long time needed to produce (enough) leaves (to sell)/ only two leaves are produced each year; NOT two leaves are produced each year	1
	(d)		Employment/ local economy/ lose source of money/ no crops for farmers/ can't sell them to make money/ ORA;	1
			Question 1 total	**[5]**

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Question			Marking details	Marks Available
2	*(a)*	(i)	protein – amino acids starch – glucose fats – fatty acids and glycerol 2/3 correct lines;; (1 correct = 1 mark)	2
		(ii)	For absorption/ pass through cell/ for getting into blood/ for use by cells/ pass through cell membrane;	1
		(iii)	{for /to release / to get} source of energy; NOT produce energy/ make energy	1
	(b)	(i)	I F II G;	1
		(ii)	C and E;	1
	(c)		Benedicts (reagent); Protein;	2
			Question 2 total	**[8]**

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Question			Marking details	Marks Available
3	*(a)*	(i)	Suitable scale properly labelled;	1
		(ii)	Correct plots; ½ small square tolerance	2
			1 error = 1 mark 2 errors = 0	
			No extrapolation	
		(iii)	Good quality line through the centre of the points with ruler;	1
	(b)	(i)	Rises then falls/ goes up and then goes down/ goes to maximum and then drops;	1
		(ii)	Correct readings from graph shown in working;	1
			Ideally (51 – (Any reading between 23 and 24))	
			Consequent correct answer; (27/ 27.5/ 28)	1
			Accept ecf	
			If no working shown accept correct answer for 2 marks if consistent with graph	
	(c)	(i)	1 (cm^3) **and** 5 (cm^3);	1
			Fair test/ comparison;	1
		(ii)	(Boiled) enzyme – denatured/ destroyed;	1
			NOT 'killed'	
	(d)		Fat;	1
			Question 3 Total	**[11]**

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Question			Marking details		Marks Available
4	*(a)*		**A** Cytoplasm; **B** Cell membrane;		2
	(b)	(i)	**Part of algal cell**	**Function**	3
			nucleus	Controls cells (activities)/ holds or contains {chromosomes/ DNA/ genes/ genetic information} ;	
			Chloroplast;	photosynthesis	
			Cell wall	Shape/ support/ rigid structure/ stops cell expansion; NOT protection/ structure unqualified/ keeps it strong/ gives stability	
		(ii)	I chloroplast/ cell wall; II nucleus/ chloroplast;		2
			Question 4 Total		**[7]**

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Question		Marking details	Marks Available
5	*(a)*	B;	1
	(b)	Phosphate **and** sugar; (either order)	3
		Bases;	
		Helix;	
	(c)	Code (for amino acids);	1
		NOT ‘code for life’	
		Question 5 Total	**[5]**

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Question			Marking details	Marks Available
6/1	*(a)*		(Obama) believes that embryonic stem cell research will lead to the {treatment/ cure} of many diseases/ treat {damaged tissue/ or correct example}. (OWTTE);	1
			(Gingrich) – reference to the ethical issues involved eg destruction of {embryos/ foetus/ unborn children}/ life is lost/ destroying (potential human) life; NOT - playing God	1
	(b)	(i)	stem cells;	1
		(ii)	avoids ethical issues of {using/killing} {unborn children/ embryos/ foetus}/ cells more likely to be accepted by the body/less likelihood of rejection; NOT less chance of transfer of disease/ nothing is killed/ less controversial unqualified	1
			Question 6/1 Total	**[4]**

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Question			Marking details	Marks Available
7/2	*(a)*	(i)	Bronchiole;	1
		(ii)	carbon dioxide/CO_2 (not CO^2/Co_2/CO2 etc);	1
	(b)		dissolves in {moist/ water} lining (of alveolus)(not dissolves in water vapour)/ passes in solution; diffuses (no ref. to diffusion gradient required); diffuses in solution = 2 marks	2
	(c)			2

Gas	*Inspired air (%)*	*Expired air (%)*
Oxygen	21	16;
Carbon dioxide	0.04;	4
Nitrogen	79	79
Water vapour	varies	1

Question 7/2 Total **[6]**

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Question			Marking details	Marks Available
8/3	*(a)*		carbon dioxide/CO_2 (not CO^2 or Co_2 etc) required for photosynthesis/starch manufacture;	1
	(b)	(i)	{Boil/ heat} in {alcohol/methanol/ethanol}; Boiling water = neutral	1
		(ii)	Iodine (solution);	1
		(iii)	no CO_2/ CO_2 absorbed by sodium hydroxide; no photosynthesis; no starch produced;	3
	(c)		Control/ to make a comparison;	1
	(d)		because you wouldn't know whether it was the lack of light or lack of carbon dioxide which prevented photosynthesis/starch production; Answer must refer to both carbon dioxide and light limiting photosynthesis	1
			Question 8/3 Total	**[8]**

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Question	Marking details	Marks Available
9/4	**Indicative content** The balloons represent lungs. The rubber sheet represents diaphragm. When rubber sheet is pulled down, the volume of air-tight space around balloons increases and pressure decreases/ drops/ goes down. The balloons inflate/ expand/ blow up as air is drawn in. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit	6
	Question 9/4 Total	**[6]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	arrow pointing to liver;	1
		(ii)	arrow pointing to gall bladder; (ends of arrows must touch or go into each organ)	1
	(b)	(i)	speeds up (digestion)/ allows more to be digested;	1
		(ii)	Break down large droplets of oil (into small droplets)/ emulsifies; NOT reference to molecules NOT reference to digestion increase surface area; Must be clear that it is in reference to oil droplets, especially if first mark is not given for lipase to work/for enzyme action; (cannot be given alone)	3
			Question 5 Total	**[6]**

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Question		Marking details	Marks Available
6	*(a)*	Mean catch/ mass caught increased; {Number/ percentage} of {young fish/ two year old fish} caught increased/ {number/ percentage} of {older fish/ 4-9 year old fish} caught decreased;	2
	(b)	Larger mesh size means {smaller/ younger} fish are not {caught/escape}/ smaller fish thrown back; young fish survive to {grow/ reach breeding age}/ young fish grow to 3-4 years of age; So would {breed/ reproduce}; (third marking point cannot be given alone)	3
	(c)	{Reduce/ limit} the {quota/ size of catch/ mass of fish}/ Restrict {days/ time} fishing boats can be used/ reduce {surface area/ size} of net/ reduce length of fishing season/ introduce no fishing;	1
	(d)	Any two from Reference to less employment; Less fish sold/ reference to money; reduction of other species because cod is a predator/ cod eat other commercially important species; cost of buying new nets or equipment;	2
		Question 6 total	**[8]**

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Question			Marking details	Marks Available
7	*(a)*		Osmosis; Movement (of water) {from where it is in high concentration to low concentration/ down a concentration gradient} <u>into</u> the micro-organism; Via a semi permeable membrane;	3
	(b)	(i)	Mould(s)/ moulds (fungi);	1
		(ii)	Removes water (from food)/ causes water to pass out (of food); NOT salt absorbs water from fish Until water activity is too low for micro-organisms (or named micro-organism) to survive/ water activity is less therefore no micro-organisms can survive;	2
	(c)		Bacteria by division/ dividing into two/ dividing/ splitting/ fission; NOT mitosis Yeast by budding;	2
			Question 7 total	**[8]**

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Question			Marking details	Marks Available
8	*(a)*	(i)	S;	1
		(ii)	Because of sugar stored in the yeast;	1
		(iii)	Sugar was used up/ no sugar left/ alcohol poisoned (killed) yeast;	1
		(iv)	To show any gas (carbon dioxide) production was caused by yeast/ eliminate oxygen/ prevent aerobic respiration/ to be able to measure from {the same starting point/ zero}; NOT so no gas present	1
	(b)	(i)	Oxygen debt;	1
		(ii)	Lactic acid;	1
		(iii)	Would be reduced;	1
		(iv)	Aerobic;	1
			Question 8 total	**[8]**

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Question	Marking details	Marks Available
9	**Indicative content** Two chains of alternating sugar and phosphate molecules connected by bases. The chains are twisted to form a double helix. There are 4 bases: adenine, thymine, cytosine and guanine. Base pairing occurs between A and T; C and G. Triplet codes determine types of amino acids. The order of amino acids will determine the particular protein produced. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit. **Question 9 Total**	**[6]**

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Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4471/01

ADDITIONAL SCIENCE
FOUNDATION TIER
BIOLOGY 2

A.M. WEDNESDAY, 9 January 2013

1 hour

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

4471 010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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Answer **all** *questions.*

1. Read the information below about bird species which are at risk of becoming endangered.

- Conservation scientists investigated the numbers of the four species of birds, shown below, in an area of the UK.
- They counted in 1999 and again in 2009.
- Numbers had decreased.

Species	Habitat
 Pied Flycatcher	Oak trees
 Turtle Dove	Farmland
 Cuckoo	Woodland
 Grey Partridge	Farmland

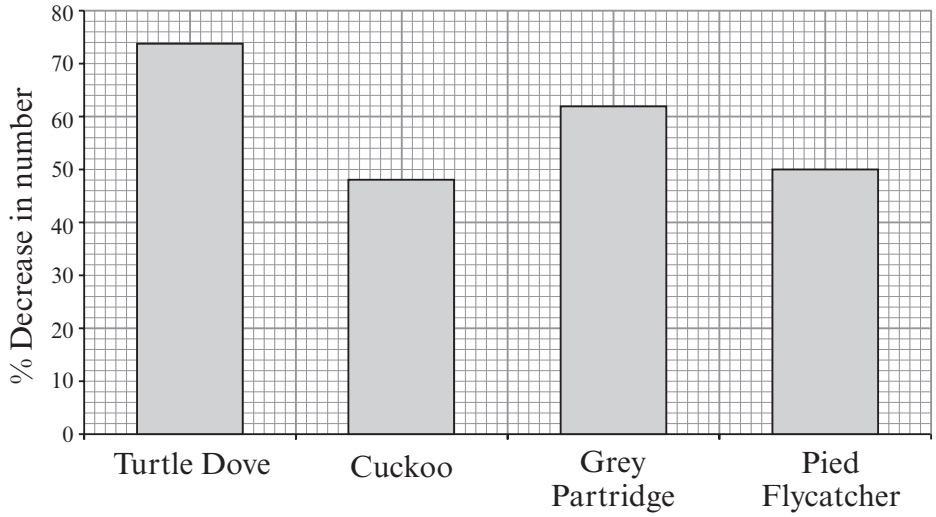
Drawings not to scale

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The bar chart below shows the % decrease in number between 1999 and 2009.



(Data from British Trust for Ornithology)

Answer the questions below using the information **opposite and above**.

(a) Which species is most at risk of becoming endangered? [1]

Species .....

Reason .....

(b) The number of Pied Flycatchers in 2009 was 520.
Calculate the number that would have been present in 1999. [1]

Answer .....

(c) Bird numbers can decrease because of human activities.
Name **one** species which could be affected by each of the following:

(i) building houses on fields previously used for growing crops; [1]

.....

(ii) cutting down trees for agriculture. [1]

.....

(d) If the numbers of these birds continue to decline in future years how will biodiversity in the area be affected? Underline your answer and give a reason. [1]

increase decrease no change

Reason .....

.....

4471 010003

5

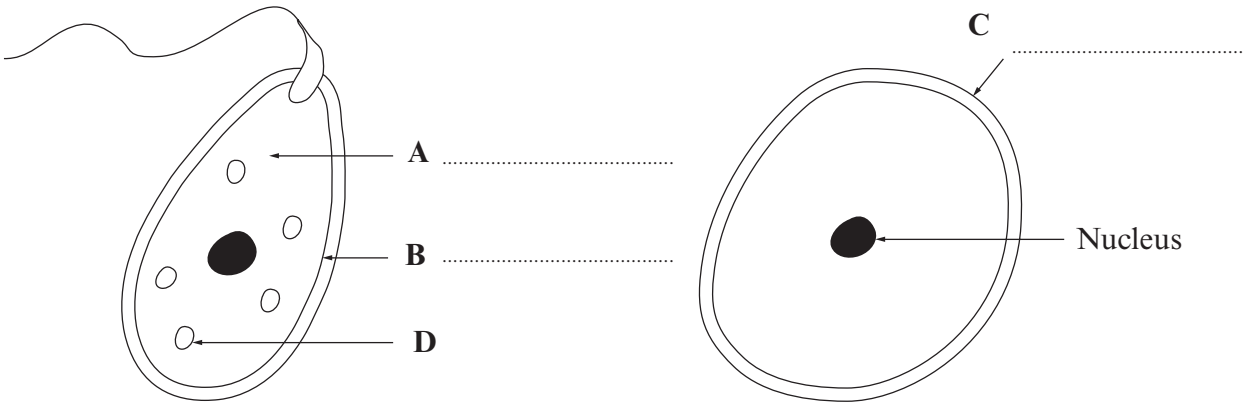
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2. *(a)* The diagrams below show two micro-organisms.

(i) Label **A**, **B** and **C** on the diagrams below. [3]



Algal Cell Yeast Cell

(ii) Structure **D** contains chlorophyll. Name this structure and state its function. [2]

Name .....

Function .....

(iii) Name **one** structure shown on the diagrams above, which would *not* be present in a bacterial cell. [1]

.....

(b) Scientists use light microscopes to study living cells. Why is an electron microscope *unsuitable* for this task? [1]

.....

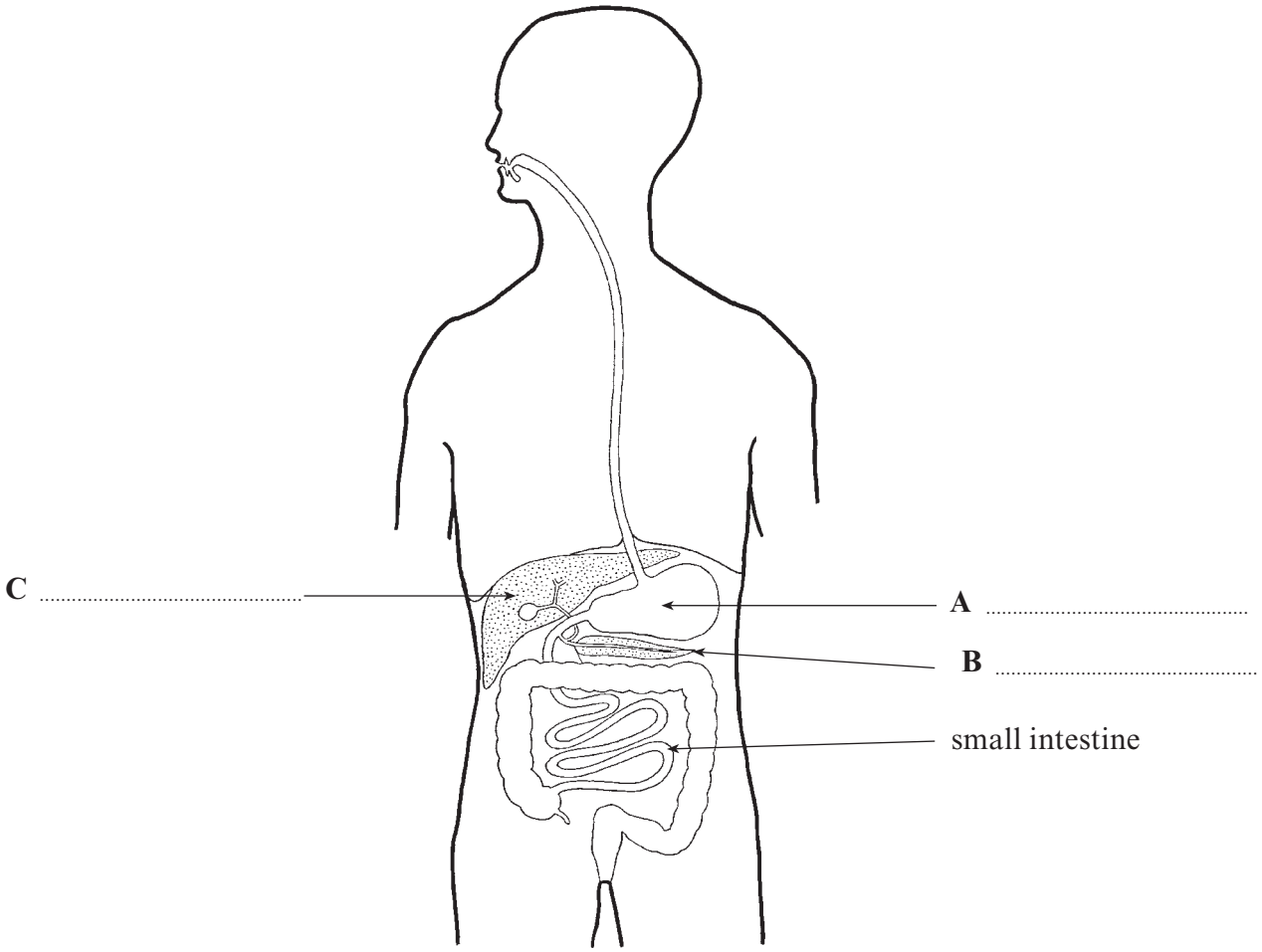
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3. *(a)* Label **A**, **B** and **C** on the diagram of the human digestive system shown below. [3]



(b) Complete the table below by writing your answers on the dotted lines [3]

Digestion in the small intestine

Substance digested	Enzyme	Digested product(s)
.....	carbohydrase	glucose
fats	.....	fatty acids and .....

(c) Which solution would be used to identify protein in a sample of food? Underline the correct answer below. [1]

Benedict's solution Biuret solution bicarbonate solution

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Turn over.

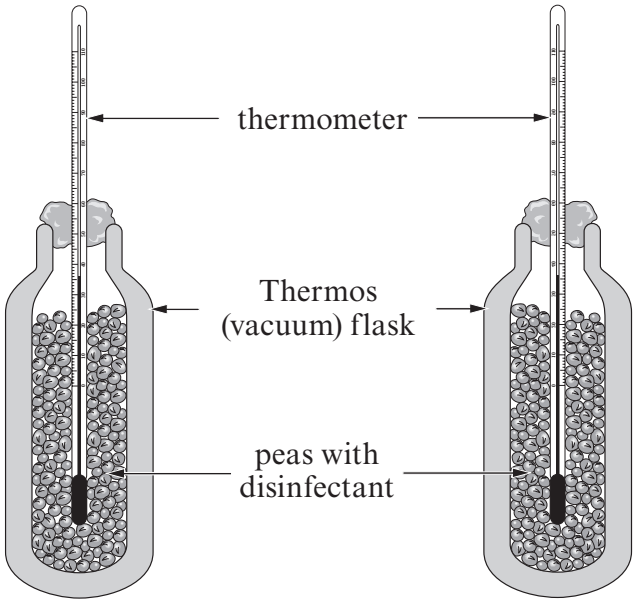
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4. *(a)* Complete the word equation below which shows respiration, the process which releases energy in living cells. [1]

glucose + ... ⟶ ..... + water

(b) Some students investigated the release of energy during respiration in living peas. They used the apparatus shown in the diagram below and measured the temperature over a period of 11 days.



Flask **A** — Living peas

Flask **B** — Dead peas

Investigation results

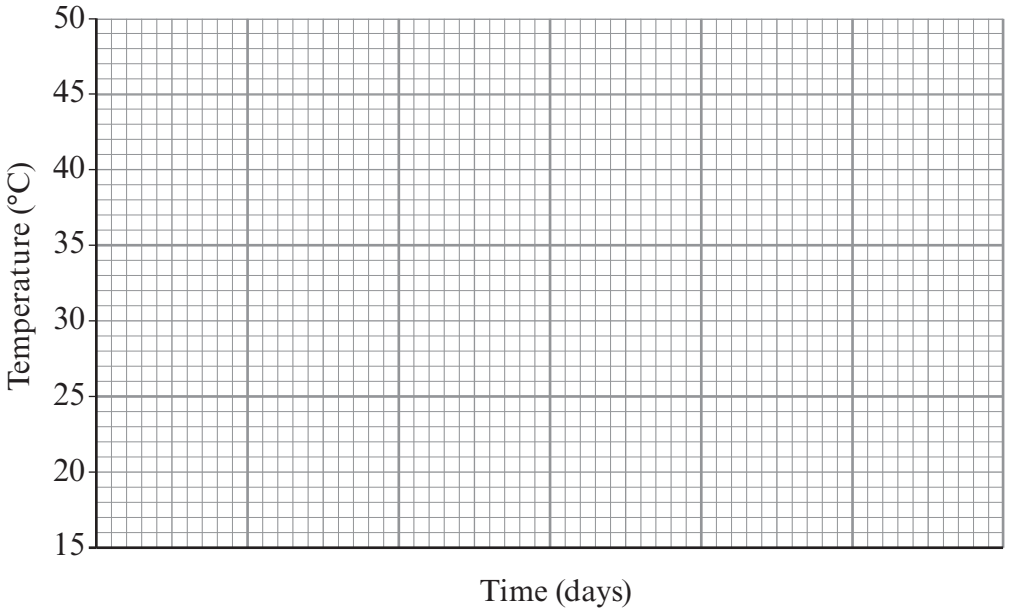
	Temperature (°C)	
Time (days)	Flask **A**	Flask **B**
1	18	18
3	20	18
5	23	18
7	35	18
9	38	18
11	38	18

(i) Complete a line graph of the results for flask **A** on the grid opposite by:

I. Choosing the scale on the time axis [1]
II. Plotting the points [2]
III. Joining the plots with a ruler [1]

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(ii) Use the graph to answer the following questions.

I. Describe how the temperature changed in flask **A** from day 3 to day 11. [1]

.....

.....

II. During which time period did the temperature change most rapidly? Place a tick **(✓)** by your answer. [1]

2-4 days ..... 4-6 days ..... 8-10 days .....

(iii) In what form was energy released in the living peas? [1]

.....

(c) Give the reason for the results obtained in flask **B**. [1]

.....

(d) (i) Why were Thermos (vacuum) flasks used rather than ordinary glass flasks? [1]

.....

(ii) Why did the students use disinfectant in the flasks? [1]

.....

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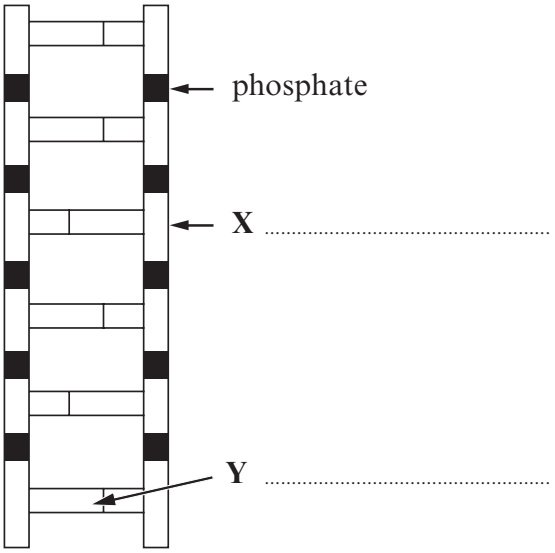
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5. *(a)* (i) Using some of the words in the list given below, label **X** and **Y** on the diagram of DNA. [2]

amino acid sugar base



(ii) Structure **Y** occurs in four forms. Two are G and C. State the other two. [1]

..... and .....

(iii) The diagram shows DNA as a straight ladder-like structure. How is the shape different in DNA in a living cell? [1]

.....

.....

(b) Complete the following sentence using some of the words below. [2]

amino acids sugars proteins salts

DNA contains a code which enables ..... to be joined together to form ..... .

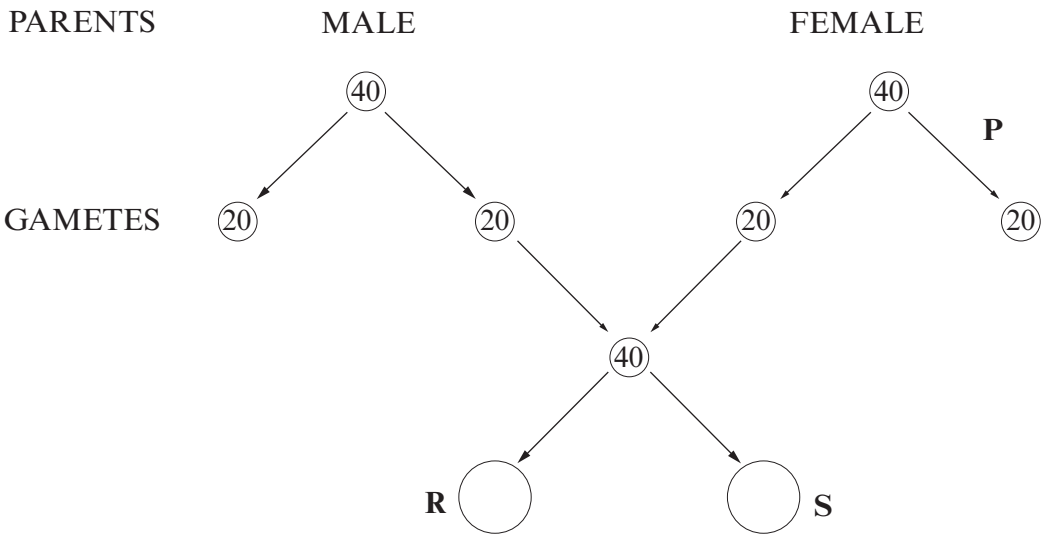
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6. The following diagram represents the stages in the life cycle of a mammal.
The numbers of chromosomes in cells at different stages in the life cycle are shown.



(a) Name the type of cell division taking place at letter **P**. [1]

.....

(b) Complete the diagram above by writing in the number of chromosomes found in **each** of the cells labelled **R** and **S** produced during growth. [1]

2

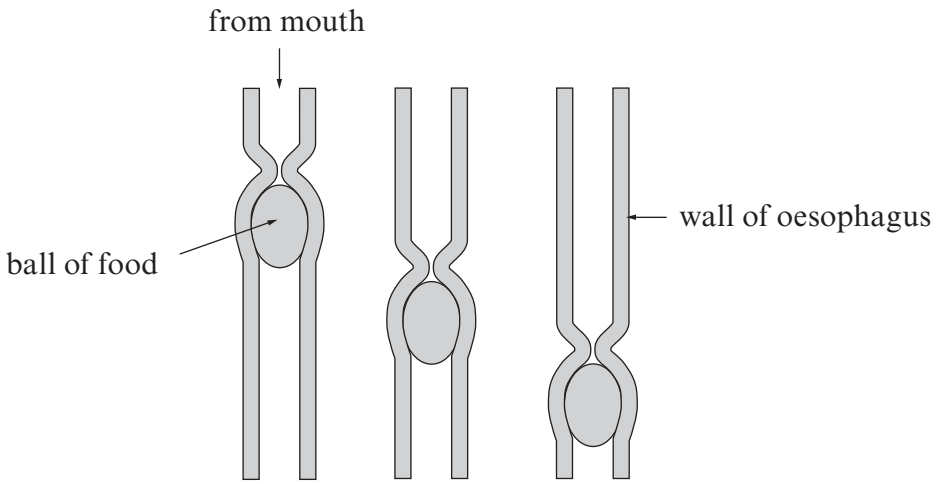
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7. The diagram shows a ball of food moving along the oesophagus (gullet).



(a) What name is given to this process? [1]

.....

(b) Explain how the ball of food is moved along the oesophagus. [2]

.....

.....

.....

3

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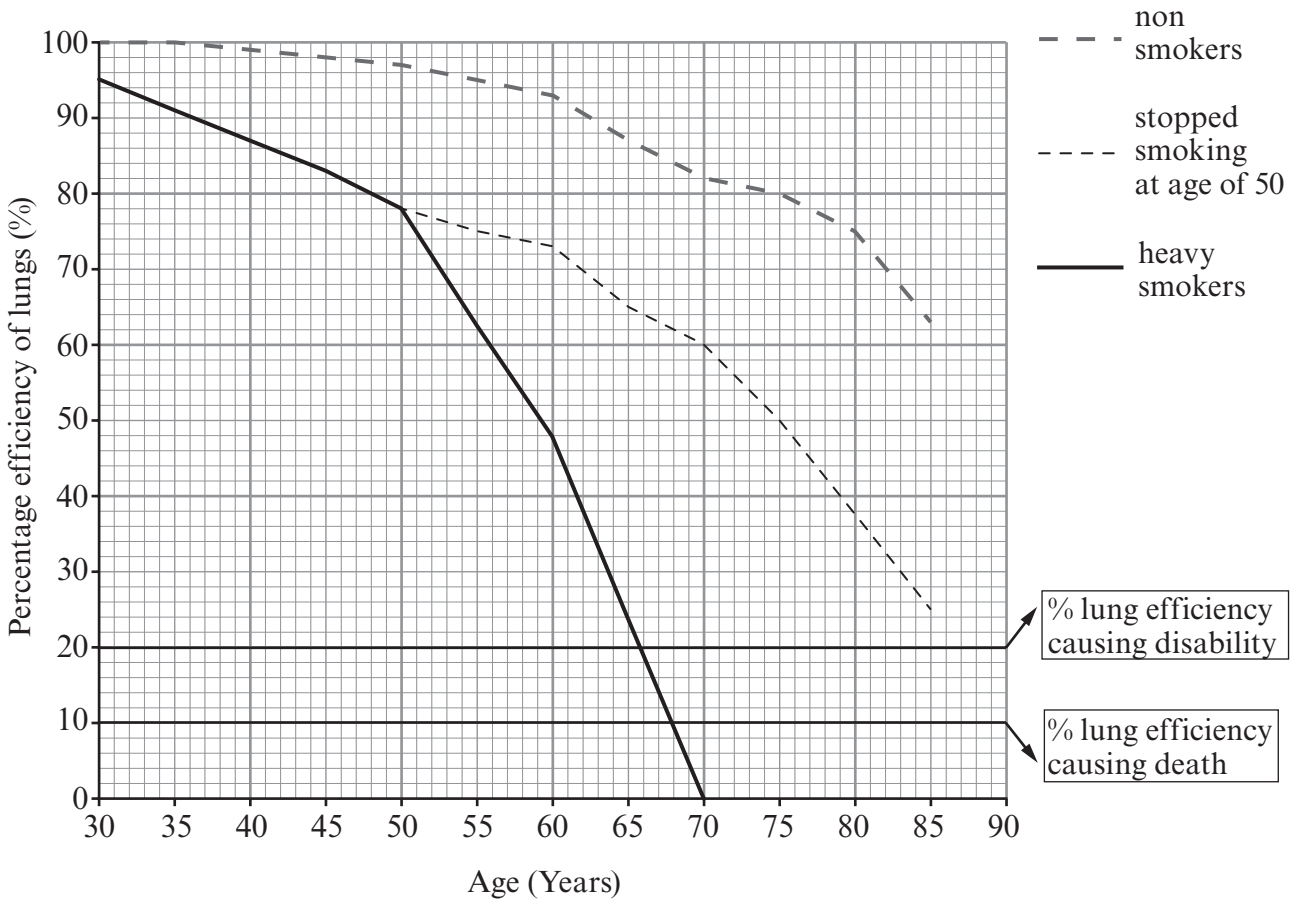
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8. The graph below shows the efficiency of the lungs (how well they work) in three different groups of people: non-smokers, smokers who stopped smoking at the age of 50 and heavy smokers.



(a) What is the difference in percentage efficiency of a 60 year old non-smoker and a 60 year old heavy smoker? [1]

..... %

(b) (i) Continuing to smoke heavily can damage the lungs and lead to disability. At what age does the graph above show this disability occurring? [1]

.....

(ii) Suggest what the lung damage mentioned in (i) could be. [1]

.....

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(c) Susan is a 50 year old heavy smoker.



Use the graph opposite to suggest what Susan might expect to happen if she gives up smoking now. [2]

.....

.....

.....

5

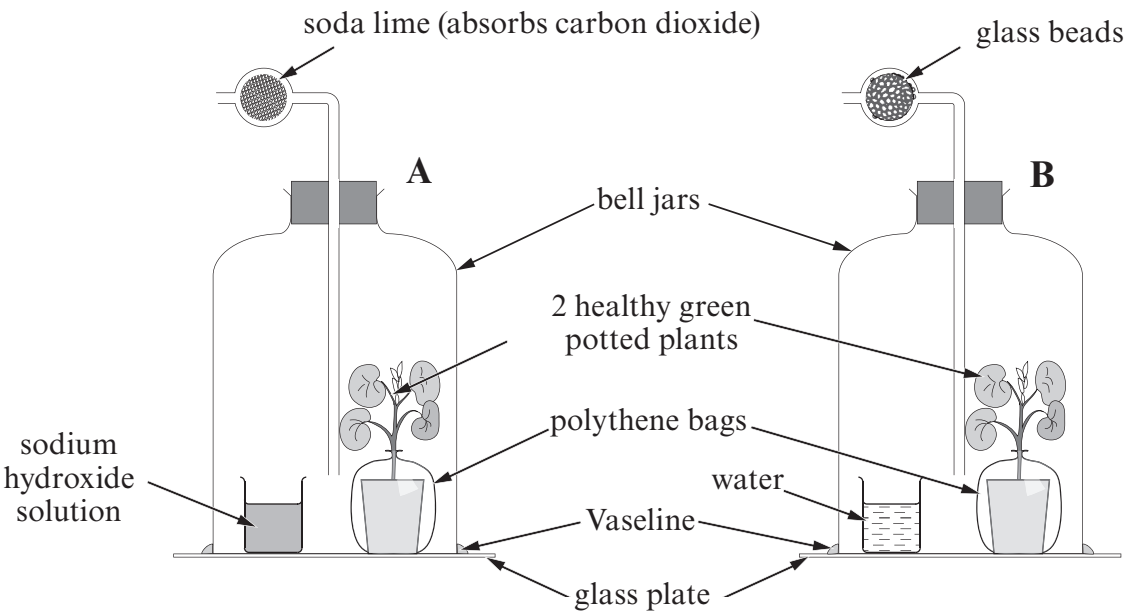
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9. The experiment was set up in a school laboratory using the apparatus shown below and left near a window for 4 days.



(a) State the purpose of the experiment. [1]

.....

(b) State the function of

(i) the polythene bag [1]

.....

.....

(ii) the sodium hydroxide solution [1]

.....

.....

(iii) the apparatus labelled **B**. [1]

.....

.....

(iv) the Vaseline. [1]

.....

.....

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(c) Explain why the plants were placed in the dark for 48 hours prior to the experiment. [1]

.....

.....

(d) At the end of the experiment a leaf was taken from each plant and tested for starch. State the colour observed for each leaf and the reason.

(i) Apparatus **A** [1]

colour observed .....

reason .....

.....

(ii) Apparatus **B** [1]

colour observed .....

reason .....

.....

8

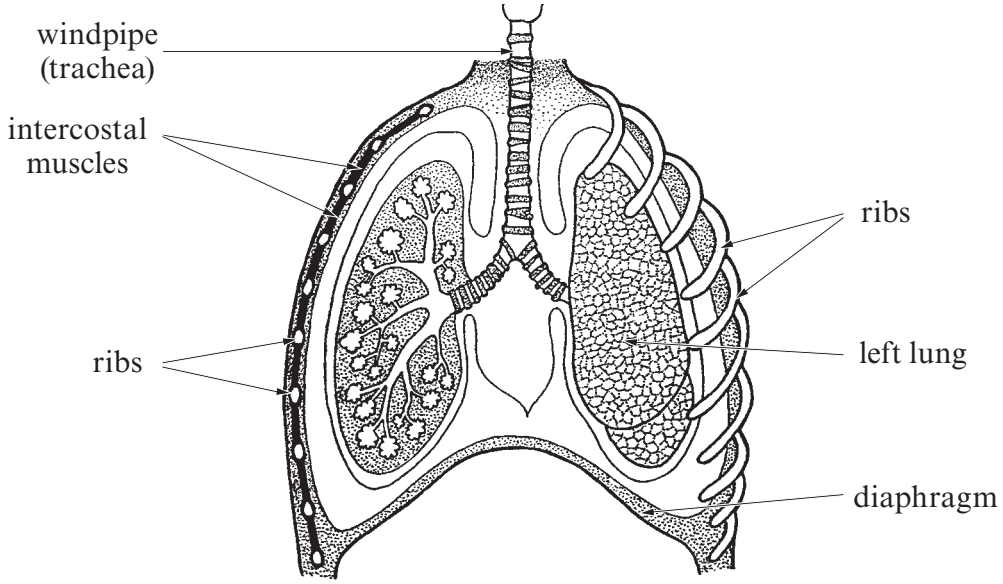
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10. The diagram below shows a section through the chest.



Use the above diagram **and your own knowledge** to explain how air is drawn into the lungs during inspiration (breathing in). [6 QWC]

.....

.....

.....

.....

.....

.....

.....

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6

END OF PAPER

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY (NEW)

JANUARY 2013

INTRODUCTION

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

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

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

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

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GCSE BIOLOGY 2 (NEW) MARK SCHEME - JANUARY 2013

FOUNDATION TIER

Question			Marking details	Marks Available
Q.1	(a)		Turtle dove + greatest decrease/ decreased the most/ highest decrease;	1
	(b)		1040;	1
	(c)	(i)	Turtle dove/ Grey Partridge;	1
		(ii)	Pied Flycatcher/ Cuckoo;	1
	(d)		Decrease + {fewer/ less} species/ less biodiversity/ species die out/ fewer bird species; NOT fewer birds/ not many species	1
			Question Total	**[5]**

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Question			Marking details		Marks Available
Q.2	(a)	(i)	A cytoplasm; B cell membrane; C cell wall;		3
		(ii)	Chloroplast; Photosynthesis;		2
		(iii)	Nucleus (allow chloroplast); NOT vacuole		1
	(b)		EM for dead cells/ tissues only;		1
				Question Total	**[7]**

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Question		Marking details		Marks Available
Q.3	(a)	A oesophagus; B pancreas; C liver;		3
	(b)	Carbohydrate/ starch; Lipase; glycerol;		3
	(c)	Biuret solution (as specification);		1
			Question Total	**[7]**

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Question			Marking details	Marks Available
Q.4	(a)		Oxygen <u>and</u> carbon dioxide;	1
	(b)	(i)	I scale;	1
			II correct plots;	2 (-1 error)
			III line quality;	1
		(ii)	I increase then plateau;	1
			II 4 – 6 days;	1
		(iii)	Heat/ thermal;	1
	(c)		No <u>respiration</u> (in dead peas);	1
	(d)	(i)	Avoid heat loss (or gain)/ avoid temperature change – due to environment/ retain heat/ prevent heat loss/ stop heat loss/ keep heat in/ insulation/ ORA e.g. glass flask allows heat to escape; NOT contain heat/ keep it warm;	1
		(ii)	Prevent growth of micro-organisms/ kill bacteria/ ensure no living {bacteria/ microbe/ fungi/ micro-organism}/ destroy bacteria; NOT get rid of bacteria/ stop microbes respiring;	1
			Question Total	**[11]**

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Question			Marking details	Marks Available
Q.5	(a)	(i)	Sugar; base;	2
		(ii)	A and T;	1
		(iii)	Twisted/ (double) helix (as spec)/ spiral;	1
	(b)		Amino acids; Protein;	2
			Question 5 Total	**[6]**

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Question		Marking details		Marks Available
Q.6/1	(a)	Meiosis – spelling correct;		1
	(b)	40 in each cell;		1
			Question Total	**[2]**

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Question		Marking details	Marks Available
Q.7/2	(a)	peristalsis;	1
	(b)	Muscles in the wall of the oesophagus contract;	2
		And {push/ force} the food (on to the next section);	
		Question Total	**[3]**

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Question			Marking details	Marks Available
Q.8/3	(a)		45/ 46%;	1
	(b)	(i)	65.5/ 66 years;	1
		(ii)	Lung cancer/ emphysema/ walls of alveoli rupture/ owtte/ correct ref to damage to cilia/ drying mucus; NOT reference to tar alone/ bronchitis;	1
	(c)		Live longer/ could expect to live to 85/ avoid earlier death; NOT less chance of dying; (Live longer) without a (smoking related) {disability/ cancer/ named damage};	2
			Question Total	**[5]**

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Question			Marking details	Marks Available
Q.9/4	(a)		To show <u>carbon dioxide</u>/ CO_2 (not CO^2) is needed for <u>photosynthesis/ starch</u> production;	1
	(b)	(i)	To prevent <u>soil</u> organisms affecting the experiment (OWTTE);	1
		(ii)	Absorb carbon dioxide / CO_2;	1
		(iii)	Control/ correct ref to using B to compare to A/ to make a comparison;	1
		(iv)	Form an air tight seal/ make the apparatus air tight / prevent {gases/ carbon dioxide/ air} going in or out of the apparatus; NOT oxygen (can be neutral);	1
	(c)		Destarch/ remove starch;	1
	(d)	(i)	Apparatus **A** Colour – brown/ iodine colour + Reason – <u>no starch</u> present/ no photosynthesis ∴<u>no starch;</u> (**both** required for one mark)	[1]
		(ii)	Apparatus **B** Colour – black/ blue black + Reason –<u>starch</u> present/ photosynthesis occurred ∴<u>starch</u> present<u>;</u> (**both** required for one mark);	[1]
			Question Total	**[8]**

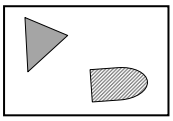
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Question	Marking details	Marks Available
Q.10/5	*Indicative content* Diaphragm contracts Diaphragm flattens/moves down Intercostals muscles contract Rib cages moves up and out/raised Thoracic volume/accept chest volume/accept space around the lungs increases Pressure decreases Lungs inflate Air drawn into lungs through nose/nasal passages/trachea/windpipe 5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. 3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. 1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. 0 marks The candidate does not make any attempt or give a relevant answer worthy of credit	
	Question Total	**[6]**

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Question			Marking details	Marks Available
Q.6	(a)	(i)	Enzyme works in {acid pH/ lower pH/ 4.5}/ (ORA); NOT low pH	1
		(ii)	Enzyme denatured or destroyed;	1
		(iii)	Low temperature; Meant few collisions between enzyme and {protein/ substrate} / takes {longer to make/ less} enzyme substrate complexes;	2
	(b)		As below, ignore chemical bond if drawn; 	1
	(c)		Lock and key;	1
			Question Total	**[6]**

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Question			Marking details	Marks Available
Q.7	(a)	(i)	Description must include DNA / RNA/ genetic material/ genes/ nucleic acid; and protein {coat/ outside};	2
		(ii)	III;	1
	(b)		Insects can become {resistant/ immune}/Could harm useful insects/ insecticides could enter food chain/ could bioaccumulate;	1
	(c)		Biological control/ biocontrol;	1
	(d)		May not be specific to target species (may use other words to convey this)/ could affect {useful/ other} insects/ could harm other animals; May not be able to {survive/ reproduce} in {environmental factors/ climate}/ reproduce successfully; Fungus could spread out of control/ could become a pest itself; Midges could become immune to the fungus;	2
			Question Total	**[7]**

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Question			Marking details	Marks Available
Q.8	(a)	(i)	Lowers/ decreases;	1
		(ii)	Less lactic acid; Greater volume of {air/ gas} breathed in (and out); lactic acid level drops {faster/ sooner};	3
	(b)		glucose;	1
	(c)		{Increased/ more} (rate of) aerobic respiration/ more carbon dioxide produced by aerobic respiration;	1
	(d)		{More/ all} glucose completely broken down/ less anaerobic respiration (NOT no anaerobic respiration)/ more aerobic respiration/ no oxygen debt/ more oxygen available to repay oxygen debt/ extra oxygen breaks down lactic acid;	1
			Question Total	**[7]**

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Question			Marking details	Marks Available
Q.9	(a)	(i)	P= $\frac{56 \times 48}{16}$; = 168; Method (1) Answer (1)	2
	(b)		Repeat the exercise/ take {more/ larger} samples; NOT take larger sample area.	1
	(c)		They are balanced/ the same/ equal/ they don't happen;	1
	(d)		Could eat them/ could be predators; Could compete for food/ eat their food/ compete for breeding space; Could introduce disease; (in fact *Astacus fluviatilis*, the American red clawed crayfish, has introduced a fungal parasite)	3
			Question Total	**[7]**

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Question			Marking details	Marks Available
Q.10	(a)		*Indicative content* Fresh water decreased the concentration of salt to below the level in which oysters live. Osmosis caused water to pass into the oysters from where it was in high concentration to where it is in low concentration/ down a concentration gradient/ from a low solute potential to a high solute concentration through a selectively permeable membrane (accept semi permeable membrane). This diluted the body fluids/ blood resulting in death. 5-6 marks The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. 3-4 marks The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. 1-2 marks The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. 0 marks The candidate does not make any attempt or give a relevant answer worthy of credit	
	(b)	(i)	Active transport;	1
		(ii)	Can carry salts/ ions against/ up a concentration gradient; Requires energy;	2
			Question Total	**[9]**

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Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4471/01

ADDITIONAL SCIENCE
FOUNDATION TIER
BIOLOGY 2

A.M. TUESDAY, 15 May 2012

1 hour

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

4471
010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

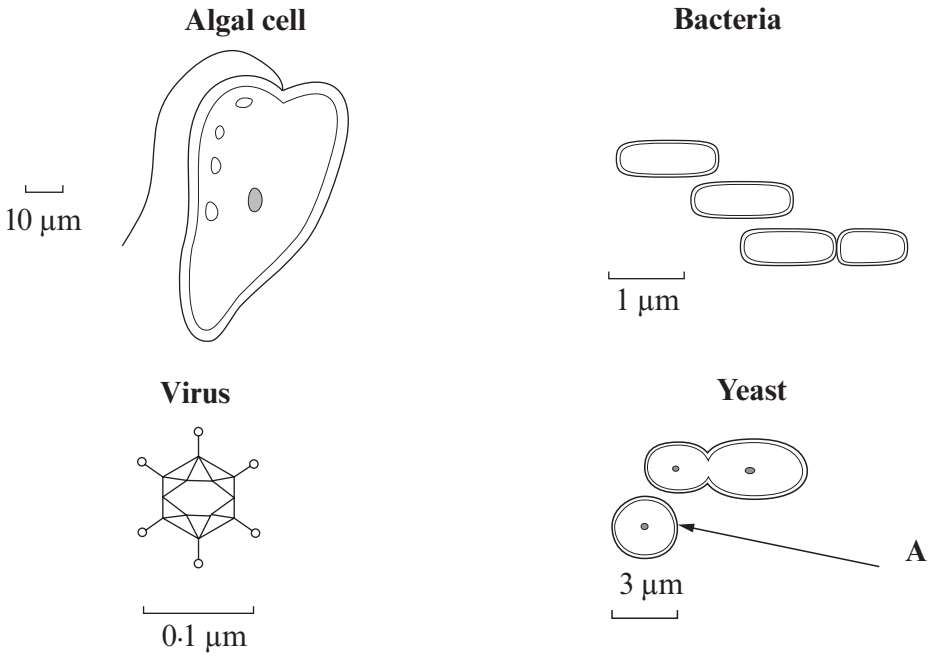
You are reminded that assessment will take into account the quality of written communication used in your answer to question **7**.

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Answer **all** *questions.*

1. The diagram below shows four types of micro-organisms.



Use the scale bars:

(a) (i) to give the diameter of yeast cell **A**; [1]

.....

(ii) to identify the largest micro-organism. [1]

.....

(b) The table gives reproductive features of some of the micro-organisms. Write the name of the correct micro-organism in each space. [3]

Feature	Micro-organism
Reproduces by budding	.....
Reproduces by dividing in two	.....
Reproduces inside a host cell	.....

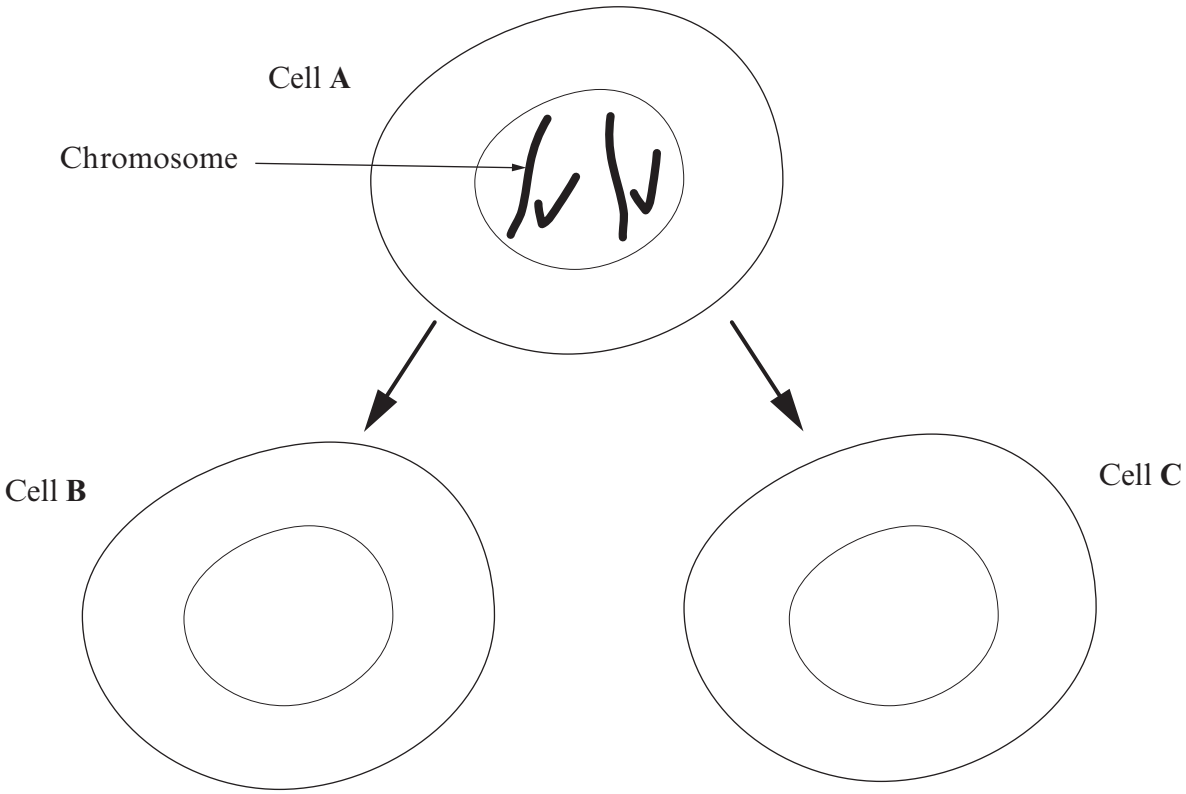
(c) Complete the following sentence by <u>underlining</u> the correct word. [1]

Viruses have an outer coat made of glucose / fat / protein.

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2. Cell division by mitosis leads to growth in plants and animals.
The diagram below shows part of the process of mitosis. Cell **A** divides to make two new cells, **B** and **C**.



(a) Label the nucleus in cell **A**. [1]

(b) How many chromosomes does cell **A** have? [1]

.....

(c) Complete the diagram by drawing in the chromosomes present in cells **B** and **C**, produced by mitosis. [1]

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3. Sweetcorn is a popular food.



Sweetcorn grows best in countries with warm climates but can be grown in the UK. Many farmers in the UK sow sweetcorn seeds in soil under plastic sheets instead of in the open. The plants then grow through slits in the sheets.



Soil under the sheets gets warmer than soil in the open. As a result the seeds are protected from frost damage. Another advantage is that the enzymes in the seeds work faster so the plants grow earlier in the year.

(a) (i) Explain why seeds sown under plastic sheets start to grow earlier in the year than seeds sown in the open. [2]

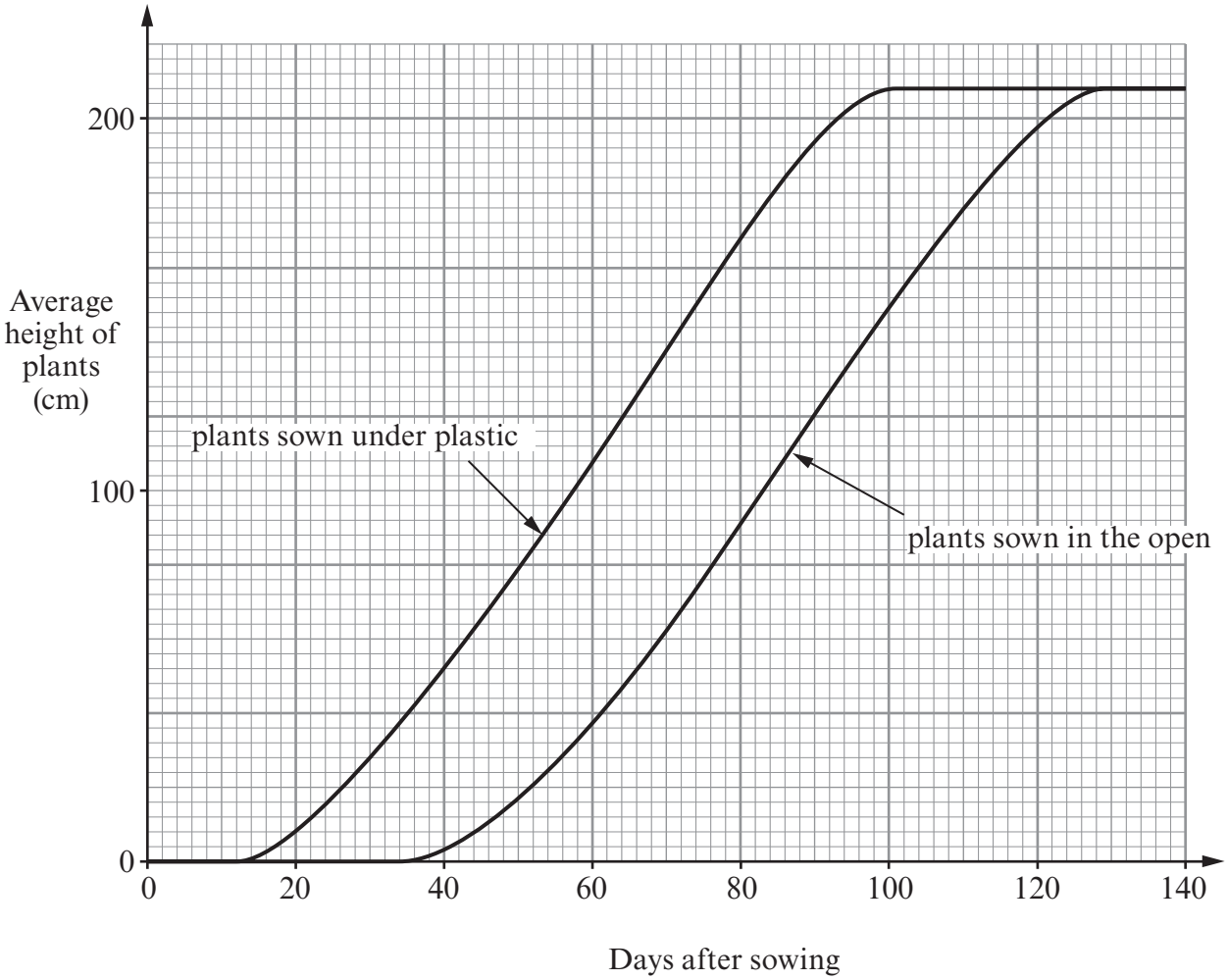
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(ii) Scientists carried out field experiments to compare the growth of sweetcorn plants sown under plastic with plants sown in the open. All the seeds were sown at the same time. The results are shown in the graph.



From the graph:

I Describe the pattern of growth of the plants **sown under plastic** between days 20 and 140. [1]

.....

II State the maximum average height of the plants. [1]

..... cm

III How many days after sowing did the plants **sown under plastic** reach maximum average height? [1]

..... days

IV How much longer did it take the plants **sown in the open** to reach maximum average height? [1]

..... days

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(b) Scientists wanted to see if the colour of the plastic sheet affected the sweetcorn. Some of the results are shown in the table.

Sowing condition	Number of sweetcorn harvested per hectare	% sugar content of sweetcorn harvested
in the open	6400	18.0
clear plastic	7310	18.0
blue plastic	7400	20.0
red plastic	7830	19.0

(i) Which sowing condition resulted in the largest number of sweetcorn harvested? [1]

.....

(ii) Which sowing condition resulted in the greatest sugar content in the sweetcorn? [1]

.....

(iii) Why did the scientists sow some of the seeds in the open? [1]

.....

(c) Explain why field experiments should be repeated over many years. [2]

.....

.....

(d) Suggest **one** reason why some people have environmental concerns about the use of plastic sheets in farming. [1]

.....

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4. *(a)* Complete the word equation for photosynthesis. [2]

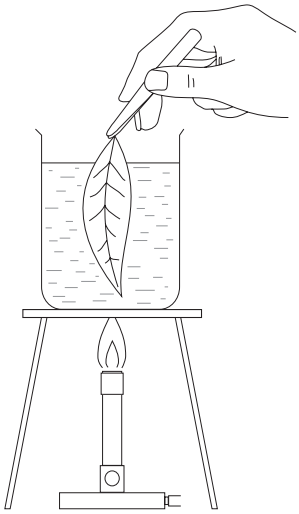
..... + water ⟶ glucose + ...

(b) State the function of chlorophyll in photosynthesis. [1]

.....

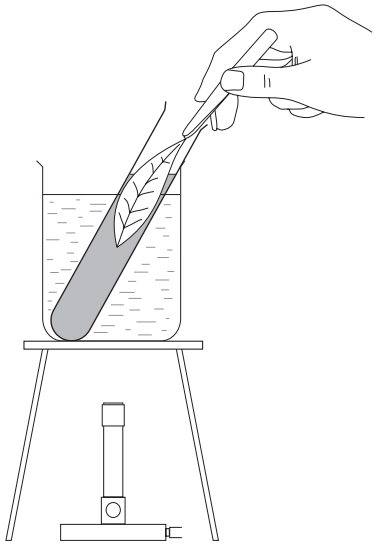
(c) Some of the glucose produced in photosynthesis may be turned into starch and stored in the leaf.
The diagram below shows stages in an experiment to test a leaf for the presence of starch.

A



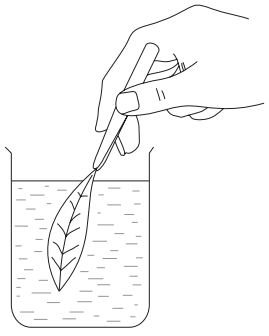
The leaf is dipped in boiling water.

B



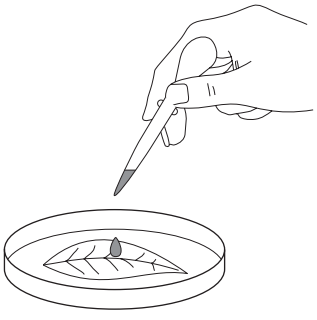
- The Bunsen burner is turned off.
- The leaf is placed in a test tube containing ethanol.
- The test tube is placed in the beaker of hot water.

C



The leaf is dipped in hot water.

D



The leaf is blotted dry and covered with dilute iodine solution.

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What is the purpose of:

(i) Stage **A**; [1]

.....

(ii) The ethanol used in stage **B**; [1]

.....

(iii) Stage **C**? [1]

.....

(iv) What colour will the leaf turn in stage **D** if the leaf contains starch?

Place a **tick (✓)** in the correct box below. [1]

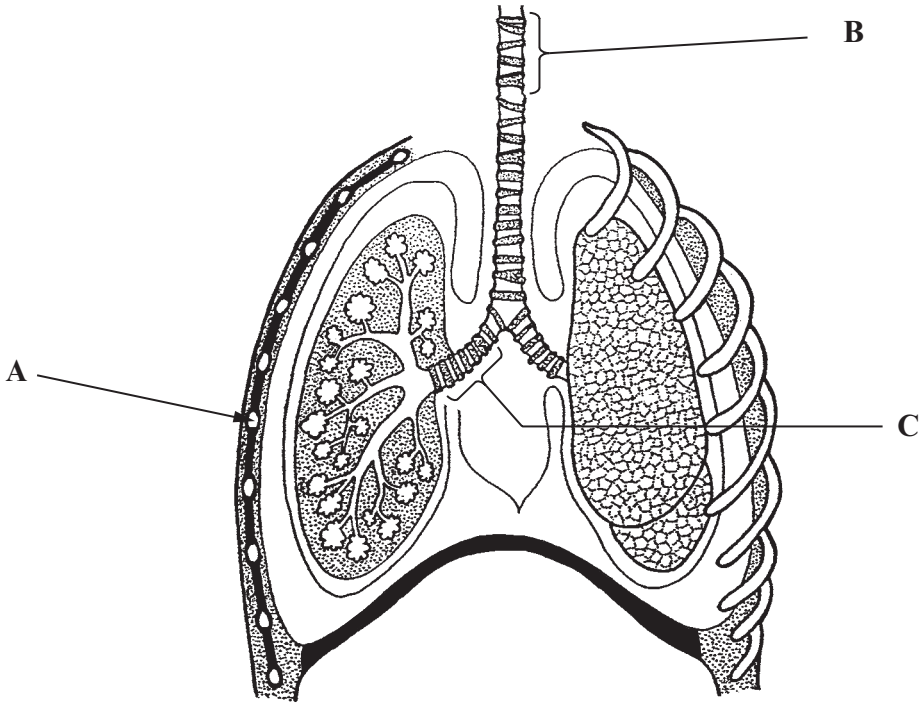
Colour of leaf	Tick (✓) correct box
dark blue-black	
dark brown	
pale yellow	

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Examiner only

5. *(a)* The diagram below shows the human respiratory system.



(i) Complete the table below to name structures **A**, **B** and **C**. [3]

Structure	Name
A	.....
B	.....
C	.....

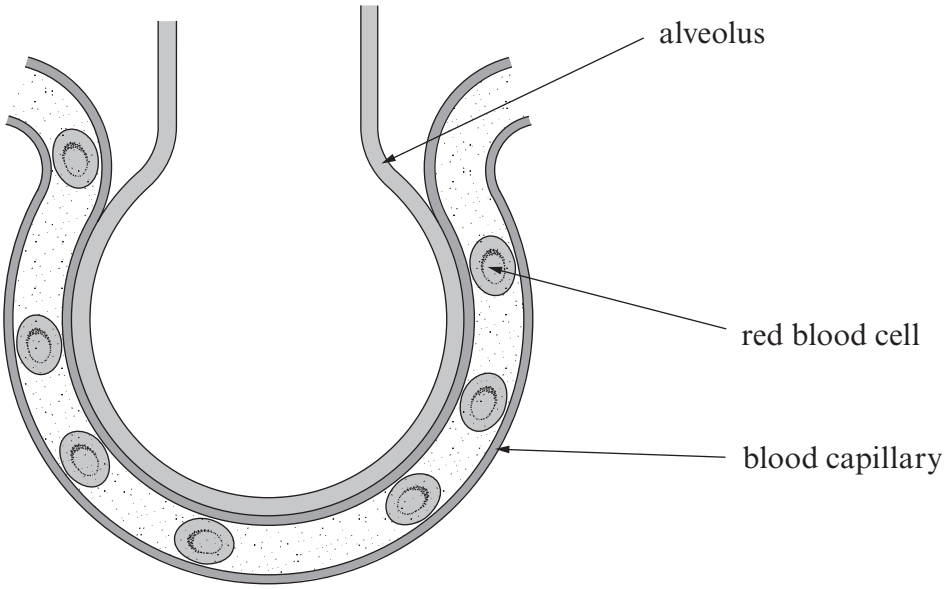
(ii) **On the diagram above**, name and label a structure that contracts when we inhale (breathe in). [2]

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(b) The diagram below shows an alveolus in section together with its blood supply.



(i) Gas exchange takes place between an alveolus and the blood.

State the process by which gas exchange takes place. [1]

.....

(ii) Describe **two** adaptations of an alveolus that help gas exchange. [2]

I .....

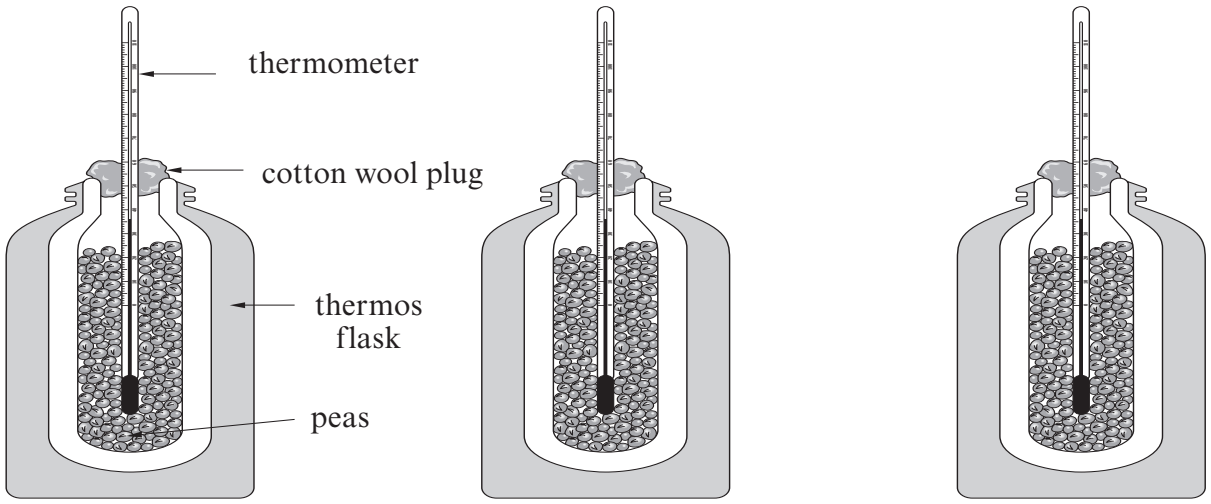
II .....

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Turn over.

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6. Siân set up the following investigation in a school laboratory. Before the start of the investigation all the peas were soaked in a very weak disinfectant.



Flask **A**
Living peas

Flask **B**
Boiled peas

Flask **C**
Boiled peas and strong disinfectant

Siân recorded the temperature in each flask at the start of the experiment (day 0) and at the same time of day for the next 6 days. She also recorded the room temperature. The results are shown below.

	Temperature °C			
Day	Room	Flask **A** Living peas	Flask **B** Boiled peas	Flask **C** Boiled peas and strong disinfectant
0	14	14	14	14
1	15	16	15	14
2	14	18	14	14
3	16	22	16	14
4	15	24	16	14
5	17	26	19	14
6	16	28	24	14

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(a) What process in the living peas caused the temperature to rise? [1]

.....

(b) (i) Why were all the seeds soaked in weak disinfectant before the start of the experiment? [1]

.....

.....

.....

(ii) Explain fully the rise in temperature recorded in flask **B**. [3]

.....

.....

.....

.....

.....

.....

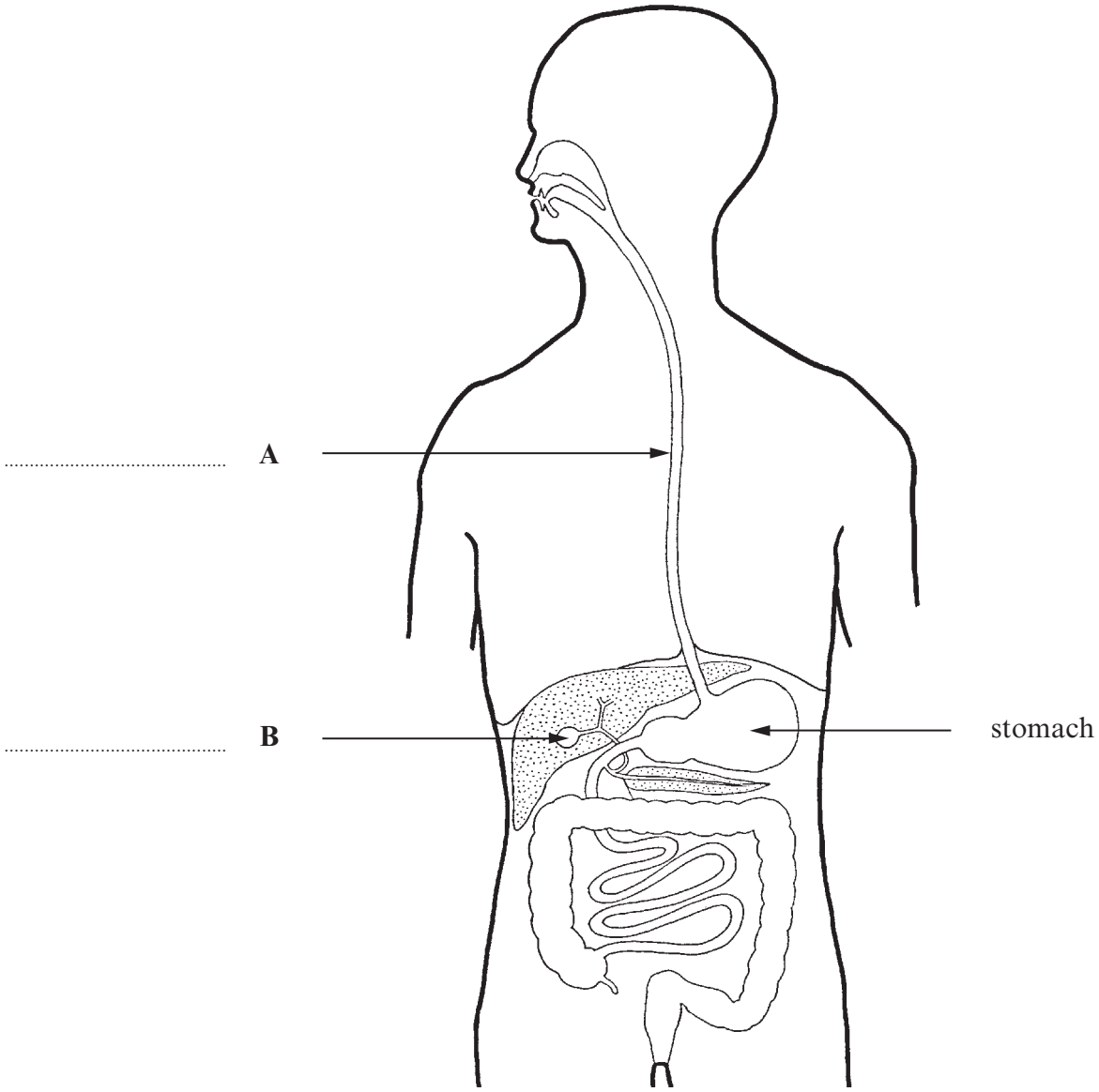
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7. The diagram below shows the human digestive system.



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

(b) Describe fully the processes involved in the chemical breakdown of food containing **fat** from the time it leaves the stomach. [6 QWC]

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8. The following information appeared in a newspaper in Wales in 2010.



- Some parents who smoke in the car with the window open when travelling with their children think the smoke will have no effect on their children's health.
- The British Lung Foundation states that smoking just one cigarette, even with the car window open, creates a greater concentration of second-hand smoke than a whole evening's smoking in a pub or a bar.
- Levels of second-hand smoke in cars can be as much as 27 times greater than in a smoker's home.
- Young children breathe faster than adults, their lungs are smaller and are still growing.

(a) (i) Using the information above, explain why the lungs of young children in particular are in danger from breathing in second-hand smoke. [3]

.....

.....

.....

.....

.....

.....

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(ii) The Welsh Government is considering introducing strict new laws where parents who smoke while driving with their children face prosecution.
Using the information given previously suggest **two** *other* important pieces of evidence that the Welsh Government may consider in coming to a decision about introducing these new laws. [2]

.....

.....

.....

.....

(b) State **two** effects that cigarette smoke has on the cleaning mechanism of the lungs. [2]

(i) .....

(ii) .....

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9. The red spider mite is a pest on fruit trees. It increases in numbers quickly causing damage to the fruit crop.

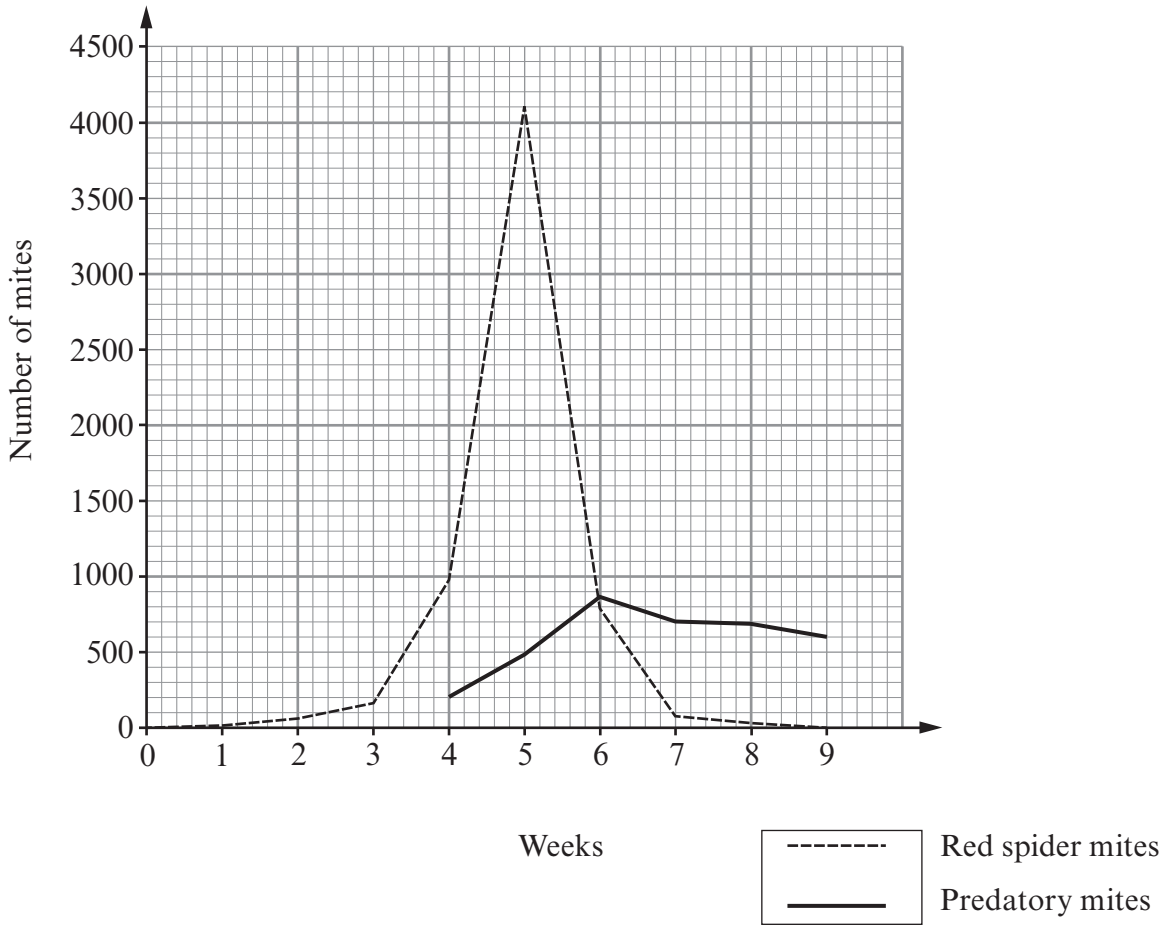
Red spider mite



Predatory mite



When the number of red spider mites was about 1000 per fruit tree, the farmer introduced predatory mites which eat the red spider mites. This happened on week 4 as shown in the graph below.



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(a) Use data from the graph to describe the effect that the introduction of the predatory mites has on the number of red spider mites. [2]

.....

.....

.....

.....

(b) What name is given to this type of pest control? [1]

.....

(c) At the end of 9 weeks there are still predatory mites present on the fruit trees. Explain how this could result in a problem. [1]

.....

.....

THERE ARE NO MORE QUESTIONS IN THIS EXAMINATION.

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GCSE MARKING SCHEME

SCIENCE - BIOLOGY

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

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

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

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UNIT B2

FOUNDATION TIER

Question			Marking details	Marks Available
1.	(a)	(i)	3(µm)	1
		(ii)	Algal (cell.)	1
	(b)			3

Feature	Micro-organism
Reproduces by budding	Yeast
Reproduces by dividing in two	Bacteria/ Algal cell
Reproduces inside a host cell	virus

(c)	Protein.	1
	Question total	**[6]**

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Question		Marking details	Marks Available
2.	(a)	Unambiguous line pointing at / in nucleus in cell A (must not touch chromosome)	1
	(b)	4/ 2 pairs	1
	(c)	Both cells must have: 2 long, 2 short lines drawn inside the nucleus.	1
		Question total	**[3]**

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Question			Marking details	Marks Available
3.	(a)	(i)	(Soil) warmer under the sheets/ protects from frost damage; so enzymes work faster/ better.	2
		(ii)	I Increases **and** plateaus/ flattens	1
			II From graph - should be 208	1
			III From graph - should be 100	1
			IV From graph - should be 28	1
	(b)	(i)	Red (plastic)	1
		(ii)	Blue (plastic)	1
		(iii)	Comparison idea / control/ to see what it would be like in the open. Reject reference to fair test	1
	(c)		To average / smooth out variation in results (due to variable weather/ soil conditions); So more reliable/ increased strength of evidence/ increased confidence in evidence. NOT accuracy/ comparison/ reproducibility/ fair test	2
	(d)		Any reasonable suggestion such as: Unsightly / litter / not recycled/ / not biodegradable/ wasteful of resources / harmful if eaten by animals / could trap animals/ is poisonous NOT pollution/ kill or harm unqualified	1
			Question total	**[12]**

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Question			Marking details	Marks Available
4.	(a)		Carbon dioxide/ CO_2 Oxygen/ O_2	2
	(b)		Absorb/ take in/ capture (sun)light. NOT catch/ trap/ uses	1
	(c)	(i)	Kill leaf / stop reactions/ breaks down cells or cell walls. NOT denature/ kill enzyme	1
		(ii)	Decolourise leaf / dissolves or removes chlorophyll/ take the green out.	1
		(iii)	Soften leaf / make leaf permeable.	1
		(iv)		1

Colour of leaf	***Tick (✓) correct box***
dark blue-black	✓
dark brown	
Pale yellow	

Question total **[7]**

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Question			Marking details	Marks Available
5.	(a)	(i)	A Rib Accept rib cage	3
			B Trachea/ windpipe	
			C Bronchus/ bronchi	
		(ii)	Diaphragm/ intercostal muscle; (allow even if label arrow incorrect)	2
			Feature identified (mark independently of label)	
	(b)	(i)	Diffusion.	1
		(ii)	Any **two** from:	3
			Large surface area;	
			thin;	
			Moist / damp; NOT wet/ water	
			Close to / rich or good blood supply.	
			Accept no gap between alveolus and blood supply	
			Question total	**[8]**

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FOUNDATION / HIGHER TIER

Question			Marking details	Marks Available
6/1	(a)		Respiration/ respire. NOT anaerobic respiration	1
	(b)	(i)	To kill or destroy bacteria / fungi / micro-organisms/ microbes/ to sterilise. NOT get rid of bacteria/ denature	1
		(ii)	Weak disinfectant didn't kill <u>all</u> bacteria / fungi/ micro-organisms; Bacteria/ fungi/ micro-organisms grew/ reproduced/ multiplied; Respired producing heat	3
			Question total	**[5]**

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Question		Marking details	Marks Available
7/2	(a)	A Oesophagus/ gullet B Gall bladder	1 1
	(b)	**Indicative content:** Food enters small intestine. Mixes with bile from gall bladder/ liver. Fat emulsified or description/ large globules to small globules (not molecules). Lipase from pancreas Lipase in small intestine. Breaks down/ digests/ hydrolyses fats. To fatty acids. And glycerol.	6

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

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

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

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

Question total **[8]**

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Question			Marking details	Marks Available
8/3	(a)	(i)	Breathing is <u>faster</u> so <u>more smoke</u> will be taken in (OWTTE);	3
			Lungs are smaller so easily/ quickly fill with smoke (OWTTE);	
			Lungs are still developing/ growing therefore easily damaged.	
			Accept Lungs are smaller and still developing = 1	
			Accept Therefore they fill quickly with smoke or easily damaged =1	
		(ii)	Any **two** from:	2
			Some parents think that smoking in cars has no effect on children;	
			How smoking in cars (greatly) concentrates cigarette smoke (OWTTE);	
			Levels of smoke in cars can be 27 times greater than in the home.	
	(b)		Any **two** from:	2
			(Particles or soot in smoke) it clog up the mucus (making harder to move);	
			(Heat from smoke)/ it dries up mucus (and cleaning mechanism fails) or it stops the airways being moist;	
			(Chemicals in smoke) it paralysing/ anaesthetises/ stops cilia/ hair like structures so they stop working.	
			Question total	**[7]**

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Question		Marking details	Marks Available
9/4	(a)	When the predatory mite reaches 500/ 1 week after introduction/ at week 5/ between weeks 5 and 6 ; It kills off/ causes a decline in the red spider mite.	2
	(b)	Biological control accept biocontrol	1
	(c)	It may start eating other (harmless/ non pest species/) insects/ species/ non target species (not enough to say it may become a pest itself). NOT start eating the fruit	1
		Question total	**[4]**
		TOTAL FOUNDATION TIER	**[60]**

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HIGHER TIER

Question			Marking details	Marks Available
5.	(a)		Diagram B (no mark) Any **two** from: Diaphragm has flattened/ contracted; Rib cage has moved up/ out/ up and out OR sternum has moved up/ out/ up and out; Thoracic volume (or description of) increased/ chest cavity expands; (Accept reverse argument.)	2
	(b)	(i)	Oxygen; Diffusing into blood / capillary. NOT moving or going in	2
		(ii)	Any **two** from: Large surface area relating to increased gaseous exchange; Moist lining relating to gases dissolving and diffusing in solution;. Rich blood supply relating to more/ faster gaseous exchange/ speed at which CO_2 can be removed and/ or O_2 can be supplied; Thin wall relating to ease at which gases can diffuse/ easier for gas exchange. NOT thin cell walls	2
			Question total	**[6]**

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Question			Marking details	Marks Available
6.	(a)		Any **two** from: No embryos used/ own stem cells; No animal use in experiments/ only tested on humans/ no animal rights issues; Not cruel (neutral) No Genetic Modification.	2
	(b)		Mitosis. (Spelling must be correct)	1
	(c)	(i)	(Growing) TIP of stem / shoot/ root or meristem	1
		(ii)	20	
			Question total	**[5]**
7.	(a)	(i)	Any number between 5 and 10	1
		(ii)	Any number between 15 and 20	1
	(b)		30-33 minutes	1
	(c)		More energy released/ More ATP produced (per glucose molecule) / Glucose <u>completely</u> used / oxidised. NOT more glucose is oxidised	1
	(d)		Yeast produces ethanol / alcohol; Yeast produces carbon dioxide It = muscle	2
			Question total	**[6]**

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Question			Marking details	Marks Available
8.	(a)		Bases.	1
	(b)		Amino acids.	1
	(c)		**7**	2
	(d)		Double helix.	1
	(e)		Enzymes / hormones	1
			Question total	**[5]**
9.	(a)		25%	1
	(b)		Osmosis; Water passes out; from a high water concentration to low concentration outside /down a gradient / from a low solute concentration to a high solute concentration (must indicate correct direction of movement); through SPM (selective / partial / semi).	4
	(c)	(i)	Active transport/ uptake.	1
		(ii)	Oxygen; Glucose	2
			Question total	**[8]**

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Question	Marking details	Marks Available
10.	**Indicative content**	

A $1m^2$ quadrat is thrown randomly and the number of living dandelions in the quadrat is counted. This is repeated at least twice (until the number in the quadrat is constant/ not increasing or a stated number of times). An average is calculated of the numbers counted. The number is multiplied to calculate the total number in the whole lawn. This is done before treatment and 1 week/ stated time after treatment

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

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

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

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

Question total	**[6]**
TOTAL HIGHER TIER	**60**

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