AQA GCSE BIOLOGY (4411)

BIOLOGY



EXAM QUESTION PACK

UNIT B3 FOUNDATION TIER BLY3F PAPERS

STEMUP

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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
June 2012

Biology

BLY3F

F

Unit Biology B3

Written Paper

Monday 21 May 2012 9.00 am to 9.45 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Answer **all** questions in the spaces provided.

1 (a) **List A** gives four structures in the human body.
List B gives the functions of some structures in the body.

Draw a straight line from each structure in **List A** to the correct function in **List B**.

List A – Structure	**List B – Function**
	Surround and protect the lungs
Alveoli	
	Filter the blood
Veins	
	Carry blood towards the heart
Villi	
	Absorb digested food
Ribs	
	Allow oxygen to enter the blood

(4 marks)

1 (b) Draw a ring around the correct answer to complete the sentence.

In the lungs, oxygen enters the blood from the air by

diffusion.

filtration.

respiration.

(1 mark)

5

Do not write outside the box

2 (a) Draw a ring around the correct answer to complete the sentence.

A plant loses water from its leaves by a process called

distillation.

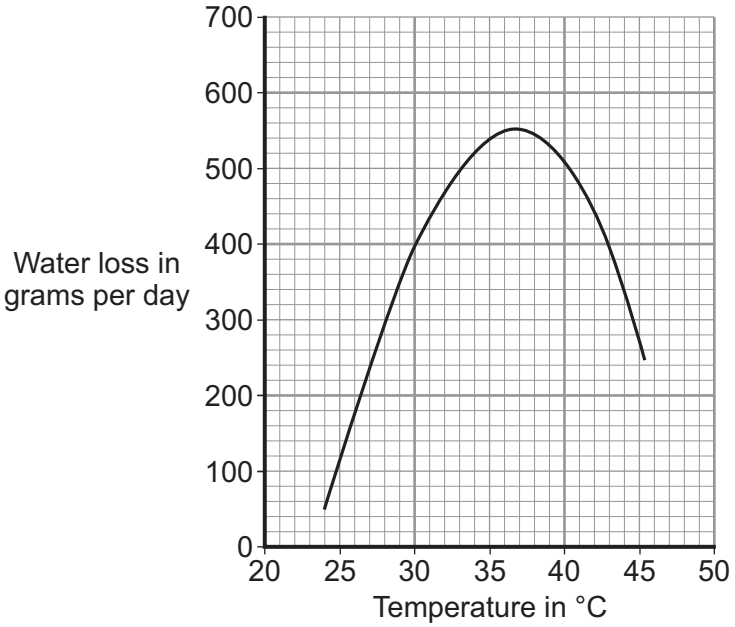
respiration.

transpiration.

(1 mark)

2 (b) Some scientists investigated the effect of temperature on water loss from a plant.

The graph shows the results.



Describe the effect of increasing the temperature on water loss from the plant.

.....

.....

.....

.....

(2 marks)

Do not write outside the box

2 (c) Under different conditions, plants open or close their stomata.

2 (c) (i) How does closing its stomata help a plant?

.....

.....

(1 mark)

2 (c) (ii) In the investigation described in part (b), which temperature range would cause most of the stomata to close?

Draw a ring around **one** answer.

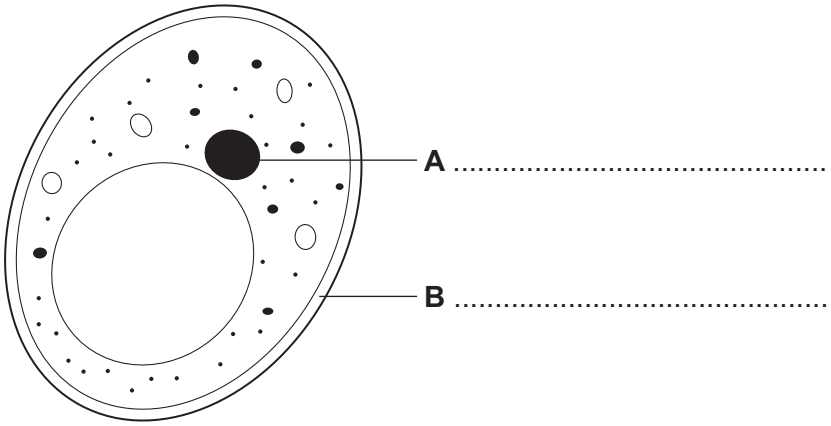
25 – 30 °C **30 – 35 °C** **40 – 45 °C**

(1 mark)

5

3 **Diagram 1** shows a yeast cell.

Diagram 1



3 (a) Use words from the box to label structures **A** and **B** on **Diagram 1**.

cell membrane	**cell wall**	**nucleus**	**vacuole**

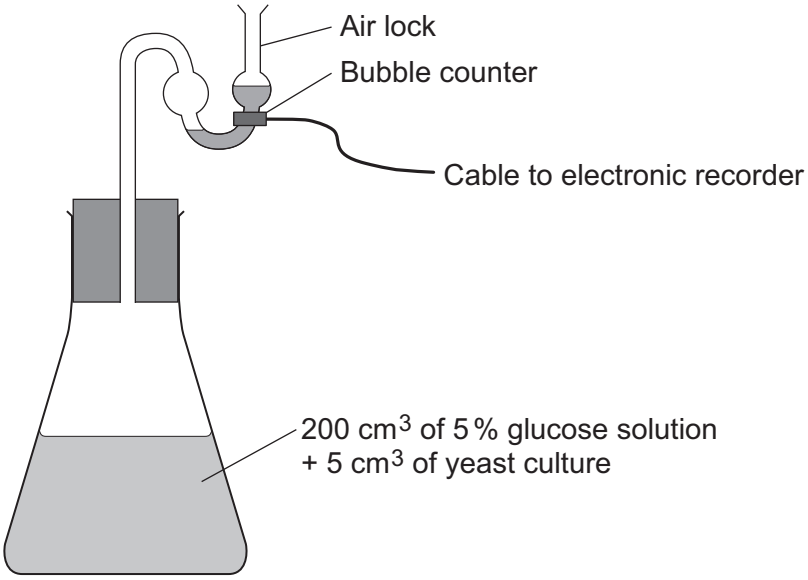
(2 marks)

Question 3 continues on the next page

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3 (b) Some students investigated fermentation in yeast. They set up a flask as shown in **Diagram 2**.

Diagram 2



The yeast produced a gas. Bubbles of this gas escaped through the air lock. The students left the investigation for 40 hours.

3 (b) (i) Draw a ring around the correct answer to complete the sentence.

The yeast produced a gas called

- carbon dioxide.
- oxygen.
- methane.

(1 mark)

3 (b) (ii) Every time a bubble of gas passed through the air lock, the bubble counter sent an electrical signal to the recorder.

Give **one** advantage of using a bubble counter and an electronic recorder instead of a person to count the bubbles.

.....

.....

(1 mark)

Do not write outside the box

The table shows the students' results.

Time in hours	Total number of bubbles of gas released
0	0
5	105
10	2800
15	5510
20	9783
25	11235
30	11408
35	11408
40	11408

3 (b) (iii) After how many hours did the yeast stop releasing bubbles of gas?

..... hours
(1 mark)

3 (b) (iv) Suggest **one** reason why the yeast stopped releasing bubbles of gas.

.....

.....
(1 mark)

3 (c) The students decided to repeat the investigation with a different species of yeast.

Give **two** factors they should keep the same to make the investigation a fair test.

1 .....

2 .....
(2 marks)

8

Do not write outside the box

4 The kidneys produce urine.

The table shows the composition of a sample of urine from one person.

Substance	Percentage
Ions	2.5
Urea	2.6
Water	

4 (a) (i) Calculate the percentage of water in this sample of urine.

Show clearly how you work out your answer.

.....

.....

Percentage of water = ... %

(2 marks)

4 (a) (ii) The urine of a healthy person does **not** contain protein.

What is the reason for this?

Tick (✓) **one** box.

Protein molecules in the plasma cannot pass through the filter in the kidney. ☐

Protein molecules in the plasma can pass through the filter in the kidney and are then reabsorbed. ☐

There are no protein molecules in the plasma. ☐

(1 mark)

Do not write outside the box

4 (b) Dialysis can be used to treat a person with kidney disease.

Draw a ring around the correct answer to complete each sentence.

4 (b) (i) The dialysis machine contains membranes that are

fully permeable.

impermeable.

partially permeable.

(1 mark)

4 (b) (ii) At the end of a dialysis session, the concentration of substances in the blood would be

higher than

lower than

the same as

the concentration of substances in the dialysis fluid.

(1 mark)

4 (c) For most patients, a kidney transplant is better than continued treatment by dialysis.

Kidney transplants have some disadvantages.

Give **one** disadvantage of a kidney transplant.

.....

.....

(1 mark)

6

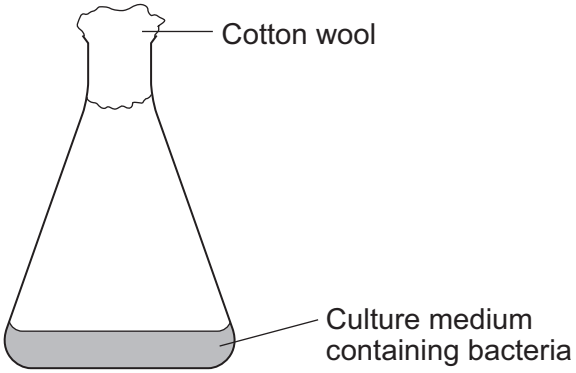
Turn over for the next question

Do not write outside the box

5 Some students grew one species of bacterium in a flask.

Diagram 1 shows the flask.

Diagram 1



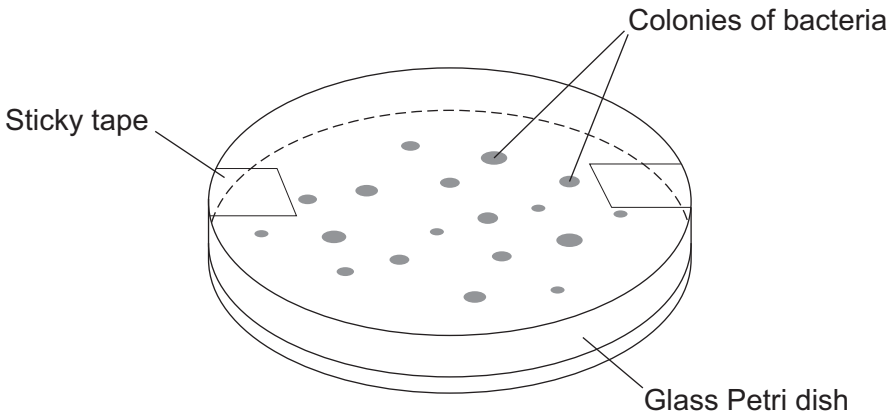
The students wanted to find the number of bacteria in 1 cm^3 of the culture medium.

The students:

- diluted 1 cm^3 of the culture medium from the flask with 999 cm^3 of water
- added 1 cm^3 of diluted culture to sterilised nutrient agar in a Petri dish
- placed the Petri dish in an incubator at 25 °C.

Diagram 2 shows the Petri dish after 3 days in the incubator.

Diagram 2



Do not write outside the box

5 (a) Each colony of bacteria is formed where one bacterium landed on the agar jelly.

How is each colony formed?

.....

.....

(1 mark)

5 (b) Complete the following calculation to find how many bacteria there were in 1 cm^3 of the undiluted culture.

Number of colonies of bacteria in the Petri dish = ...

These colonies were formed from 1 cm^3 of the culture diluted $\times$ 1000.

Therefore, number of bacteria in 1 cm^3 of undiluted culture = ...

(2 marks)

5 (c) It is important to sterilise the culture medium and all the apparatus before use.

Explain why.

.....

.....

.....

.....

(2 marks)

5 (d) The bacteria would grow faster at 35 °C. In a school laboratory, the Petri dish should **not** be incubated at a temperature higher than 25 °C.

Why?

.....

.....

(1 mark)

5 (e) The students decided to repeat their investigation.

Why?

.....

.....

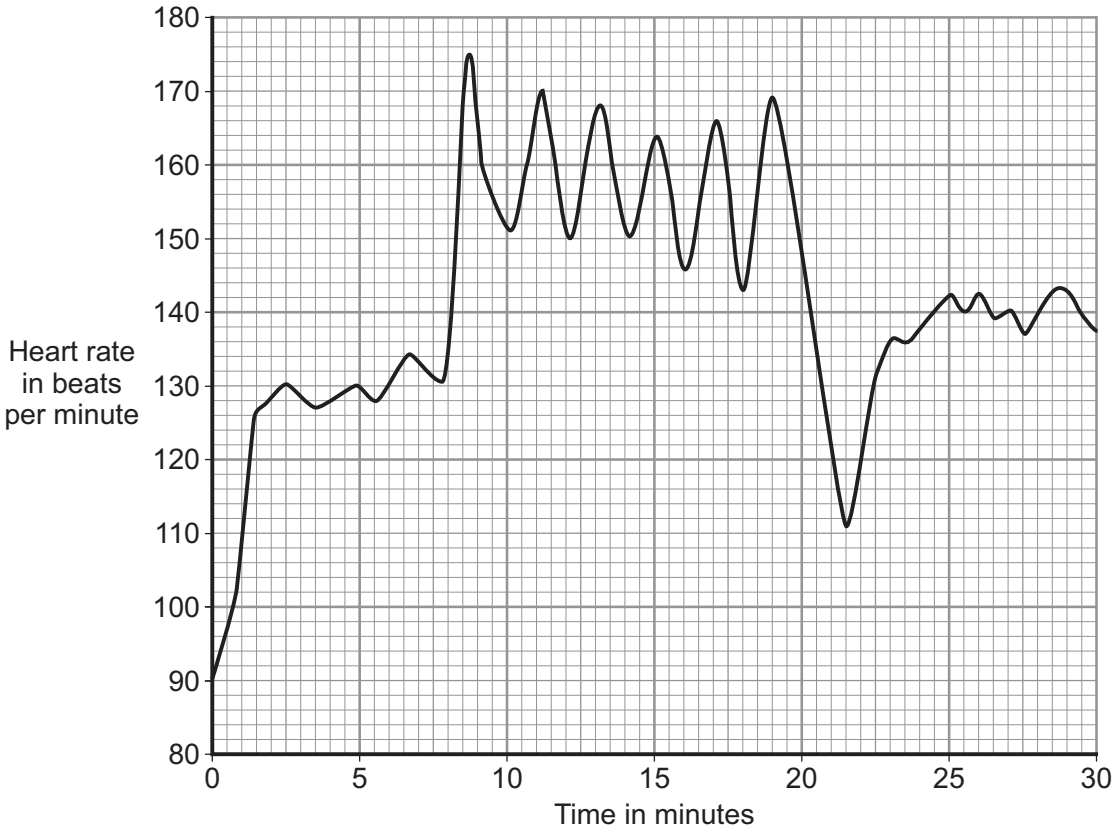
(1 mark)

7

Do not write outside the box

6 One type of training exercise involves alternating periods of walking and running.

The graph shows how an athlete's heart rate changed during one 30-minute training session.



6 (a) (i) The athlete ran 6 times during the 30-minute training session.

Describe the evidence for this in the graph.

.....

.....

(1 mark)

6 (a) (ii) Immediately after the final run, the athlete rested for a short time before he started to walk again.

For how many minutes did this rest last?

..... minutes

(1 mark)

Do not write outside the box

6 (b) The heart rate increases during exercise.

This increase in heart rate increases blood flow to the muscles.

Explain, as fully as you can, why this increase in heart rate is necessary.

.....

.....

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.....

.....

(4 marks)

6

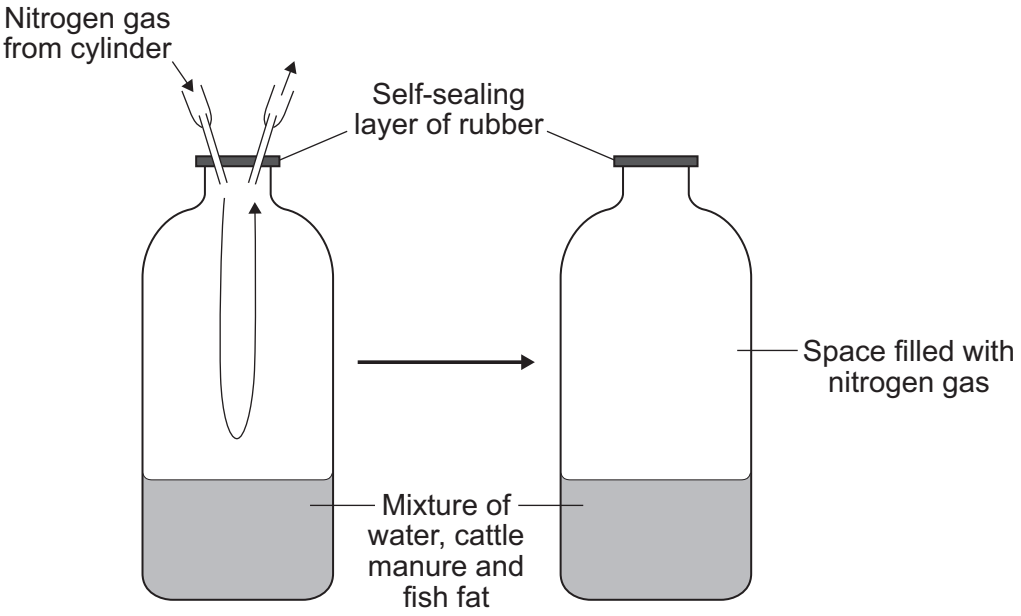
Turn over for the next question

Do not write outside the box

7 Norway has a large fishing industry. Norwegian scientists investigated the effect of adding waste fish fat to cattle manure to improve the production of biogas.

The scientists set up many jars containing different concentrations of fish fat added to the cattle manure. The air in each jar was removed and replaced with pure nitrogen gas.

The diagram shows how one of these jars was set up.



The scientists then kept all the jars in an incubator at 35 °C for 6 weeks.

7 (a) The scientists sealed each jar with a layer of rubber and replaced the air in the jars with nitrogen gas.

Explain why.

.....

.....

.....

.....

(2 marks)

Do not write outside the box

7 (b) The scientists removed samples of gas from each jar at intervals over the 6 weeks.

The table shows some of the scientists' results.

Contents of jar	Yield of biogas in cm^3 per gram	Yield of methane in cm^3 per gram	Proportion of methane in the biogas
Cattle manure	426	256	0.60
Cattle manure + 2.5% fish fat	686	426	
Cattle manure + 5% fish fat	861	543	0.63
Cattle manure + 10% fish fat	999	630	0.63

7 (b) (i) The final column of the table shows the proportion of methane in the biogas.

Apart from the methane and the added nitrogen, name the other gas that makes up most of the rest of the biogas.

.....

(1 mark)

7 (b) (ii) Calculate the proportion of methane in the biogas when 2.5% fish fat was added to the manure.
Show clearly how you work out your answer.

.....

.....

Proportion of methane = ...

(2 marks)

7 (b) (iii) Describe the effects on biogas production of adding fish fat to cattle manure.

.....

.....

.....

.....

.....

(2 marks)

Question 7 continues on the next page

Do not write outside the box

7 (b) (iv) Olaf is a Norwegian farmer. Olaf's farm is 110 kilometres from the sea. He has a biogas generator on his farm. Olaf adds manure from his 50 cattle to his biogas generator.

Olaf decided **not** to add fish fat to his biogas generator.

Suggest **one** reason why.

.....

.....

(1 mark)

8

END OF QUESTIONS

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Version : 10/08/2012

General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2012 examination – June series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

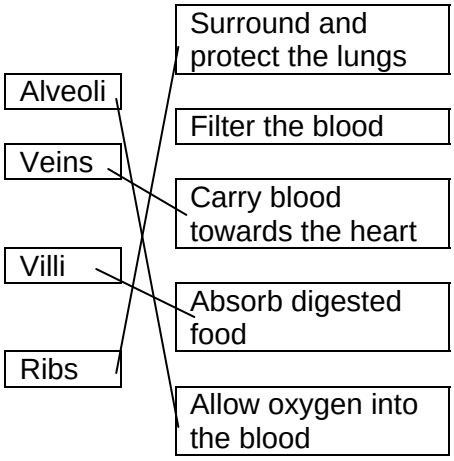
3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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Question 1

question	answers	extra information	mark
1(a)		4 correct = **4** marks 3 correct = **3** marks 2 correct = **2** marks 1 correct = **1** mark extra line from a structure cancels the mark	max 4
1(b)	diffusion		1
Total			**5**

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BLY3F

Question 2

question	answers	extra information	mark
2(a)	transpiration		1
2(b)	increase then decrease maximum rate at 36 – 38 (°C) / 540 – 560 (grams per day)	 any figure in these ranges	1 1
2(c)(i)	reduce water loss / prevent wilting	allow stops water loss	1
2(c)(ii)	40 – 45 °C		1
Total			**5**

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BLY3F

Question 3

question	answers	extra information	mark
3(a)	A = nucleus B = cell wall	 allow wall	1 1
3(b)(i)	carbon dioxide		1
3(b)(ii)	any **one** from: • reference to losing count • more accurate / reliable • correct reading • the experiment lasts for a long time	 ignore human error ignore more precise	1
3(b)(iii)	30	allow any value in range >25 ≤ 30	1
3(b)(iv)	ran out of food / glucose / energy **or** too much alcohol formed	ignore reaction complete do **not** allow runs out of oxygen allow toxic waste products formed **or** yeast dies	1
3(c)	any **two** from: • volume / amount / concentration of glucose / solution • volume / amount / concentration of yeast • temperature • time	ignore same apparatus	2
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)(i)	94.9	correct answer with or without working if answer is incorrect 100 – (2.5 + 2.6) gains **1** mark	2
4(a)(ii)	protein molecules in the plasma cannot pass through the filter in the kidney		1
4(b)(i)	partially permeable		1
4(b)(ii)	the same as		1
4(c)	any **one** from • hazards of operation / named example • may be rejected / need to use immunosuppressant drugs / need to find (tissue) match • not enough donors • transplants have a limited life	 allow long term drug use allow a long waiting list	1
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)	cell division / bacterium divides / multiplies / reproduces	allow asexual / mitosis ignore growth	1
5(b)	18 18 000 / 18×10^3 / 1.8×10^4	 do **not** accept 1.8^{04} / 1.8 04 / 1.8^4 allow ecf from wrong count	1 1
5(c)	to kill / destroy other microorganisms / named type **or** to prevent contamination to prevent other microorganisms affecting the results **or** other microorganisms would be counted	ignore germs / viruses allow to give accurate / reliable results	1 1
5(d)	prevent growth of pathogens / disease-causing microorganisms / dangerous microorganisms	do **not** accept microorganisms <u>become</u> pathogenic ignore germs / viruses ignore general safety / biohazards / harmful products produced by bacteria	1
5(e)	to improve the reliability of the investigation / check for anomalies	do **not** accept accuracy / precision / fairness / validity ignore averages / repeatability / reproducibility	1
Total			**7**

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Question 6

question	answers	extra information	mark
6(a)(i)	6 peaks in heart rate	accept 6 increases / spikes **or** goes very high 6 times allow heart rate increases each time he runs	1
6(a)(ii)	2.5 / 2½	allow 2 minutes 30 seconds do **not** accept 2.3 / 2:3 / 2.30	1
6(b)		more / faster / a lot **must** be stated at least once for full marks	
	(more) oxygen supplied / needed **or** (more) aerobic respiration	allow less anaerobic (respiration) **or** prevents oxygen debt	1
	(more) glucose / sugar / food supplied / needed	ignore feeding	1
	(more) energy needed / released	allow energy produced / made	1
	(more) carbon dioxide / heat / lactic acid removed (from muscles) **or** more cooling **or** less lactic acid formed		1
Total			**6**

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Question 7

question	answers	extra information	mark
7(a)	(biogas / methane is made) by fermentation / anaerobic respiration	accept reverse argument accept for **1** mark so no oxygen in jar **or** so oxygen can't enter **or** makes conditions anaerobic ignore references to keeping other microbes out ignore air	2
7(b)(i)	carbon dioxide	accept CO_2 / CO2 do **not** accept CO^2	1
7(b)(ii)	0.62 look for answer in table	correct answer with or without working gains **2** marks allow 62% for **2** marks but 62 for **1** mark if incorrect / no answer $\frac{426}{686}$ gains **1** mark	2
7(b)(iii)	(more fat → much) more biogas / methane (more fat →) only small increase in proportion / concentration / percentage of methane **or** approximately constant **or** no change above 5%	allow more implied by giving two numbers or a subtraction / division allow increases only from 0.60 to 0.63 **or** only changes by 0.03	1 1
7(b)(iv)	fat (too) expensive **or** fat (too) expensive to transport (from coast to farm)	accept any suitable reference to extra cost / effect on environment eg more pollution from transport	1
Total			**8**

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TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2012

Biology

BLY3F

Unit Biology B3

F

Written Paper

Tuesday 24 January 2012 9.00 am to 9.45 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

Instructions
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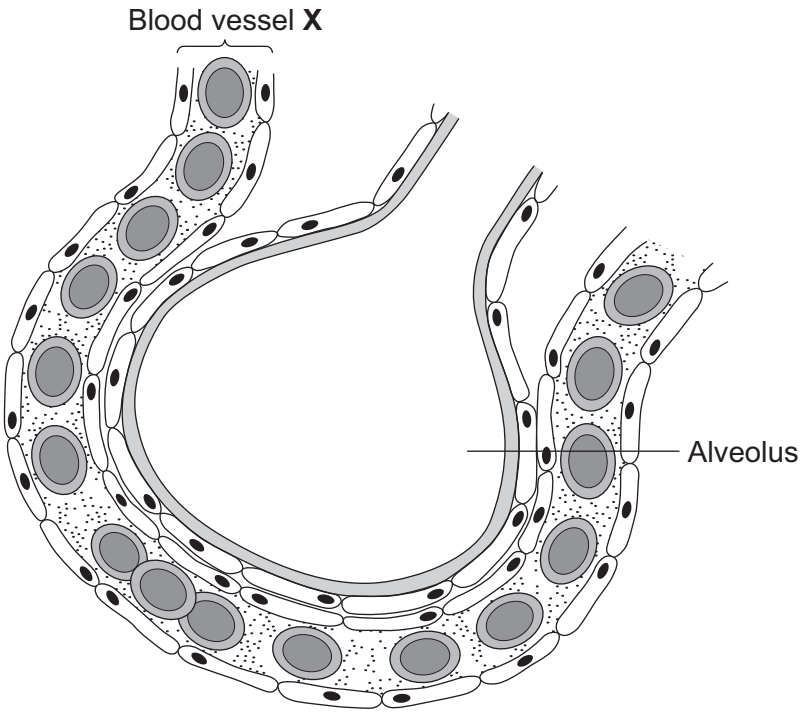
Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

Answer **all** questions in the spaces provided.

1 The diagram shows an alveolus and a blood vessel in the lung.



1 (a) Draw a ring around the correct answer to complete each sentence.

1 (a) (i) Blood vessel **X** is

an artery.

a capillary.

a vein.

(1 mark)

1 (a) (ii) Gases pass across the wall of the alveolus by

diffusion.

evaporation.

fermentation.

(1 mark)

Do not write outside the box

1 (a) (iii) The table compares the concentrations of some gases in inhaled air and exhaled air.

Complete the table.
Write 'lower' **or** 'higher' in each box.
One line has been completed for you as an example.

Gas	Concentration	
	Inhaled air	**Exhaled air**
Water vapour	lower	higher
Carbon dioxide		
Oxygen		

(2 marks)

1 (b) Draw a ring around the correct answer to complete each sentence.

1 (b) (i) Oxygen is carried in the blood mainly in

blood plasma.

red blood cells.

white blood cells.

(1 mark)

1 (b) (ii) In the blood, the oxygen combines with

carbon dioxide.

haemoglobin.

urea.

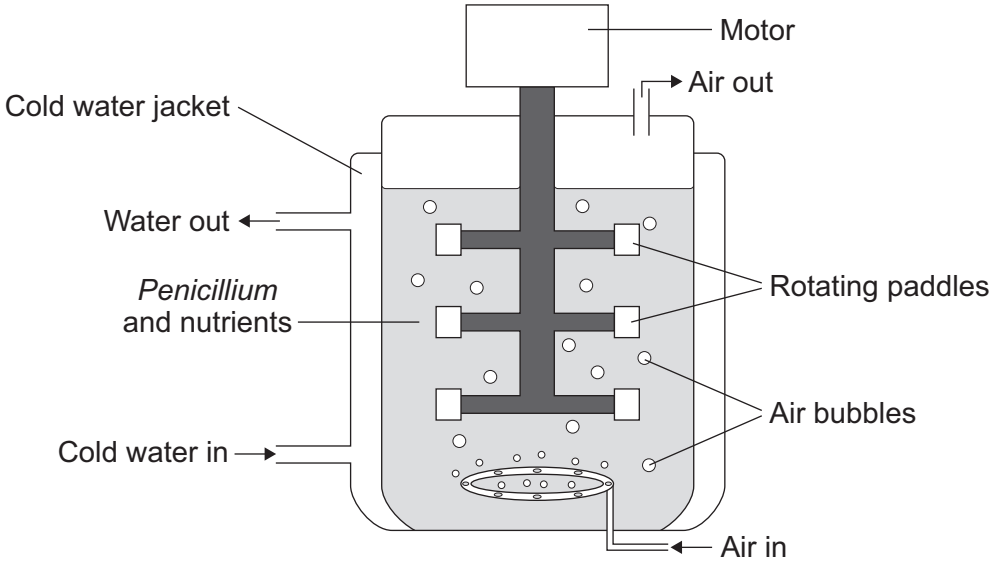
(1 mark)

6

Turn over for the next question

Do not write outside the box

2 The diagram shows an industrial fermenter. This fermenter is used for growing the fungus *Penicillium*. *Penicillium* makes the antibiotic penicillin.



2 (a) Draw a ring around the correct answer to complete each sentence.

2 (a) (i) The cold water jacket removes heat which is produced by

breathing.

gas exchange.

respiration.

(1 mark)

2 (a) (ii) Temperatures above 45 °C would

cause too much oxygen to dissolve.

kill the *Penicillium.*

make the reaction too fast.

(1 mark)

2 (a) (iii) The function of the rotating paddles is to

move the water in the cold water jacket.

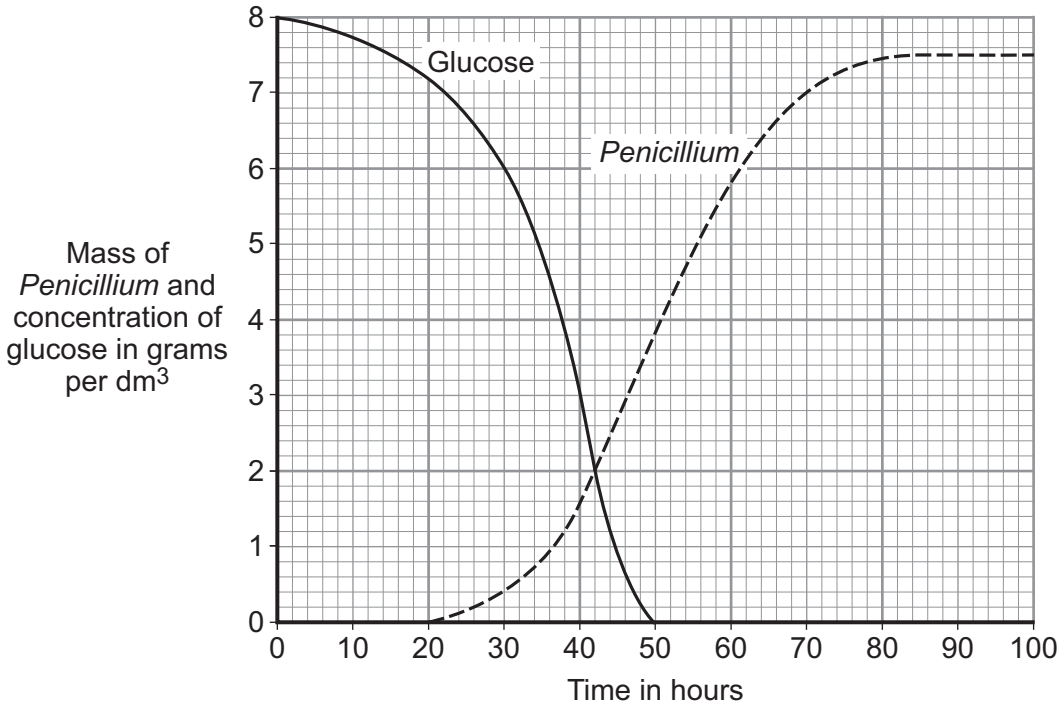
mix the *Penicillium* with the nutrients.

remove oxygen from the fermenter.

(1 mark)

Do not write outside the box

2 (b) The graph shows how the amounts of glucose and of *Penicillium* in the fermenter changed over 100 hours.



2 (b) (i) By how much did the concentration of glucose decrease during the first 40 hours?

..... grams per dm^3

(1 mark)

2 (b) (ii) Draw a ring around the correct answer to complete the sentence.

The mass of the *Penicillium* increased most rapidly

- before 40 hours.
- between 40 and 70 hours.
- after 70 hours.

(1 mark)

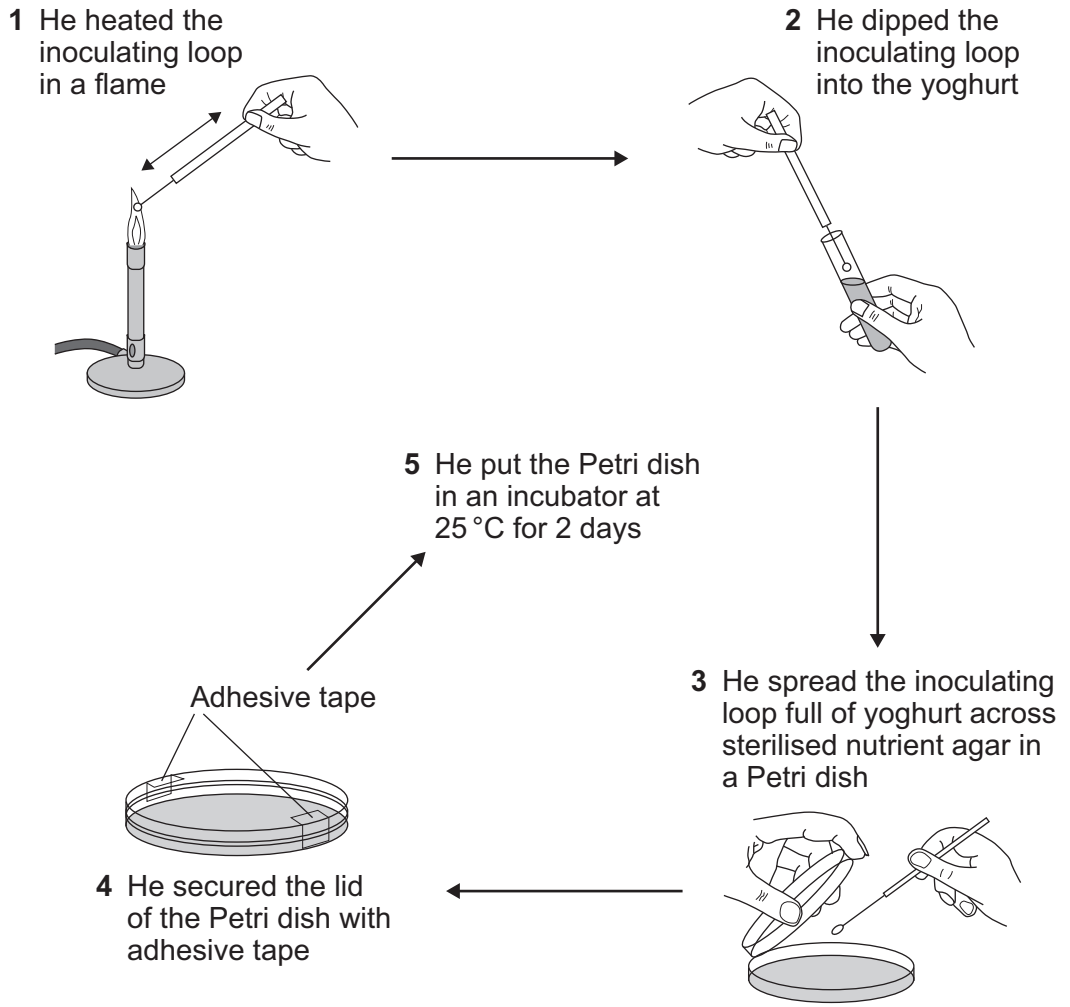
5

Turn over for the next question

Do not write outside the box

3 Fresh yoghurt contains living bacteria.

A scientist wanted a pure sample of **one** species of bacterium from some yoghurt. The diagram shows how the scientist did this.



Do not write outside the box

3 (a) **List A** gives three of the actions shown in the diagram.
List B gives four possible reasons for these actions.

Draw a line from each action in **List A** to the correct reason in **List B**.

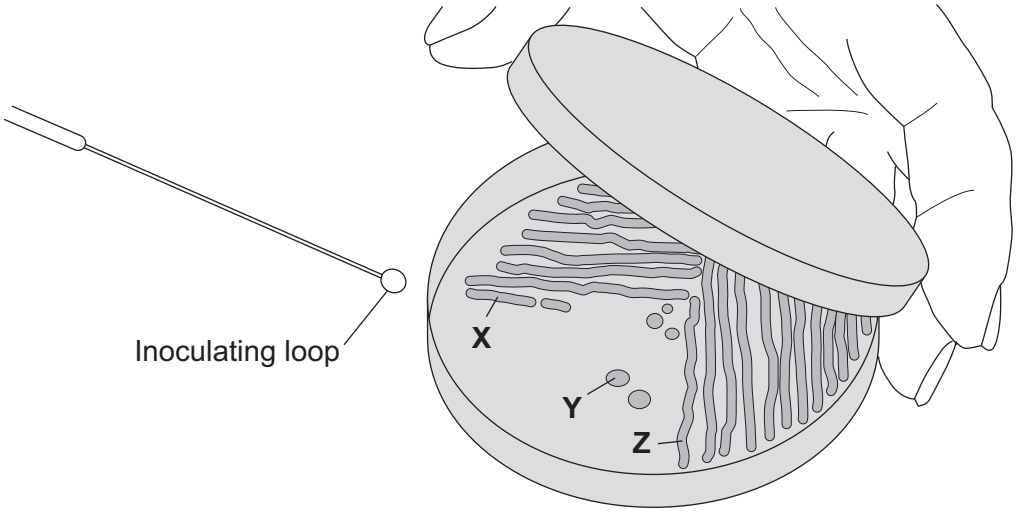
List A **Action**	**List B** **Reason**
	To stop bacteria from the air getting in
He heated the inoculating loop in a flame. (step **1**)	
	To stop oxygen getting in
He secured the lid of the Petri dish with adhesive tape. (step **4**)	
	To kill bacteria
He put the Petri dish in an incubator at 25 °C instead of 35 °C. (step **5**)	
	To reduce the growth of pathogens

(3 marks)

Question 3 continues on the next page

Do not write outside the box

3 (b) The drawing shows what the Petri dish looked like after 2 days at 25 °C.



The scientist is going to take some bacteria out of the dish with the inoculating loop.

3 (b) (i) The scientist wants a pure sample of **one** species of bacterium.

Should he take bacteria from region **X**, region **Y**, or region **Z**? ☐

(1 mark)

3 (b) (ii) Explain why you chose this region.

.....

.....

(1 mark)

3 (c) The scientist transferred the bacteria into some milk.

3 (c) (i) Which nutrient in the milk would be an energy source for the bacteria?

Draw a ring around **one** answer.

carbohydrate **mineral ion** **vitamin**

(1 mark)

Do not write outside the box

3 (c) (ii) Draw a ring around the correct answer to complete each sentence.

The bacteria in the milk ferment

- malt.
- lactose.
- protein.

The fermentation causes the milk to become

- more acidic.
- more alkaline.
- neutral.

(2 marks)

8

Turn over for the next question

Do not write outside the box

4 Doctors use dialysis to treat patients with kidney failure.

The table shows the sizes of molecules of some of the substances found in blood plasma.

Substance	Size of molecule in arbitrary units
Water	18
Sodium ion	23
Urea	60
Glucose	180
Albumin (a blood protein)	68 000

4 (a) Use information from the table to answer the questions.

4 (a) (i) Albumin is a blood protein. Albumin is **not** removed from the blood during dialysis.

Explain why.

.....

.....

.....

.....

(2 marks)

4 (a) (ii) During a dialysis session, one patient's body mass decreased by 2 kilograms.

This decrease was mainly due to removal from the blood of **one** of the substances in the table.

Which substance was this? .....

(1 mark)

Do not write outside the box

4 (a) (iii) The substance you named in part **(a)(ii)** was able to pass through the dialysis membrane.

Draw a ring around the correct answer to complete the sentence.

The substance passed through because the

membrane was

impermeable.
partially permeable.
surrounded by capillaries.

(1 mark)

4 (b) For most patients, a kidney transplant is better than continued treatment using dialysis.

Kidney transplants have some disadvantages.

Give **two** disadvantages of kidney transplants.

1 .....

.....

2 .....

.....

(2 marks)

6

Turn over for the next question

Do not write outside the box

5 Plants lose water vapour from their leaves. Most of this water vapour is lost through the stomata.

5 (a) Draw a ring around the correct answer to complete the sentence.

Plants lose water vapour by

distillation.

filtration.

transpiration.

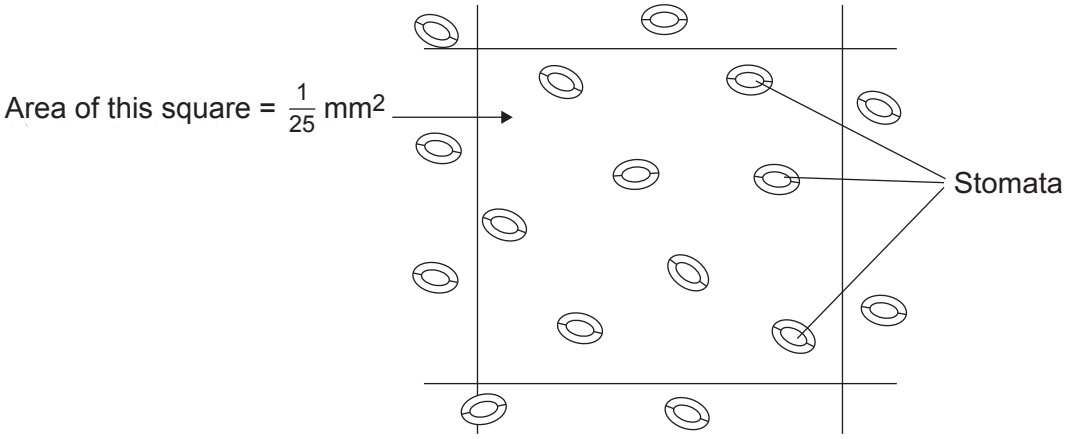
(1 mark)

5 (b) A class of students investigated the number of stomata per mm^2 on the upper surface and on the lower surface of the leaves of three species of plant, **P**, **Q** and **R**.

The students placed samples of the surface cells onto a grid on a microscope.

Student **X** counted the stomata on the lower surface of a leaf from one of the plant species.

The diagram shows part of the grid that student **X** saw under the microscope.



5 (b) (i) Complete the calculation to estimate the number of stomata per mm^2 on the lower surface of this leaf.

Number of stomata in $\frac{1}{25}$ mm^2 = ...

Number of stomata in 1 mm^2 = ...

(2 marks)

Do not write outside the box

The table shows the mean results for the class.

Plant species	Mean number of stomata per mm^2 of leaf	
	Upper surface of leaf	Lower surface of leaf
P	40	304
Q	0	11
R	85	195

5 (b) (ii) Student **X** had counted the stomata on the lower surface of a leaf from one of the plant species.

Use your answer to part **(b)(i),** and information in the table, to help you to answer this question.

From which plant species, **P**, **Q** or **R**, was student **X**'s leaf most likely to have been taken? ☐

(1 mark)

5 (b) (iii) Species **Q** is normally found growing in hot, dry conditions.

Explain **one** way in which species **Q** is adapted for living in hot, dry conditions.

Use information from the table.

.....

.....

.....

.....

(2 marks)

6

Turn over for the next question

Do not write outside the box

6 Some students investigated the best temperature for gas production by yeast.

The students set up the apparatus as shown in **Diagram 1**.

Diagram 1

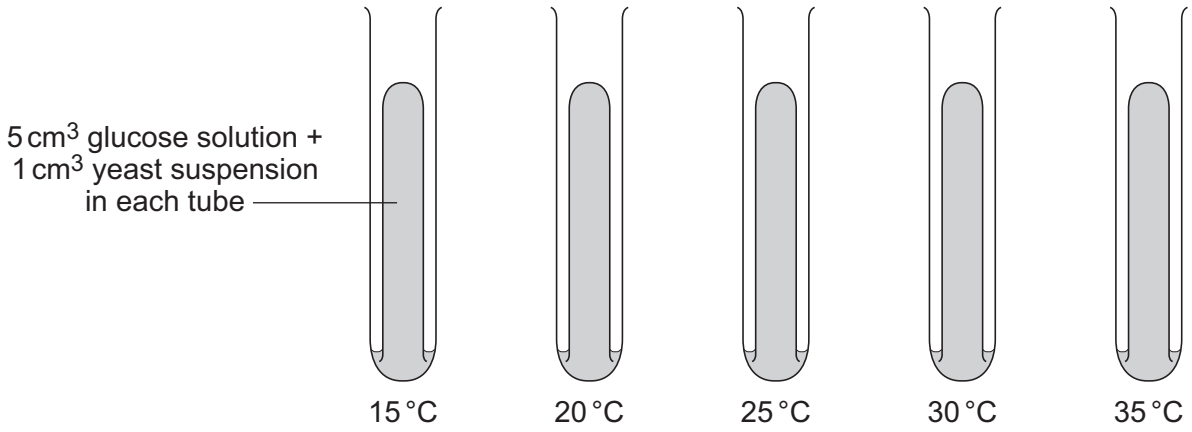
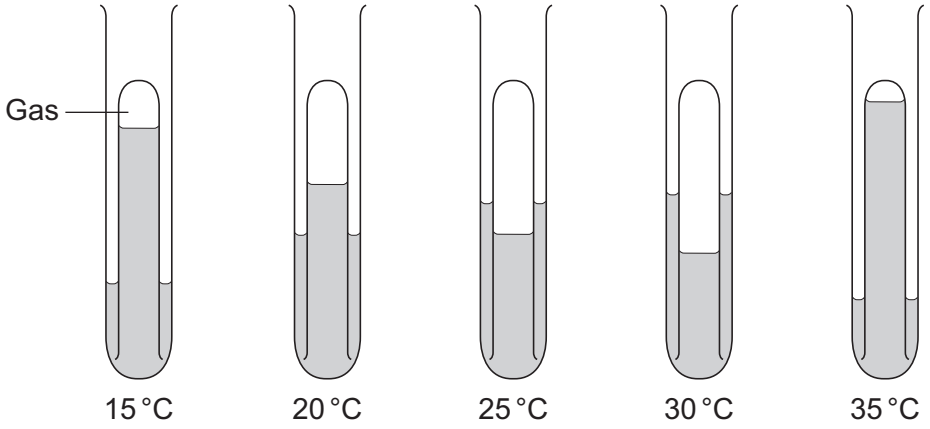


Diagram 2 shows the results after one hour.

Diagram 2



6 (a) In each apparatus the yeast produced a gas.

6 (a) (i) Name this gas.

.....

(1 mark)

6 (a) (ii) Name the process which produces this gas.

.....

(1 mark)

Do not write outside the box

6 (b) One student said that the best temperature for the yeast to produce the gas was 30 °C.

What is the evidence for this in **Diagram 2**?

.....

.....

(1 mark)

6 (c) A second student said that the investigation might not have produced reliable results.

6 (c) (i) What should the students do next to check the reliability of their results?

.....

.....

(1 mark)

6 (c) (ii) How would the students then know if their results were reliable?

.....

.....

(1 mark)

6 (d) A third student said that the investigation might not have produced an accurate value for the best temperature for gas production.

What should the students do next to check that 30 °C was an accurate value for the best temperature?

.....

.....

.....

.....

(2 marks)

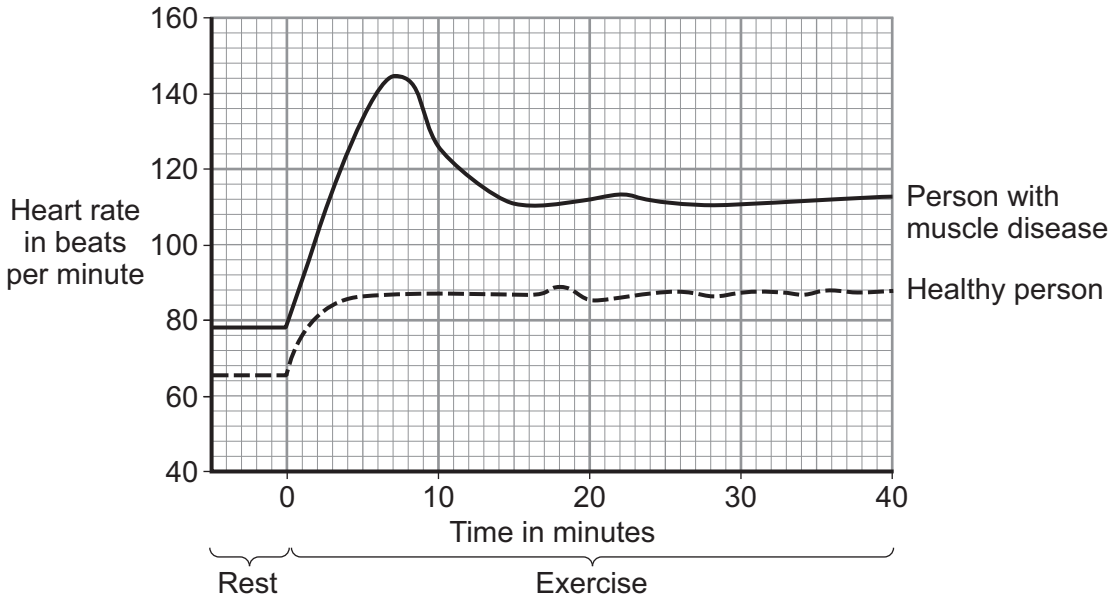
7

Turn over for the next question

Do not write outside the box

7 Two people did the same amount of gentle exercise on an exercise cycle.
One person had a muscle disease and the other had healthy muscles.

The graph shows the effect of the exercise on the heart rates of these two people.



7 (a) Describe **three** ways in which the results for the person with the muscle disease are different from the results for the healthy person.

To gain full marks in this question you need to include data from the graph in your answer.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

Do not write outside the box

7 (b) The blood transports glucose to the muscles at a faster rate during exercise than when a person is at rest.

7 (b) (i) Name **one** other substance that the blood transports to the muscles at a faster rate during exercise.

.....

(1 mark)

7 (b) (ii) People with the muscle disease are not able to store glycogen in their muscles.

The results shown in the graph for the person with the muscle disease are different from the results for the healthy person.

Suggest an explanation for the difference in the results.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(3 marks)

7

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Version : 07/03/2012

General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2012 examination – January series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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Question 1

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>1(a)(i)</td><td>capillary</td><td></td><td>1</td></tr>
<tr><td>1(a)(ii)</td><td>diffusion</td><td></td><td>1</td></tr>
<tr><td>1(a)(iii)</td><td><table><tr><td>Carbon dioxide</td><td>low(er)</td><td>high(er)</td></tr><tr><td>Oxygen</td><td>high(er)</td><td>low(er)</td></tr></table></td><td>1 mark for each correct row</td><td>1
1</td></tr>
<tr><td>1(b)(i)</td><td>red blood cells</td><td></td><td>1</td></tr>
<tr><td>1(b)(ii)</td><td>haemoglobin</td><td></td><td>1</td></tr>
<tr><td>Total</td><td></td><td></td><td>6</td></tr>
</table>

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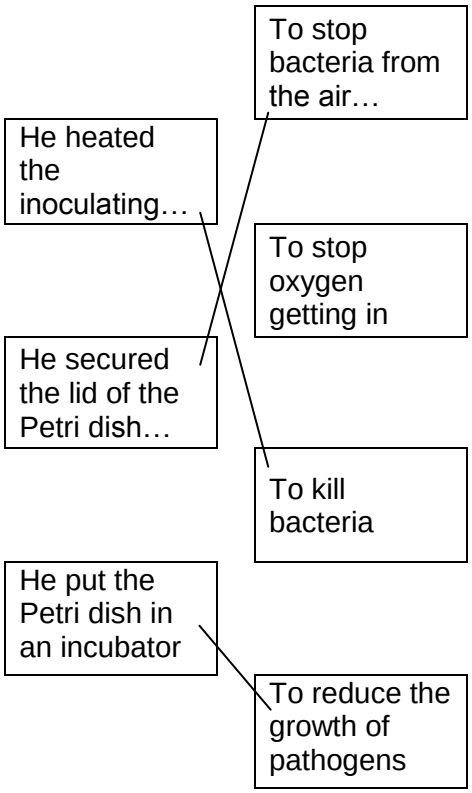
Question 2

question	answers	extra information	mark
2(a)(i)	respiration		1
2(a)(ii)	kill the *Penicillium*		1
2(a)(iii)	mix the *Penicillium* with the nutrients		1
2(b)(i)	5	accept in range 4.9 to 5.1	1
2(b)(ii)	between 40 and 70 hours		1
Total			**5**

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Question 3

question	answers	extra information	mark
3(a)		each correct line gains **1** mark extra line from a statement cancels the mark	3
3(b)(i)	**Y**		1
3(b)(ii)	separate (colony) **or** all from one bacterium		1
3(c)(i)	carbohydrate		1
3(c)(ii)	lactose more acidic		1 1
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)(i)	(too) big cannot fit / pass through filter / through (pores) in membrane / cannot be filtered	 too big to be filtered = **2** marks	1 1
4(a)(ii)	water		1
4(a)(iii)	partially permeable		1
4(b)	any **two** from: • hazards of operation / named eg • may be rejected **or** need to use immunosuppressant drugs / long term drug use **or** transplant may need to be replaced • susceptible to other infections • shortage of donors • high <u>initial</u> cost		2
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)	transpiration		1
5(b)(i)	200	correct answer with or without working if answer incorrect: allow **1** mark for 8 × 25 **or** allow **1** mark for answer from candidate's count × 25	2
5(b)(ii)	**R**	allow **P or Q** if candidate's answer to (b)(i) nearer to value for one of those do **not** allow **R** if the answer to 5bi would give an answer of **P** or **Q** allow R if 5bi is blank	1
5(b)(iii)	few stomata little / less transpiration **or** little / less water (vapour) loss / enable water to be retained	allow no stomata on upper surface / all stomata on lower surface allow no water loss from upper surface	1 1
Total			**6**

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Question 6

question	answers	extra information	mark
6(a)(i)	carbon dioxide	accept CO_2 / CO2 do **not** accept CO^2	1
6(a)(ii)	fermentation / respiration	ignore aerobic / anaerobic	1
6(b)	most / more gas (produced) **or** liquid level lowest	do **not** allow 'a lot' allow alternative descriptions ignore name of gas	1
6(c)(i)	repeat **or** compare with results of others	ignore reference to average or mean	1
6(c)(ii)	if reliable – get same / similar results **or** small range	allow same pattern but **not** pattern alone allow no anomalies ignore anomalies unqualified	1
6(d)	use smaller intervals around 30°C **or** between 25°C and 35°C	can be implied do **not** allow for temperatures below 25°C above 35°C ignore references to sensitivity or precision (of thermometer) NB do at 28°C, 30°C and 32°C = **2** marks	1 1
Total			**7**

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Question 7

question	answers	extra information	mark
7(a)	<u>person with muscle disease:</u> any **three** from: • higher resting rate **or** higher at start • when exercise starts / then increases more / more rapidly • peaks (then falls) • levels off <u>later</u> than healthy person • higher rate during exercise • greater range	allow reverse argument for healthy person NB all points are comparative except peak (point 3) allow use of **two** approximate figures as a comparison accept description eg rise …. fall if no other marks awarded allow **1** mark for 'it's higher'	3
7(b)(i)	oxygen	accept adrenaline accept O_2 do **not** accept O, O2 or O^2	1
7(b)(ii)	cannot release sugar / glucose (from glycogen) **or** cannot store glucose / sugar (as glycogen) need to receive glucose / sugar (from elsewhere) for energy / respiration / cannot store energy	 ignore oxygen ignore aerobic / anaerobic	1 1 1
Total			**7**

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UMS Conversion Calculator www.aqa.org.uk/umsconversion

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
June 2011

Biology

BLY3F

F

Unit Biology B3

Written Paper

Thursday 19 May 2011 1.30 pm to 2.15 pm

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

Answer **all** questions in the spaces provided.

1 Microorganisms are used to make yoghurt and alcoholic drinks.

List A gives four materials used in making yoghurt and alcoholic drinks.
List B gives information about these materials.

Draw a line from each material in **List A** to the correct information in **List B**.

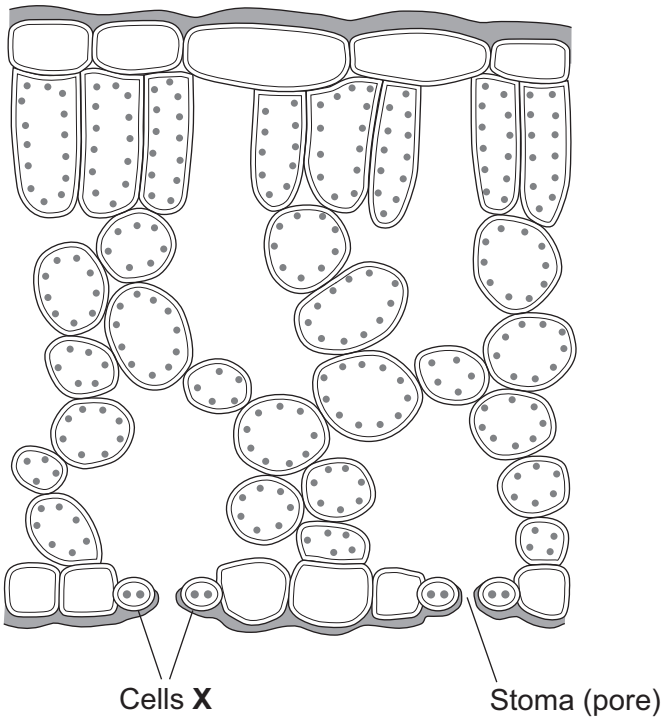
List A **Material**	**List B** **Information**
	The sugar in milk
Lactose	
	Used in brewing beer to give a bitter flavour
Lactic acid	
	Enzyme made by yeast
Hops	
	Causes milk to clot in yoghurt making
Ethanol	
	Made in fermentation by yeast

(4 marks)

4

Do not write outside the box

2 The diagram shows a section through a plant leaf.



2 (a) The cells labelled **X** surround a stoma (pore).

Draw a ring around the correct answer to complete the sentence.

Cells **X** are called

- alveoli.
- guard cells.
- villi.

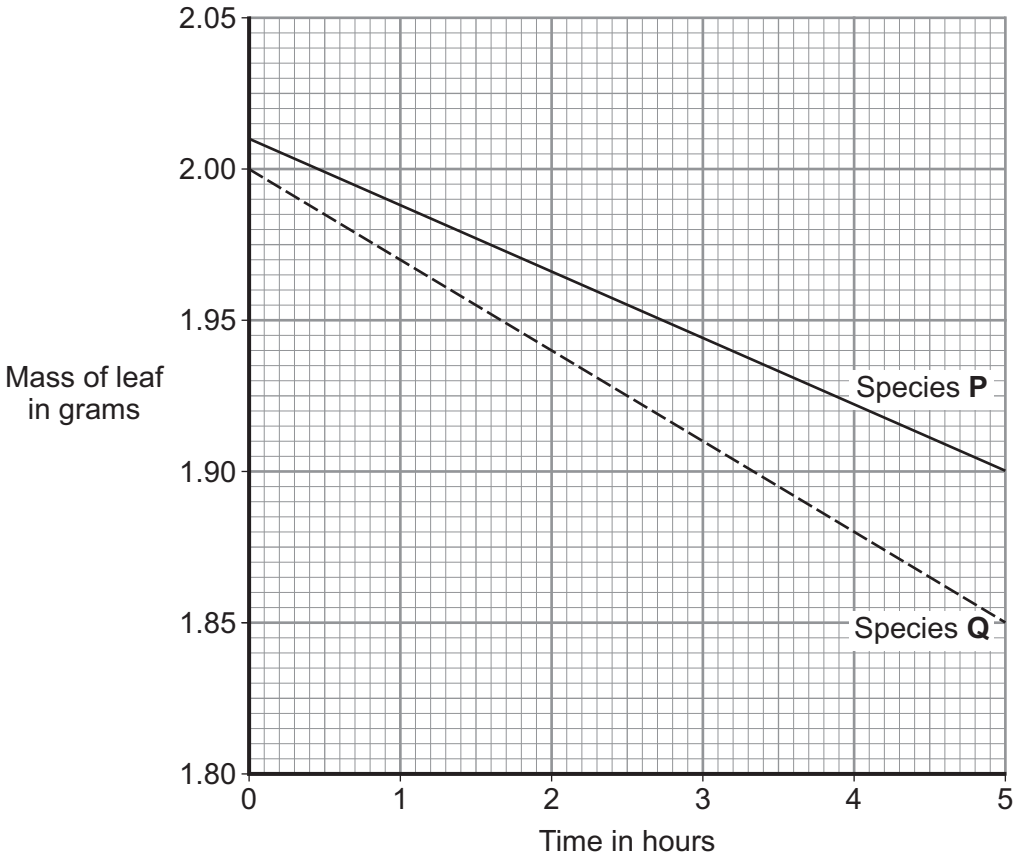
(1 mark)

Question 2 continues on the next page

Do not write outside the box

2 (b) Water vapour is lost from leaves. Water loss causes a leaf to lose mass.

The graph shows how the masses of leaves from two plant species, **P** and **Q**, changed over several hours. Both leaves were kept in the same conditions.



2 (b) (i) What was the mass of the leaf of species **Q** at 0 hours? ..... grams

(1 mark)

2 (b) (ii) What was the difference between the mass of the leaf of species **P** and the mass of the leaf of species **Q** after 5 hours?

..... grams

(1 mark)

2 (b) (iii) The leaf of species **Q** lost water at a faster rate than the leaf of species **P**.

Suggest **one** reason why.

.....

.....

(1 mark)

Do not write outside the box

2 (b) (iv) Which weather conditions would cause the greatest rate of loss of mass for both species **P** and species **Q**?

Tick (✓) **one** box in the table.

Weather conditions		**Tick (✓)**
Still air or wind	**Temperature in °C**	
Wind	30	
Still air	30	
Wind	20	

(1 mark)

2 (c) Draw a ring around the correct answer to complete the sentence.

In very hot, dry conditions, the stomata close.

This is to prevent

anaerobic respiration.

breathing.

wilting.

(1 mark)

6

Turn over for the next question

Do not write outside the box

3 Mycoprotein is produced from the fungus *Fusarium*. Mycoprotein is sometimes used instead of meat in foods for vegetarians.

3 (a) The table shows the amounts of some substances in mycoprotein and in chicken.

Substance	Mass in grams per 100 grams	
	Mycoprotein	**Chicken**
Protein	11.8	22.0
Dietary fibre	4.8	0.0
Fat	3.5	6.2
Carbohydrate	2.0	0.0
Cholesterol	0.0	0.1

3 (a) (i) Draw a ring around the correct answers to complete the sentence.

Eating mycoprotein instead of chicken helps to lower the risk of heart disease because

mycoprotein contains no | fat / carbohydrate / cholesterol | and

mycoprotein contains less | dietary fibre. / fat. / carbohydrate. |

(2 marks)

3 (a) (ii) A body-builder ate 4 kilograms of chicken each week to help him build up his muscles.

If he ate mycoprotein instead of chicken, he would need to eat about twice as much to have the same effect.

Use information from the table to give **one** reason why.

.....

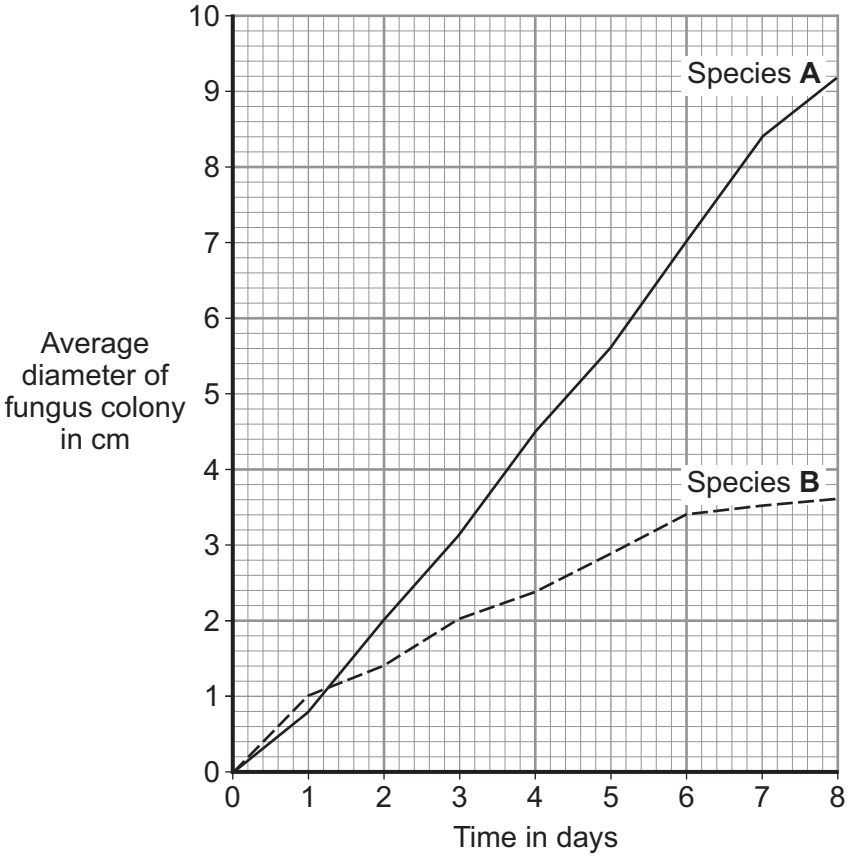
.....

(1 mark)

Do not write outside the box

3 (b) Scientists investigated the growth of two species, **A** and **B**, of the fungus *Fusarium.*
The scientists grew the fungus on agar jelly in Petri dishes.
They measured the diameter of a colony of each fungus every day for 8 days.

The graph shows the results.



3 (b) (i) Describe how the diameter of the colony of species **A** changed between day 0 and day 8.

.....

.....

.....

.....

(2 marks)

3 (b) (ii) Give **one** difference between the results for species **A** and the results for species **B**.

.....

.....

(1 mark)

Question 3 continues on the next page

Turn over ▶

Do not write outside the box

3 (c) Both Petri dishes contained the same nutrients.
Both Petri dishes were kept at 25 °C.

When *Fusarium* is grown in an industrial fermenter, other factors also need to be controlled.

Give **two** of these other factors.

1 .....

2 .....

(2 marks)

8

4 Muscles need energy during exercise.

Draw a ring around the correct answer in parts (a) and (b) to complete each sentence.

4 (a) (i) The substance stored in the muscles and used during exercise is

glycogen.

lactic acid.

protein.

(1 mark)

4 (a) (ii) The process that releases energy in muscles is

digestion.

respiration.

transpiration.

(1 mark)

Do not write outside the box

4 (b) The table shows how much energy is used by two men of different masses when swimming at different speeds.

Speed of swimming in metres per minute	Energy used in kJ per hour	
	34 kg man	**70 kg man**
25	651	1155
50	1134	2103

4 (b) (i) When the 34 kg man swims at 50 metres per minute instead of at 25 metres per minute,

the extra energy he uses each hour is

36 kJ.

483 kJ.

948 kJ.

(1 mark)

4 (b) (ii) When swimming at 50 metres per minute, each man's heart rate is faster than when swimming at 25 metres per minute.

A faster heart rate helps to supply the muscles with more

carbon dioxide.

glycogen.

oxygen.

(1 mark)

4 (b) (iii) During the exercise the arteries supplying the muscles would

constrict.

dilate.

pump harder.

(1 mark)

4 (c) When a person starts to swim, the breathing rate increases.

Give **one** way in which this increase helps the swimmer.

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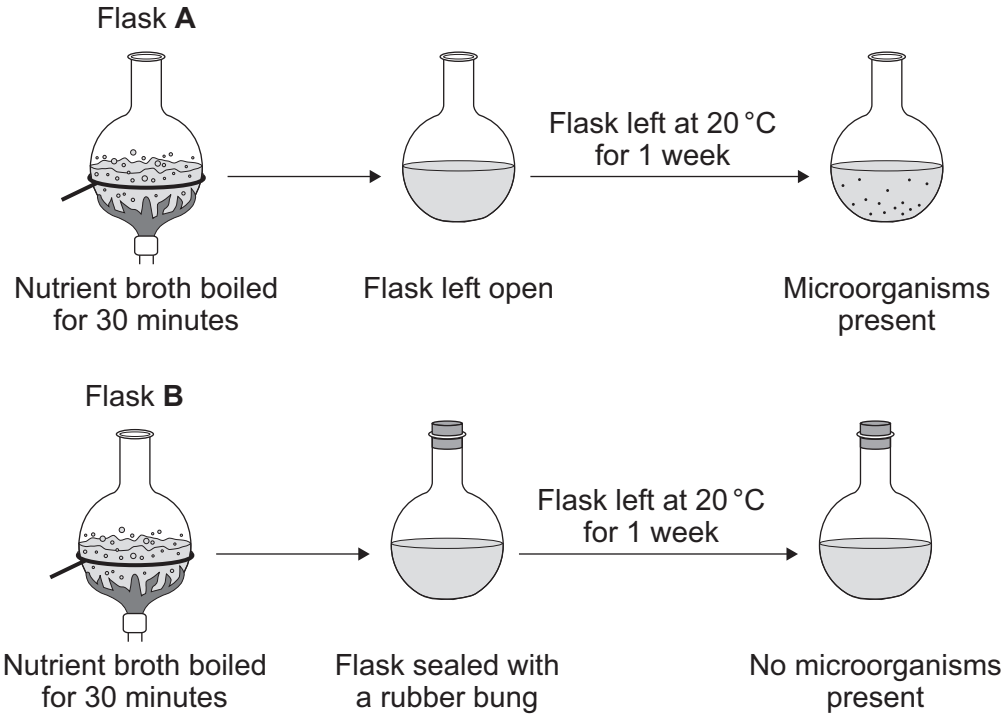
.....

(1 mark)

6

Do not write outside the box

5 The diagram shows how some students did an investigation.



5 (a) Each flask of nutrient broth was first boiled for 30 minutes.

Why?

.....

.....

(1 mark)

5 (b) Flask **A** and flask **B** were set up differently.

5 (b) (i) Describe the difference in the way in which flask **A** and flask **B** were set up.

.....

.....

(1 mark)

5 (b) (ii) Describe the difference in the results for flask **A** and flask **B** after one week.

.....

.....

(1 mark)

Do not write outside the box

5 (b) (iii) Suggest a reason for the difference in the results.

.....

.....

(1 mark)

5 (b) (iv) At the end of one week, the rubber bung was removed from flask **B**. Flask **B** was then left open at 20 °C for one more week.

What result would you expect?

.....

.....

(1 mark)

5 (c) The results of the investigation give evidence that supports the theory of biogenesis.

What is meant by *biogenesis*?

Tick (✓) **one** box.

The spontaneous generation of living organisms from non-living matter ☐

New species of organisms develop from an existing species ☐

Living organisms are produced only by other living organisms ☐

(1 mark)

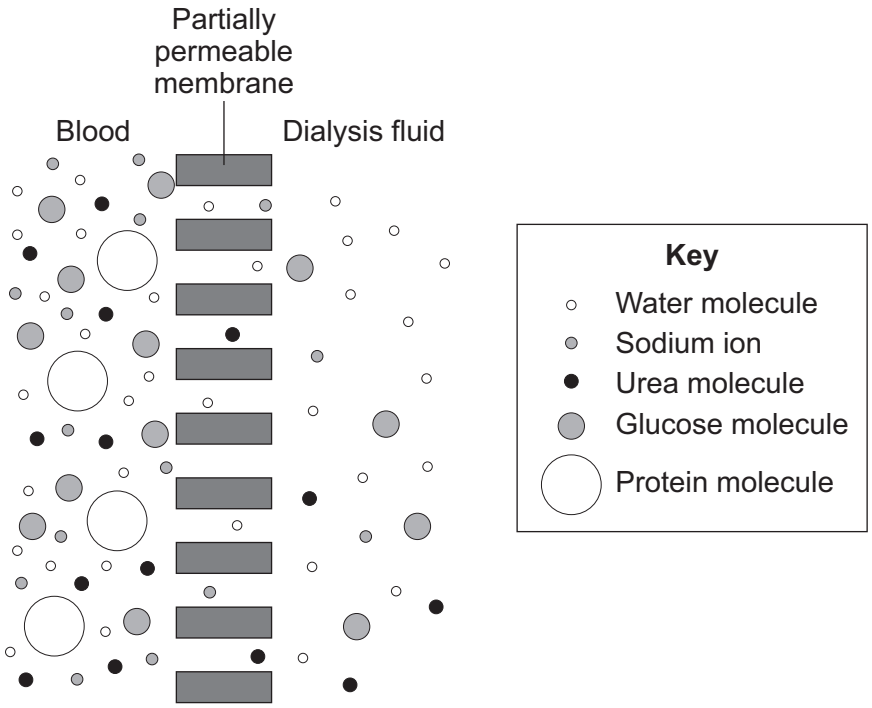
6

Turn over for the next question

Do not write outside the box

6 Dialysis can be used to treat a person with kidney disease.

The diagram shows blood and dialysis fluid separated by a partially permeable membrane.



Blood plasma and dialysis fluid contain several substances dissolved in water.

The table shows the concentrations of some of these substances in dialysis fluid and in the blood plasma of a person with kidney disease immediately before dialysis.

Substance	Concentration of substance in grams per dm^3	
	Blood plasma of person with kidney disease	Dialysis fluid
Sodium ions	3.26	3.15
Urea	0.45	0.00
Glucose	0.90	0.99
Protein	60.00	0.00

6 (a) Protein molecules are **not** able to move from the blood to the dialysis fluid.
Use information from the diagram to explain why.

.....

.....

(1 mark)

Do not write outside the box

6 (b) Urea molecules move from the blood into the dialysis fluid.

6 (b) (i) Give the name of this type of movement. .....

(1 mark)

6 (b) (ii) Why do the urea molecules move in this direction?

Use information from the table to help you to answer this question.

.....

.....

(1 mark)

6 (c) The concentration of sodium ions in the blood plasma will change during dialysis.

Suggest a value for the concentration of sodium ions in the plasma at the end of dialysis.

Use information from the table.

Concentration of sodium ions = ... grams per dm^3

(1 mark)

6 (d) For most patients a kidney transplant is better than continued treatment by dialysis.

6 (d) (i) Give **two** advantages of having a kidney transplant rather than treatment by dialysis.

1 .....

.....

2 .....

.....

(2 marks)

6 (d) (ii) Give **two** possible disadvantages of having a kidney transplant.

1 .....

.....

2 .....

.....

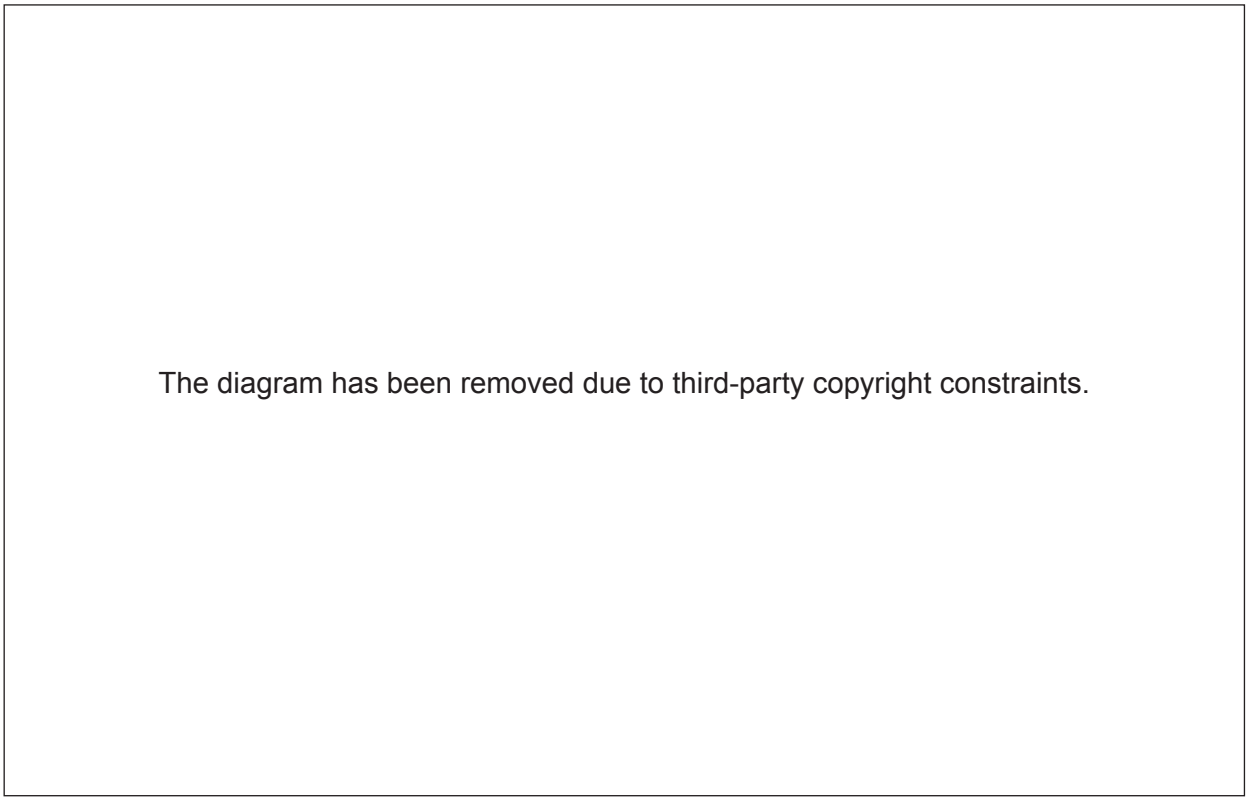
(2 marks)

8

Turn over ▶

Do not write outside the box

7 The diagram shows part of a biogas generator. Organic matter flows through the generator, as shown in the diagram.



7 (a) The table shows the composition of the biogas produced by this generator.

Gas	Percentage
Carbon dioxide	27.0
Water vapour	2.0
Hydrogen sulfide	0.5
Ammonia	0.5
Gas **X**	

7 (a) (i) Name gas **X**. .....

(1 mark)

Do not write outside the box

7 (a) (ii) Calculate the percentage of gas **X** in the biogas.

Show clearly how you work out your answer.

.....

.....

Percentage of gas **X** = ... %

(2 marks)

7 (b) (i) Some biogas is pumped back in at the base of the generator. This biogas moves around inside the generator, as shown by the arrows in the diagram.

The movement of the biogas makes the breakdown of the organic matter more efficient.

Suggest how.

.....

.....

(1 mark)

7 (b) (ii) Biogas is pumped into the generator rather than air.

Suggest **one** reason why.

.....

.....

(1 mark)

7 (c) The biogas generator is usually kept underground in a large tank of water. The water can be heated to keep the temperature at 35 °C.

Explain why the biogas generator is kept at 35 °C.

.....

.....

.....

.....

(2 marks)

7

END OF QUESTIONS

There are no questions printed on this page

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Version : 04/08/2011



General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2011 examination – June series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

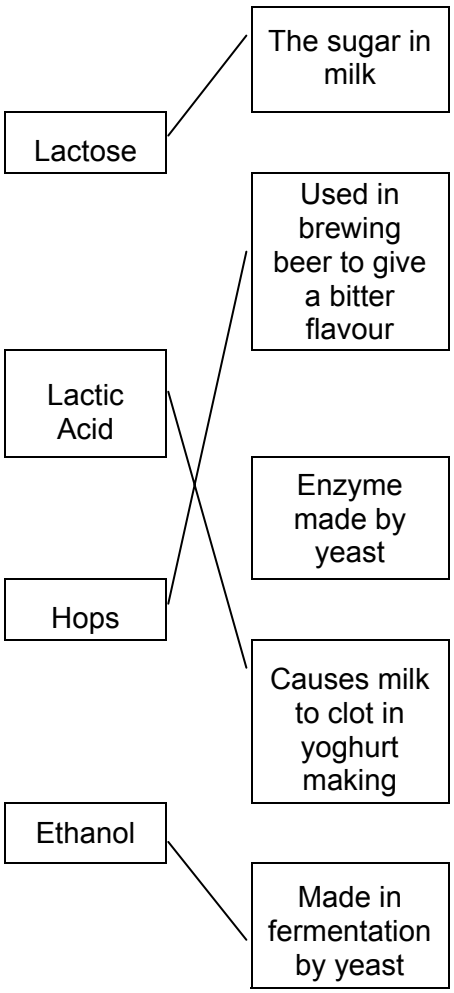
3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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BLY3F

Question 1

question	answers	extra information	mark
1		all four correct = **4** marks three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	4
Total			**4**

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BLY3F

Question 2

question	answers	extra information	mark
2(a)	guard cells		1
2(b)(i)	2.00 / 2.0 / 2		1
2(b)(ii)	0.05 or 1/20		1
2(b)(iii)	(Q has) large(r) surface area / more stomata / thinner cuticle / larger leaves	it = Q accept other sensible answers	1
2(b)(iv)	wind 30	extra box ticked cancels the mark	1
2(c)	wilting	extra ring drawn cancels the mark	1
Total			**6**

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BLY3F

Question 3

question	answers	extra information	mark
3(a)(i)	cholesterol fat	in this order	1 1
3(a)(ii)	mycoprotein has (approx) half amount of <u>protein</u> / has 11.8 (g) <u>protein</u> while chicken has 22.0 (g)	accept has less protein ignore less fat	1
3(b)(i)	increased (±) constant rate **or** (from 0) to 9.2 / by 9.2(cm) **or** about 1 cm a day **or** increase slower at the beginning and / or at the end		1 1
3(b)(ii)	species **A** grows faster / more than species **B** **or** species **A** has larger diameter **or** is bigger **or** the growth of species **B** slows down after 6 weeks	accept use of approximate figures	1
3(c)	any **two** from: • pH / acidity / alkalinity • (speed of) stirring • oxygen (concentration) / aeration • ion <u>concentration</u> / named eg $-NH_4^+$ • pressure	 ignore references to carbon dioxide / waste products ignore time in the fermenter ignore initial amount of Fusarium allow ammonia	2
Total			**8**

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BLY3F

Question 4

question	answers	extra information	mark
4(a)(i)	glycogen		1
4(a)(ii)	respiration		1
4(b)(i)	483 kJ		1
4(b)(ii)	oxygen		1
4(b)(iii)	dilate		1
4(c)	supplies more / a lot of oxygen **or** removes more carbon dioxide **or** release more energy / faster respiration		1
Total			**6**

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BLY3F

Question 5

question	answers	extra information	mark
5(a)	to kill microorganisms / to sterilise / to show that any microorganisms present at the end had appeared during the investigation	allow microbes / bacteria / fungi do **not** allow viruses / germs allow destroyed for kill do **not** allow get rid of or remove microbes	1
5(b)(i)	**B** is sealed / closed / covered / has (rubber) bung **or A** is left open		1
5(b)(ii)	**A** has microorganisms **or B** has no microorganisms	ignore **B** is clear ignore reasons given	1
5(b)(iii)	microorganisms <u>enter</u> (from the air) **or** microorganisms only <u>enter</u> if flask is left open	do **not** allow nothing can enter flask **B**	1
5(b)(iv)	microorganisms grow / appear / present	allow bacteria / microbes / fungi	1
5(c)	living organisms are produced only by other living organisms		1
Total			**6**

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BLY3F

Question 6

question	answers	extra information	mark
6(a)	(protein molecules too) big **or** larger than pore size	allow cannot fit through the pores / hole / gaps	1
6(b)(i)	diffusion		1
6(b)(ii)	high to low concentration **or** high concentration in blood, low concentration in dialysis fluid **or** down concentration gradient **or** correct use of numbers	ignore along gradient / across gradient allow there is none in dialysis fluid	1
6(c)	any value between 3.15 and 3.25 (inclusive)		1
6(d)(i)	any **two** from: • kidney works all the time **or** dialysis works for short time **or** dialysis needs regular trips to hospital / regular treatment / long term treatment • kidney maintains correct concentration all the time **or** no build-up as between dialysis sessions • no need to regulate diet **or** correct example – eg low salt / low protein / low fluid intake as with dialysis • cheaper in the long term	ignore enables an active life accept kidney transplant is one off treatment	2

Question 6 continues on the next page . . .

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BLY3F

Question 6 continued . . .

question	answers	extra information	mark
6(d)(ii)	any **two** from: • rejection / described **or** need to use immunosuppressants **or** need to take drugs for life • susceptible to other infections • hazards of operation / anaesthetic • shortage of donors / match • high initial cost	allow may need later replacement	2
Total			**8**

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BLY3F
Question 7

question	answers	extra information	mark
7(a)(i)	methane	accept CH_4 / CH4 ignore CH^4 / Ch_4 / Ch^4	1
7(a)(ii)	70	correct answer with or without working if answer is incorrect **or** no answer 100 – (27 + 2 + 0.5 + 0.5) gains **1** mark	2
7(b)(i)	allows (better) mixing of microorganisms and organic matter **or** to maintain temperature for enzyme action / chemical reaction / microorganisms	accept allows microorganisms to get at organic matter	1
7(b)(ii)	any **one** from: • need anaerobic conditions / respiration • prevent aerobic respiration • biogas made in absence of O_2 / air • less methane would be made with air • more CO_2 would be made with air	accept biogas made by fermentation	1
7(c)	best / optimum temperature for named process (in microorganisms) eg growth / reproduction / digestion / respiration / chemical / enzyme reactions / decomposition / breakdown of organic matter causes high (rate of) biogas production		1 1
Total			**7**

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2011

Biology

BLY3F

Unit Biology B3

F

Written Paper

Thursday 13 January 2011 9.00 am to 9.45 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

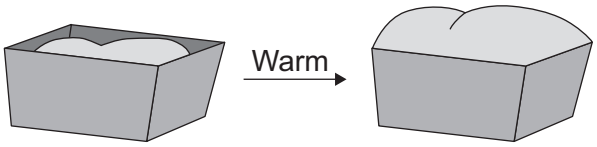
Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

Answer **all** questions in the spaces provided.

1 Yeast produces a gas. This gas makes bread dough rise.



Bread dough

1 (a) Draw a ring around the correct answer to complete each sentence.

1 (a) (i) The gas that makes bread dough rise is

carbon dioxide.

methane.

oxygen.

(1 mark)

1 (a) (ii) The process which produces this gas is called

biogenesis.

fermentation.

malting.

(1 mark)

Do not write outside the box

1 (b) The table shows the effect of temperature on how quickly bread dough rises.

Temperature in °C	Rate of rising in arbitrary units
10	0.14
15	0.41
20	1.00
25	1.73
30	1.50
35	0.00

At which temperature did the bread dough rise fastest? ..... °C

(1 mark)

3

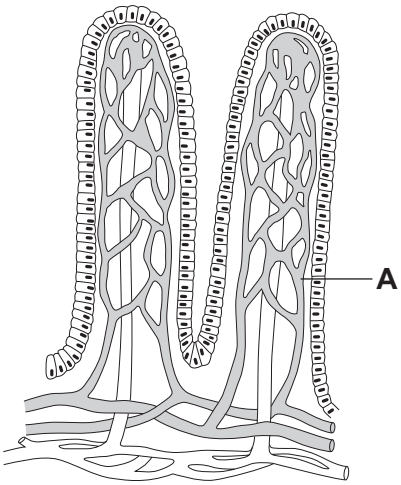
Turn over for the next question

Do not write outside the box

2 Villi are found in some parts of the digestive system.

Diagram 1 shows two villi.

Diagram 1



2 (a) Draw a ring around the correct answer to complete each sentence.

2 (a) (i) Structure **A** is a

muscle.

nerve.

capillary.

(1 mark)

2 (a) (ii) The villi absorb the products of digestion by

dialysis.

diffusion.

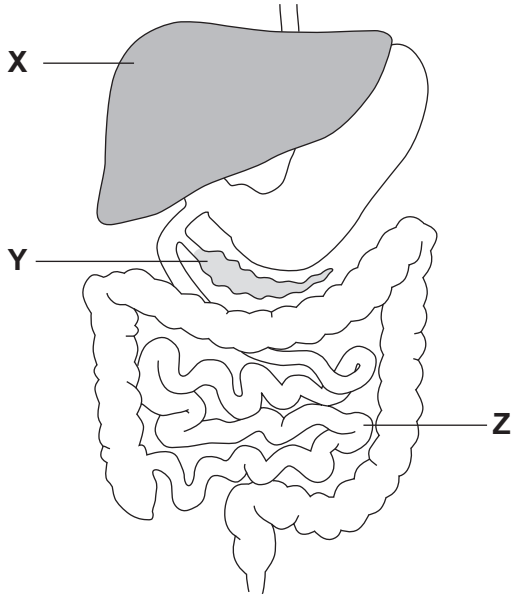
osmosis.

(1 mark)

Do not write outside the box

2 (b) **Diagram 2** shows the digestive system.

Diagram 2



2 (b) (i) In which part of the digestive system, **X**, **Y** or **Z**, are most villi found?

(1 mark)

2 (b) (ii) There are about 2000 villi in each cm^2 of this part of the digestive system.

Why is it helpful to have lots of villi?

.....

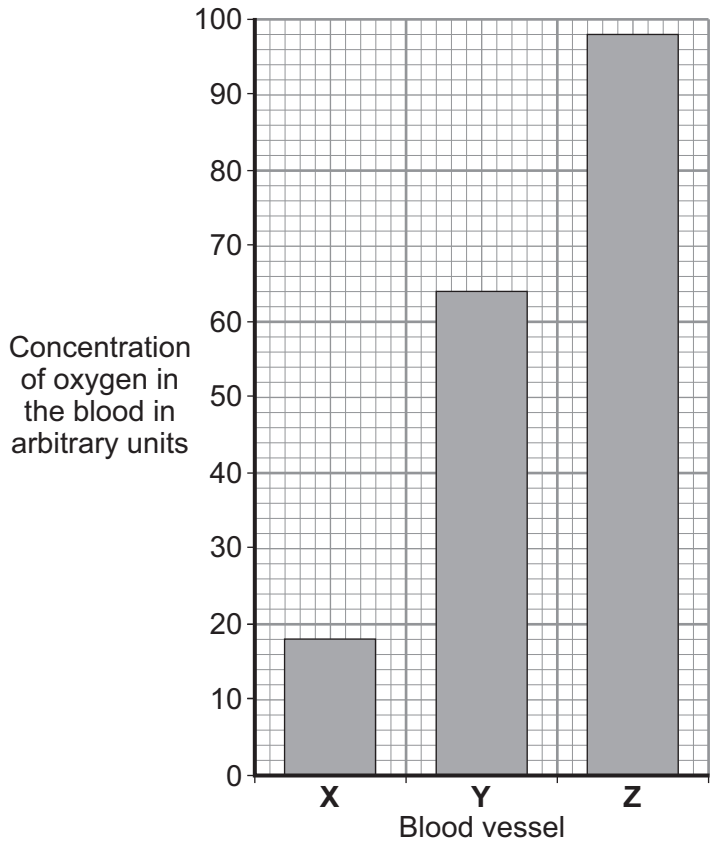
.....

(1 mark)

4

Do not write outside the box

3 The bar chart shows the concentration of oxygen in the blood in three different blood vessels, **X**, **Y** and **Z**.



3 (a) (i) What is the concentration of oxygen in blood vessel **X**?

Answer ..... arbitrary units.
(1 mark)

3 (a) (ii) Which blood vessel, **X**, **Y** or **Z**, carries blood from the lungs to the heart? ☐

(1 mark)

Do not write outside the box

3 (b) Draw a ring around the correct answer to complete each sentence.

3 (b) (i) Most of the oxygen in the blood is carried by the

plasma.

red blood cells.

white blood cells.

(1 mark)

3 (b) (ii) Oxygen combines with a coloured pigment in the blood.

This coloured pigment is called

alveoli.

haemoglobin.

lactic acid.

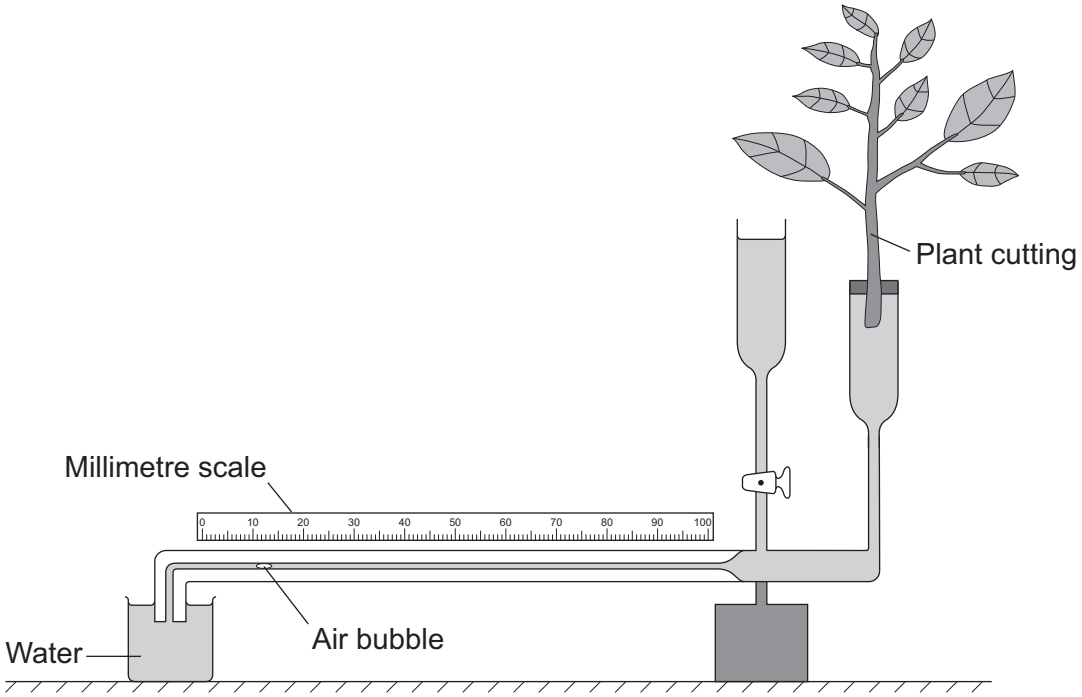
(1 mark)

4

Turn over for the next question

Do not write outside the box

4 Some students used the apparatus shown in the diagram to measure the rate of water uptake by a plant cutting.



The students set up the apparatus in three different conditions:

- no wind at 15°C
- no wind at 25°C
- wind at 25°C

For each experiment, the students recorded the movement of the air bubble along the scale.

4 (a) (i) Name the **two** variables that the students chose to change in these experiments.

1 .....

2 .....

(2 marks)

4 (a) (ii) It was important to use the same plant cutting each time to make these experiments fair.

Explain why.

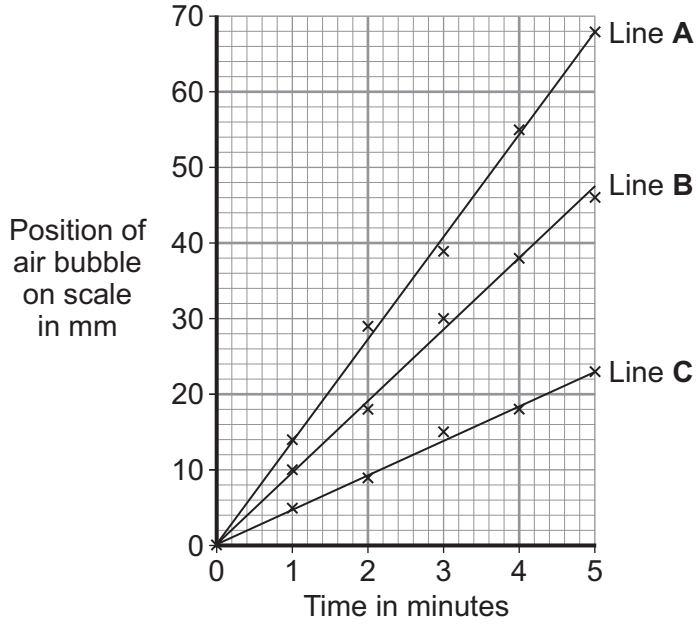
.....

.....

(1 mark)

Do not write outside the box

4 (b) The graph shows the students' results.



Which line on the graph, **A**, **B** or **C**, shows the results for each of the three different experiments?

Write each of the letters **A**, **B** or **C** in the correct boxes in the table.

Condition	Letter
No wind at 15°C	
No wind at 25°C	
Wind at 25°C	

(2 marks)

4 (c) Water is lost from the leaves of the plant cutting.

Name this process.

Draw a ring around **one** answer.

distillation **respiration** **transpiration**

(1 mark)

6

Do not write outside the box

5 (a) Urine contains mineral ions, and other substances, dissolved in water.

What effect will each of the activities in **Table 1** have on the concentration of mineral ions in the urine?

Use words from the box to complete **Table 1**.

increase	**decrease**	**stay the same**

Table 1

Activity	Concentration of mineral ions in urine
Drinking a large bottle of water	
Eating salty foods such as potato crisps	

(2 marks)

5 (b) A person with kidney disease may be treated by having a kidney transplant.

Table 2 shows the effect of a person's age on the success of a kidney transplant.

Table 2

	Age of patient	
	50–59 years	**Over 60 years**
Percentage of kidneys rejected	38	23
Percentage of kidneys which continued to work for at least 5 years	82	87
Percentage of patients who survived for at least 10 years	82	76

Do not write outside the box

Some doctors think that people over 60 years of age should not be given transplants.

From the data in the table, do you agree with these doctors?

Draw a ring around your answer. **Yes / No**

Give **two** reasons for your answer.

1 .....

.....

2 .....

.....

(2 marks)

4

Turn over for the next question

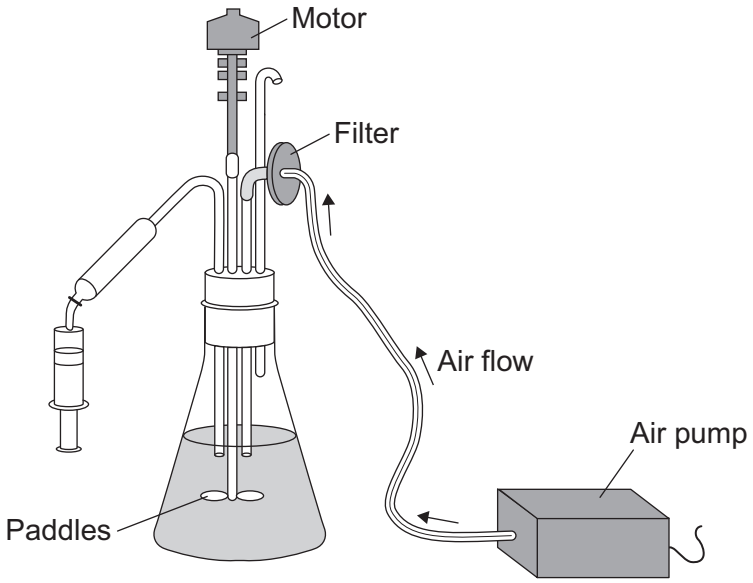
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ANSWER IN THE SPACES PROVIDED

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6 The diagram shows a simple laboratory fermenter.



Some students grew the fungus *Fusarium* in this fermenter.
After 5 days the students measured the dry mass of the *Fusarium*.

6 (a) **List A** gives the names of three pieces of apparatus in the diagram.
List B gives four possible functions of these pieces of apparatus.

Draw **one** line from each piece of apparatus in **List A** to its correct function in **List B**.

List A **Apparatus**	**List B** **Function**
	To stop microorganisms entering the flask
Air pump	
	To allow gases to escape from the flask
Filter	
	To supply oxygen to the fungus
Paddles	
	To keep the contents well mixed

(3 marks)

Question 6 continues on the next page

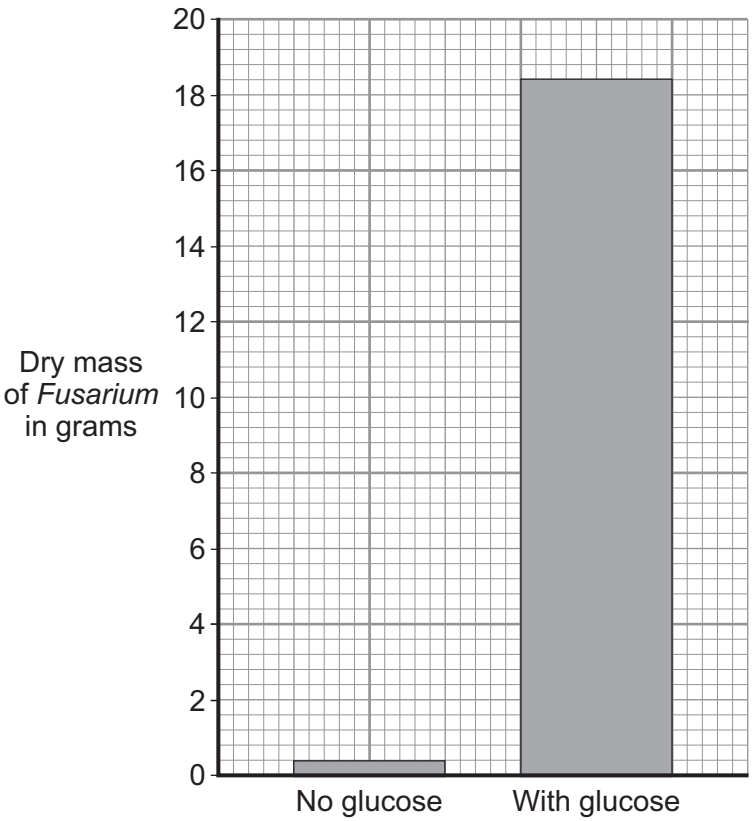
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6 (b) The students grew the *Fusarium* in a culture solution of minerals dissolved in water.

The students repeated the experiment with the same concentration of minerals, but this time they also added glucose.

The bar chart shows the effect of adding glucose to the culture solution.



6 (b) (i) Describe, in detail, the effect of adding glucose to the culture solution.

.....

.....

.....

.....

(2 marks)

6 (b) (ii) Suggest an explanation for the effect of adding glucose.

.....

.....

(1 mark)

Do not write outside the box

6 (c) The students repeated the investigation four more times. They used the culture solution with added glucose but each time they left out one of the minerals.

Their results are given in the table.

Mineral left out of the culture solution	Dry mass of *Fusarium* in grams
Calcium	18.50
Iron	16.80
Magnesium	1.90
Potassium	10.80

Which mineral is most important for the growth of *Fusarium*?

Draw a ring around **one** answer.

calcium **iron** **magnesium** **potassium**

(1 mark)

6 (d) Draw a ring around the correct answer to complete the sentence.

In industry, *Fusarium* is usually grown to make

alcohol.

biogas.

mycoprotein.

(1 mark)

8

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Do not write outside the box

7 The table shows the volume of blood flowing through different organs at three levels of exercise.

Organ(s)	Volume of blood flowing through organ(s) in cm^3 per minute		
	Light exercise	**Moderate exercise**	**Heavy exercise**
Gut	1 100	600	300
Kidneys	900	600	250
Brain	750	750	750
Heart muscles	350	750	1 000
Skeletal muscles	4 500	12 500	22 000
Skin	1 500	1 900	600
Other	400	500	100
Total	**9 500**	**17 600**	**25 000**

7 (a) (i) Which organ has a constant flow of blood through it?

.....

(1 mark)

7 (a) (ii) Which organ has the greatest reduction in the volume of blood supplied during heavy exercise compared with light exercise?

.....

(1 mark)

7 (a) (iii) What proportion of the blood flows through the heart muscle during heavy exercise?

.....

(1 mark)

Do not write outside the box

7 (b) The volume of blood flowing through the skeletal muscles increases greatly during exercise.

Give **two** ways in which the body brings about this increase.

1 .....

.....

2 .....

.....

(2 marks)

7 (c) During exercise, the concentration of carbon dioxide in the blood increases.

Explain what causes this increase.

.....

.....

.....

.....

.....

.....

(3 marks)

8

Turn over for the next question

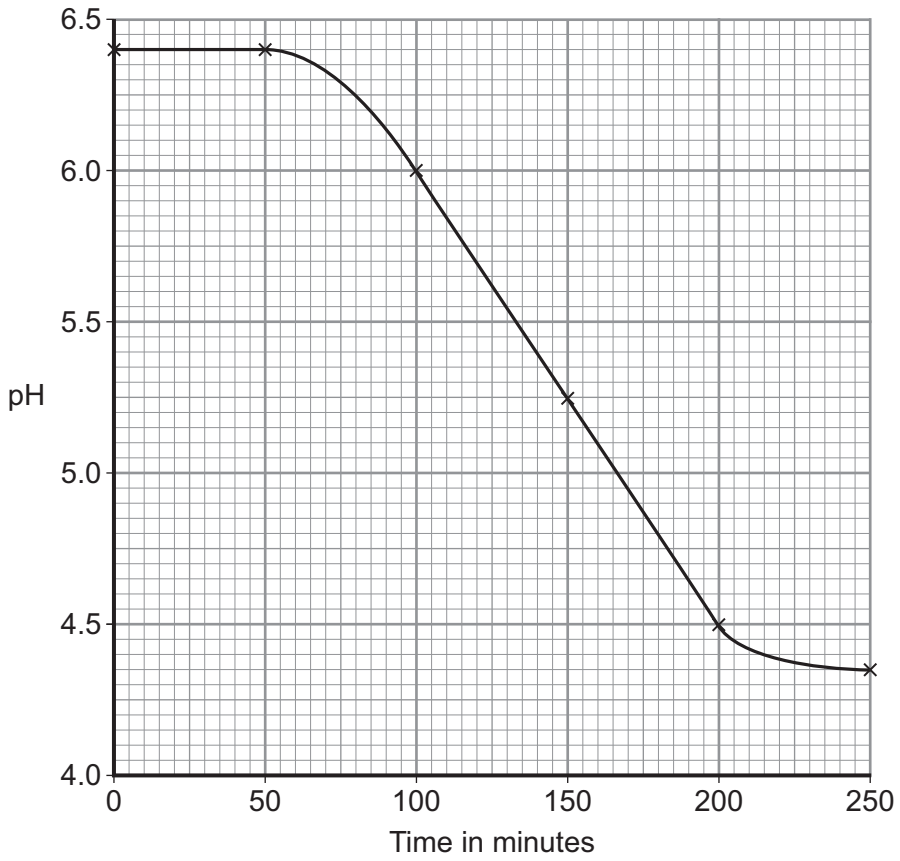
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8 A student investigated the production of yoghurt.

The student:

- boiled 200 cm^3 of milk in a flask for 10 minutes
- let the milk cool to room temperature
- then added 20 cm^3 of 'yoghurt starter culture' (plain yoghurt which contains living bacteria)
- put the flask in a water bath at room temperature
- measured the pH of the yoghurt every 50 minutes.

The results are shown in the graph.



8 (a) The milk was boiled for 10 minutes before it was used.

Explain why this was necessary.

.....

.....

(1 mark)

Do not write outside the box

8 (b) (i) Use information from the graph to calculate the rate of fall in pH between 100 and 200 minutes.

Show clearly how you work out your answer.

.....

.....

.....

Answer = ... pH units per minute

(2 marks)

8 (b) (ii) Suggest **one** reason why the rate of fall in pH slowed down after 200 minutes.

.....

.....

(1 mark)

8 (c) What substance causes the yoghurt to thicken after 200 minutes?

.....

.....

(2 marks)

8 (d) The yoghurt would have been produced more quickly at 35 °C.

8 (d) (i) What is the maximum temperature at which bacteria should be grown in a school laboratory?

..... °C

(1 mark)

8 (d) (ii) It is **not** safe to grow bacteria at 35 °C in a school laboratory.

Explain why.

.....

.....

(1 mark)

8

END OF QUESTIONS

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Version : 28/02/2011



General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2011 examination – January series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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Question 1

question	answers	extra information	mark
1(a)(i)	carbon dioxide		1
1(a)(ii)	fermentation		1
1(b)	25		1
Total			**3**

BLY3F

Question 2

question	answers	extra information	mark
2(a)(i)	capillary		1
2(a)(ii)	diffusion		1
2(b)(i)	Z	ignore any names	1
2(b)(ii)	large / increased surface / area / **or** to absorb <u>more</u> food **or** improved diffusion	allow all food absorbed	1
Total			**4**

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Question 3

question	answers	extra information	mark
3(a)(i)	18		1
3(a)(ii)	Z		1
3(b)(i)	red blood cells		1
3(b)(ii)	haemoglobin		1
Total			**4**

BLY3F

Question 4

question	answers	extra information	mark
4(a)(i)	wind temperature	answers in either order ignore weather	1 1
4(a)(ii)	different plants have different sizes / different numbers of leaves / different sizes of leaves / different plants take up different amounts of water	ignore reference to validity allow different plants need different amounts of water	1
4(b)	in table, in sequence: C B A	 all 3 correct = **2** marks 2 correct = **1** mark 0 **or** 1 correct = **0** mark	max 2
4(c)	transpiration		1
Total			**6**

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BLY3F

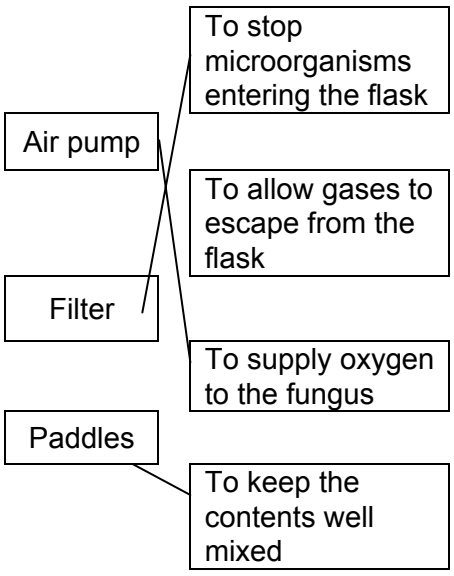
Question 5

question	answers	extra information	mark
5(a)	in table, in sequence: decrease increase	allow descriptions for increase / decrease	 1 1
5(b)	**No** older have lower % / less chance of rejection (than younger) older have higher % / more chance of still working (after 5 years than younger) **or** **Yes** older have lower % / less chance of surviving (at least 10 years than younger) (1)	 allow figures allow figures allow in older patients kidney works for longer allow max **1** mark if Yes allow older people are more likely to die	 1 1
Total			**4**

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Question 6

question	answers	extra information	mark
6(a)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	3
6(b)(i)	increased growth **or** increased (dry) mass correct use of numbers eg by 18 (grams) / by 46 times		1 1
6(b)(ii)	glucose supplies energy / materials (for growth) **or** glucose can be used in respiration	ignore glucose provides food	1
6(c)	magnesium		1
6(d)	mycoprotein		1
Total			**8**

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Question 7

question	answers	extra information	mark
7(a)(i)	brain		1
7(a)(ii)	skin		1
7(a)(iii)	1/25 **or** 4% **or** 0.04 **or** 1 in 25 **or** 1:25 **or** 1 out of 25	allow $\frac{1000}{25000}$	1
7(b)	any **two** from: • increased / high heart rate / pulse rate • dilation / widening of <u>arteries / arterioles</u> (to skeletal muscles) **or** less blood flow to other organs • increased stroke volume / described	do **not** allow pumps more blood unqualified accept vasodilation unqualified do **not** accept reference to veins / capillaries	2
7(c)	<u>more</u> respiration / description **or** <u>more</u> energy required **or** to provide <u>more</u> energy	ignore references to breathing	1
	respiration / process described → CO_2	do **not** accept anaerobic respiration	1
	CO_2 <u>diffuses</u> into blood		1
Total			**8**

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BLY3F

Question 8

question	answers	extra information	mark
8(a)	to kill (other) (micro) organisms (in the milk) / to sterilise	allow germs ignore viruses allow destroy ignore pasteurise	1
8(b)(i)	0.015	award **2** marks for correct answer irrespective of working allow answer or use of 1.5 for **1** mark allow **1** mark for $\frac{(y_1 - y_2)}{100}$ but incorrect answer y-values may be incorrect **or** use of 6.0 **and** 4.5 but incorrect answer	2
8(b)(ii)	running out of substrate / sugar / food **or** (acid / low pH) denatures enzymes / proteins / kills bacteria	accept stops / slows enzymes / metabolism allow (acid / low pH) stops / slows bacteria working / growing	1
8(c)	lactic acid	 if incorrect acid allow **1** mark	1 1
8(d)(i)	25		1
8(d)(ii)	pathogens / harmful bacteria (might) grow (at 35 °C)	do **not** accept viruses	1
Total			**8**

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
June 2010

Biology

BLY3F

Unit Biology B3

F

Written Paper

Friday 21 May 2010 9.00 am to 9.45 am

You will need no other materials.
You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

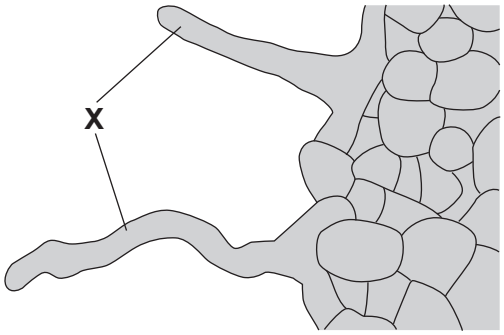
Advice
- In all calculations, show clearly how you work out your answer.

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Answer **all** questions in the spaces provided.

1 The diagram shows part of a plant root. A large number of structures like the ones labelled **X** grow out of the surface of the root.



1 (a) (i) What is the name of structure **X**?

Draw a ring around **one** answer.

root hair **stoma** **villus**

(1 mark)

1 (a) (ii) Name **two** substances which structure **X** absorbs from the soil.

1 .....

2 .....

(2 marks)

Do not write outside the box

1 (b) The substances in (a)(ii) are transported from the roots to the leaves. Carbon dioxide also enters the leaves.

Draw a ring round the correct answer to complete each sentence.

1 (b) (i) Carbon dioxide enters leaves through

alveoli.

stomata.

villi.

(1 mark)

1 (b) (ii) Carbon dioxide enters leaf cells by

active transport.

diffusion.

reabsorption.

(1 mark)

5

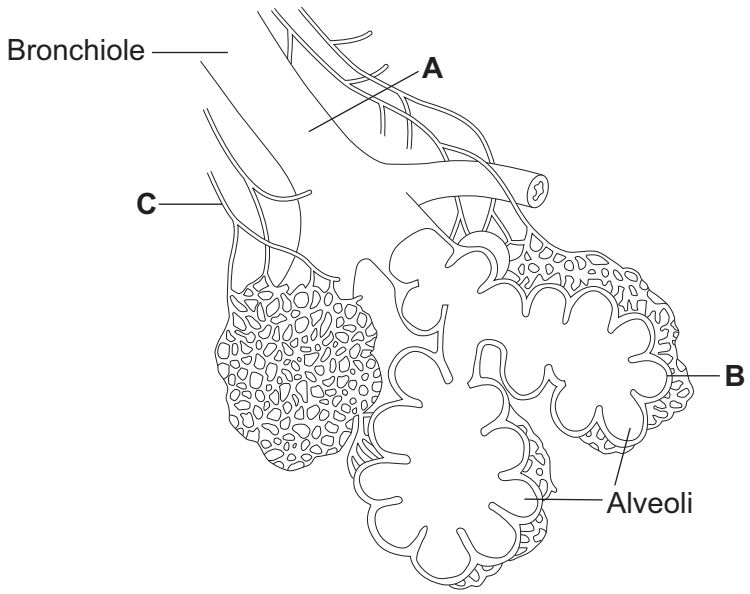
Turn over for the next question

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2 People with asthma sometimes find it difficult to breathe.

Diagram 1 shows part of a human lung. Bronchioles are tubes that carry air to the alveoli.

Diagram 1

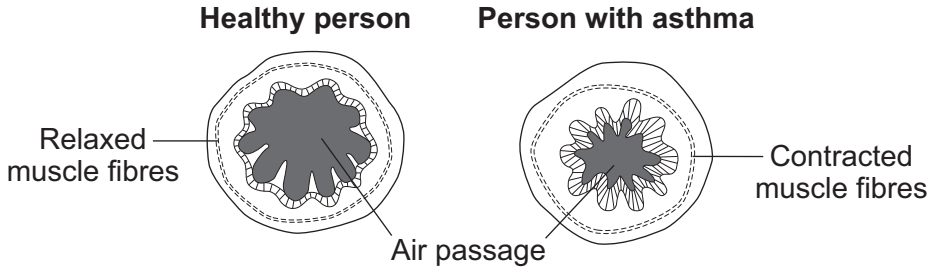


2 (a) Which letter, **A**, **B** or **C**, shows where oxygen enters the blood? ☐

(1 mark)

2 (b) **Diagram 2** shows a section through a bronchiole of a healthy person and of a person suffering from asthma.

Diagram 2



The person with asthma may find it difficult to breathe.

Use information from **Diagram 2** to give the reason for this.

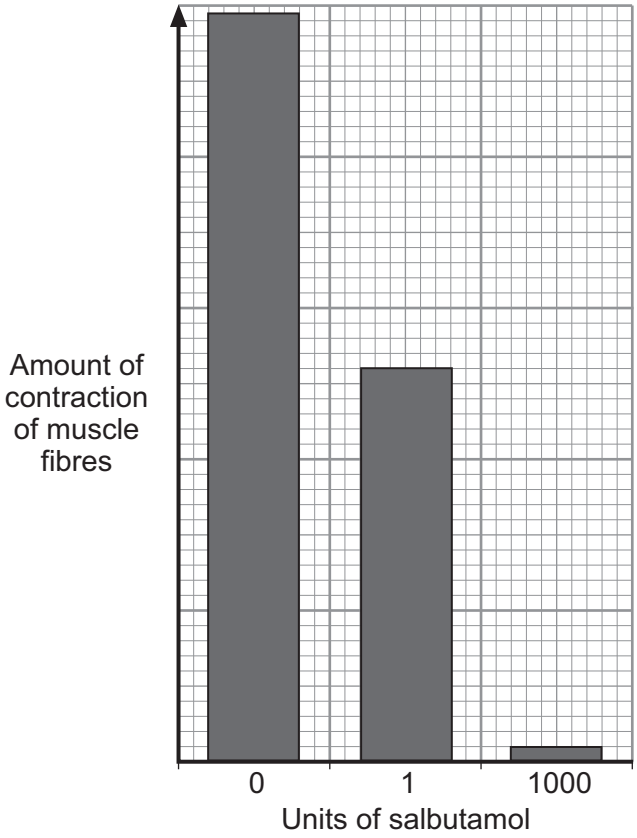
.....

.....

(1 mark)

Do not write outside the box

2 (c) A person has asthma. The bar graph shows the effect of the drug salbutamol on the contraction of the muscle fibres in the wall of this person's bronchioles.



2 (c) (i) Describe the effect of salbutamol on the person's muscle fibres.

.....

.....

(1 mark)

2 (c) (ii) How does salbutamol help this person?

.....

.....

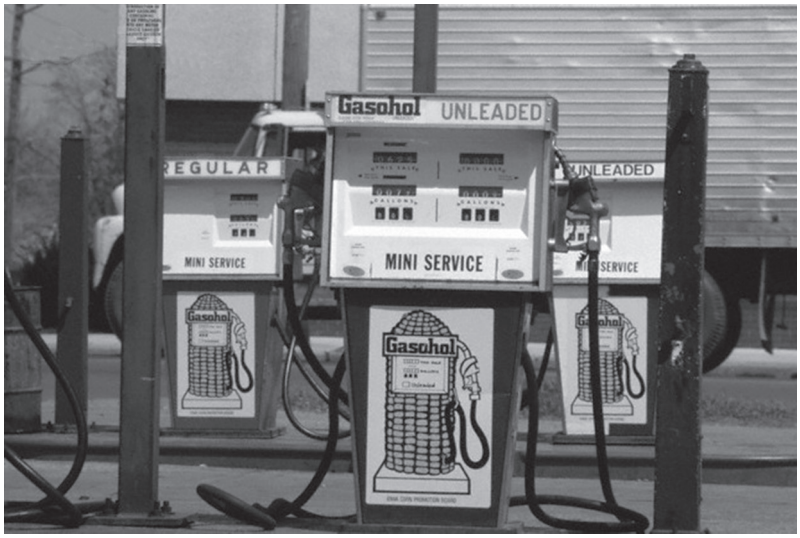
(1 mark)

4

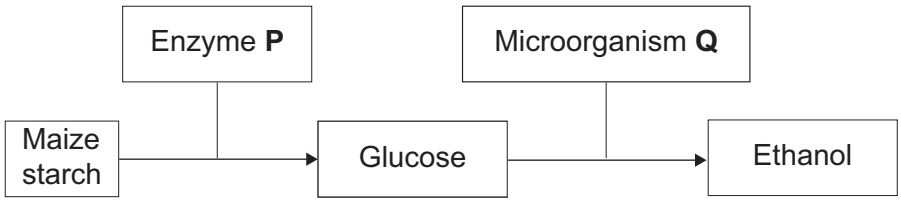
Turn over ▶

Do not write outside the box

3 Ethanol (alcohol) can be mixed with petrol to make gasohol.
The photograph shows three gasohol pumps at a service station.



The flowchart shows one way of manufacturing ethanol.



3 (a) Draw a ring around the correct answer to each question.

3 (a) (i) Enzyme **P** changes starch into glucose.

What type of enzyme is **P**?

carbohydrase **lipase** **protease**

(1 mark)

3 (a) (ii) Microorganism **Q** changes glucose into ethanol.

What type of microorganism is **Q**?

bacterium **mould** **yeast**

(1 mark)

Do not write outside the box

3 (a) (iii) The ethanol produced by microorganism **Q** is contaminated with water.

Ethanol is separated from the mixture by

distillation **fermentation** **filtration**

(1 mark)

3 (b) In the long term, it may be better to use ethanol made from maize crops as a fuel for cars rather than petrol.

Explain why.

.....

.....

.....

.....

.....

(2 marks)

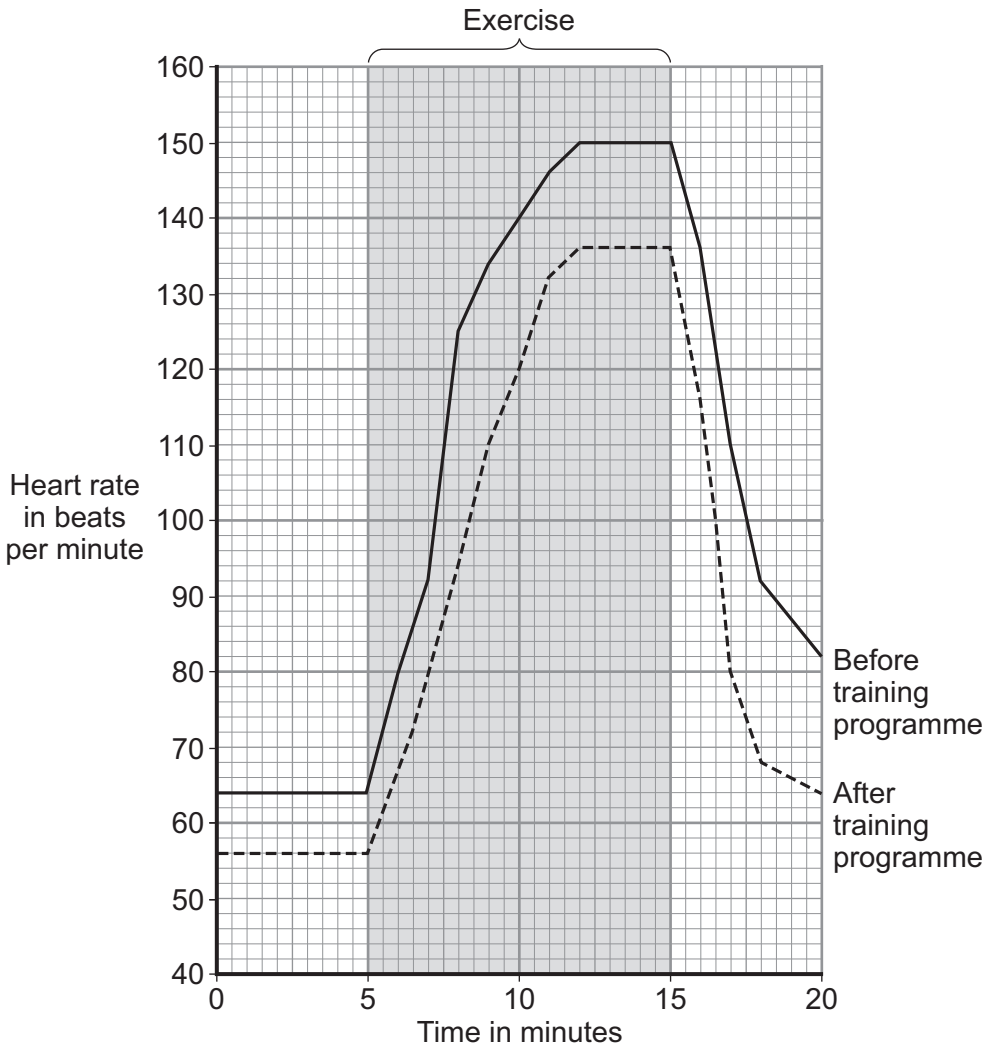
5

Turn over for the next question

Do not write outside the box

4 An athlete did a 6-month training programme.

The graph shows the effect of the same amount of exercise on his heart rate before and after the training programme.



4 (a) (i) What was the maximum heart rate of the athlete during exercise before the training programme?

..... beats per minute
(1 mark)

Do not write outside the box

4 (a) (ii) Give **two** differences between the heart rate of the athlete before and after the training programme.

After the training programme

Difference 1 .....

.....

Difference 2 .....

.....

(2 marks)

4 (b) Which **two** substances need to be supplied to the muscles in larger amounts during exercise?

Tick (✓) **two** boxes.

Carbon dioxide ☐

Glucose ☐

Lactic acid ☐

Oxygen ☐

Urea ☐

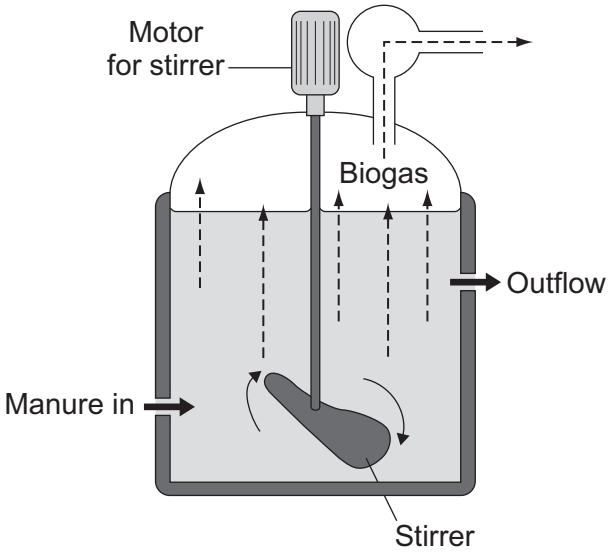
(2 marks)

5

Turn over for the next question

Do not write outside the box

5 The diagram shows one type of biogas generator.



5 (a) With this type of biogas generator, the concentration of solids fed into the reactor must be kept very low.

Suggest **one** reason for this.

Tick (✓) **one** box.

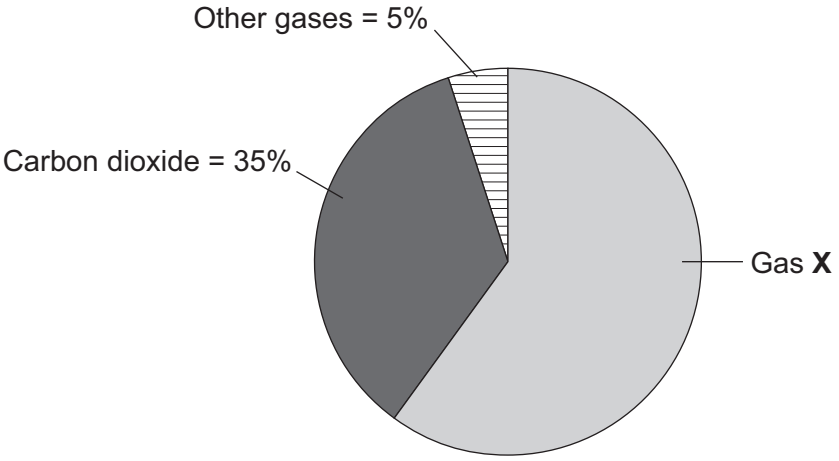
A higher concentration contains too little oxygen. ☐

A higher concentration would be difficult to stir. ☐

A higher concentration contains too much carbon dioxide. ☐

(1 mark)

5 (b) The pie chart shows the percentages of the different gases found in this biogas.



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Do not write outside the box

Gas **X** is the main fuel gas found in this biogas.

5 (b) (i) What is the name of gas **X**?

Draw a ring around **one** answer.

methane **nitrogen** **oxygen**

(1 mark)

5 (b) (ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

.....

.....

.....

Percentage of gas **X** = ...

(2 marks)

5 (c) If the biogas generator is not airtight, the biogas will contain a much higher percentage of carbon dioxide.

Draw a ring around the correct answer to complete each sentence.

5 (c) (i) The air that leaks in will increase the rate of

aerobic respiration.
anaerobic respiration.
fermentation.

(1 mark)

5 (c) (ii) The process in part (c)(i) occurs because the air contains

ammonia.
nitrogen.
oxygen.

(1 mark)

6

Do not write outside the box

6 The table shows the concentrations of some substances in the blood plasma, kidney filtrate and urine of one person.

Substance	Concentration in grams per dm^3		
	Plasma	**Filtrate**	**Urine**
Protein	78.0	0.0	0.0
Glucose	0.8	0.8	0.0
Urea	0.3	0.3	20.0
Sodium ions	2.8	2.8	3.5

6 (a) Draw a ring around the correct answer to complete each sentence.

6 (a) (i) Protein is **not** found in the filtrate.

This is because protein molecules are

too large to pass through the filter.

used up in respiration.

reabsorbed into the blood.

(1 mark)

6 (a) (ii) Glucose is found in the filtrate but **not** in the urine.

This is because glucose is

too large to pass through the filter.

used up in respiration.

passed through the filter, then reabsorbed into the blood.

(1 mark)

Do not write outside the box

6 (a) (iii) The concentration of urea is much higher in the urine than in the filtrate.

This is because

- urea is made by the kidney.
- water is reabsorbed from the filtrate into the blood.
- glucose and salts are reabsorbed from the filtrate into the blood.

(1 mark)

6 (a) (iv) The fluid entering the bladder

will contain

- water, protein, glucose, urea and sodium ions.
- water, urea and sodium ions.
- water, glucose, urea and sodium ions.

(1 mark)

6 (b) An athlete ran a 10-kilometre race on a cold day. He then ran the same race on a hot day. He ate and drank the same on each day.

Draw a ring round the correct answer to complete each sentence.

6 (b) (i) On the **hot** day this athlete will produce

- more urine.
- less urine.
- the same amount of urine.

(1 mark)

6 (b) (ii) On the **hot** day the athlete's urine will be

- more concentrated.
- less concentrated.
- the same concentration.

(1 mark)

6

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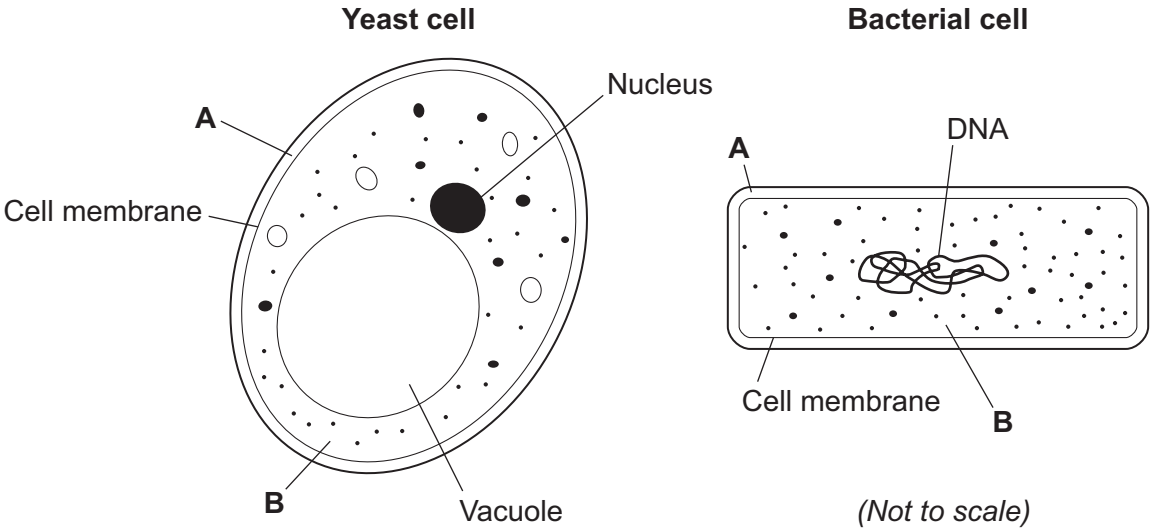
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ANSWER IN THE SPACES PROVIDED

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7 Sourdough bread is light in texture and tastes slightly sour. It is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. This acid makes the bread taste sour.

7 (a) The diagrams show the structures of the yeast cell and the bacterial cell.



7 (a) (i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

A .....

B .....

(2 marks)

7 (a) (ii) The yeast cell and the bacterial cell have different shapes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

.....

.....

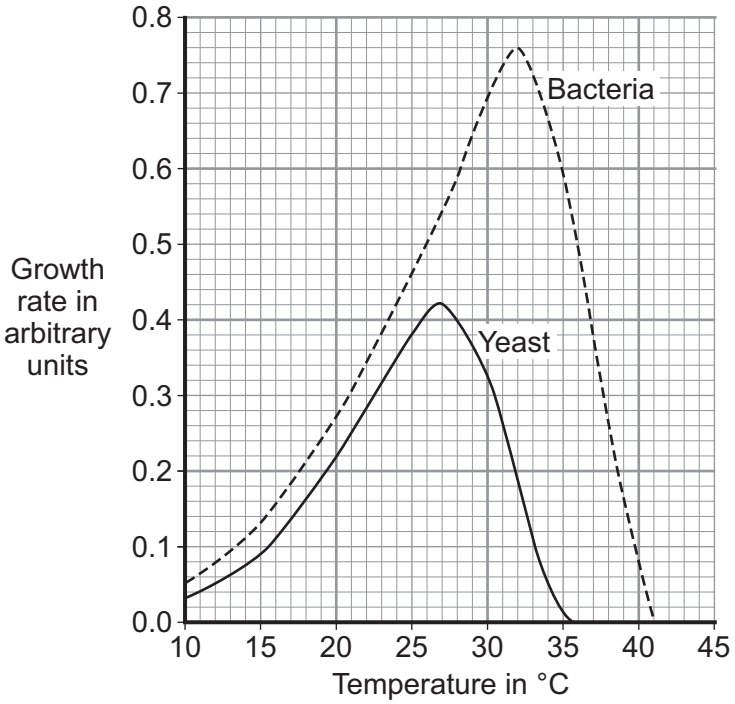
(1 mark)

Question 7 continues on the next page

Turn over ▶

Do not write outside the box

7 (b) The graph shows how the growth rates of the yeast and the bacteria change with temperature.



7 (b) (i) Sourdough bread rises fastest at 27 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

7 (b) (ii) The bread has a sourer taste if it rises at 32 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

Do not write outside the box

7 (b) (iii) The growth rate of the yeast is unaffected by pH in the range 3.5 to 7.0 pH units.

Why is this useful in the production of sourdough bread?

.....

.....

(1 mark)

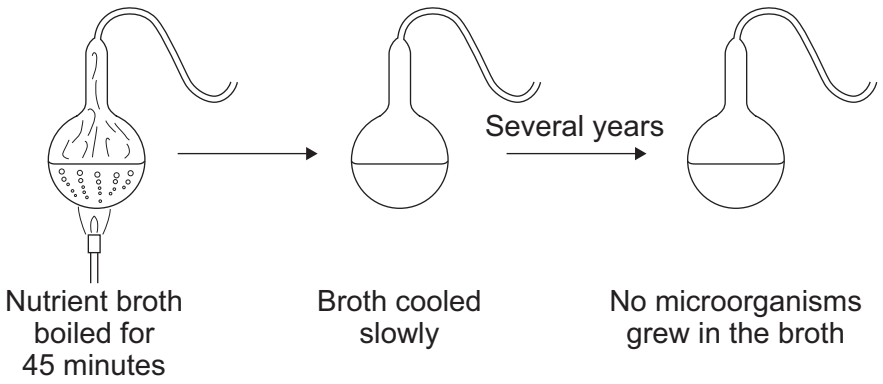
8

Turn over for the next question

Do not write outside the box

8 **Diagram 1** shows some details of an investigation carried out by Louis Pasteur.

Diagram 1



8 (a) (i) Why did Pasteur boil the nutrient broth?

.....

.....

(1 mark)

8 (a) (ii) Because of the shape of the flask, no microorganisms grew even after several years.

Explain why.

.....

.....

(1 mark)

8 (b) Pasteur repeated the investigation several times.

Why is it useful to repeat a scientific investigation several times?

.....

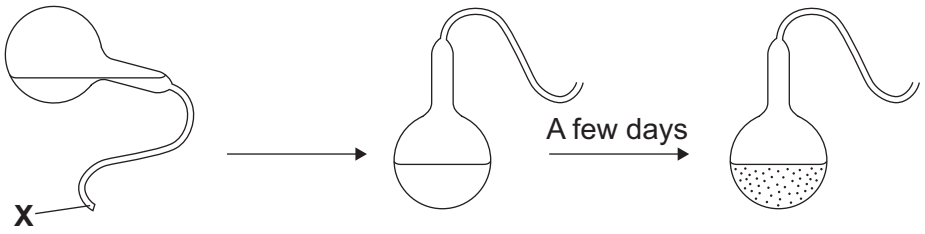
.....

(1 mark)

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8 (c) After several years, some of Pasteur's flasks were tilted so that the broth flowed to point **X**, as shown in **Diagram 2**. The flasks were then returned to the upright position and left for a few days.

Diagram 2



Flask tilted so broth flowed to point **X**

Flask returned to upright position

Microorganisms grew in the broth

Microorganisms grew in the broth.

Explain why.

.....

.....

.....

.....

(2 marks)

8 (d) Complete the sentence.

This investigation provides evidence for the theory of ..... .

(1 mark)

6

END OF QUESTIONS

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There are no questions printed on this page

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Version: 09/08/2010

General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2010 Examination – June Series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Marking Guidance for Examiners

GCSE Science Papers

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example:

where consequential marking needs to be considered in a calculation;

or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct

substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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BLY 3F

Question 1

question	answers	extra information	mark
1(a)(i)	root hair		1
1(a)(ii)	any **two** from: • water • ions / minerals / nutrients / salts / correct named eg nitrates • oxygen	ignore food ignore N,P,K	2
1(b)(i)	stomata		1
1(b)(ii)	diffusion		1
Total			**5**

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BLY 3F

Question 2

question	answers	extra information	mark
2(a)	B		1
2(b)	Narrow(er) small(er) / thin(ner)(air) passages / bronchioles **or** less air can pass through **or** harder for air to enter	allow muscle fibres are contracted allow oxygen instead of air ignore reference to surface area	1
2(c)(i)	salbutamol causes relaxation / reduces contraction		1
2(c)(ii)	widens / enlarges / bronchioles / (air) passages **or** allows air through more easily **or** allows person to breathe more easily	allow oxygen instead of air	1
Total			**4**

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BLY 3F

Question 3

question	answers	extra information	mark
3(a)(i)	carbohydrase		1
3(a)(ii)	yeast		1
3(a)(iii)	distillation		1
3(b)	petrol will run out **or** petrol increasingly difficult to obtain **or** petrol non-renewable	ignore cost ignore ease of production allow: (more) pollution / named eg allow petrol damages environment allow (more) global warming	1
	more maize can be grown **or** maize is renewable	allow better for the environment allow causes less global warming	1
Total			**5**

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BLY 3F

Question 4

question	answers	extra information	mark
4(a)(i)	150		1
4(a)(ii)	any **two** from: • lower resting rate • lower rate during exercise • recovers faster after exercise	accept correct use of numbers accept pulse rate allow a general statement about lower rate if neither of the first two points given	2
4(b)	glucose oxygen		1 1
Total			**5**

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BLY 3F

Question 5

question	answers	extra information	mark
5(a)	A higher concentration would be difficult to stir		1
5(b)(i)	methane		1
5(b)(ii)	60	100 – (5 + 35) but incorrect answer allow **1** mark	2
5(c)(i)	aerobic respiration		1
5(c)(ii)	oxygen		1
Total			**6**

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BLY 3F

Question 6

question	answers	extra information	mark
6(a)(i)	too large to pass through the filter		1
6(a)(ii)	passed through the filter, then reabsorbed into blood		1
6(a)(iii)	water is reabsorbed from the filtrate into the blood		1
6(a)(iv)	water, urea and sodium ions		1
6(b)(i)	less urine		1
6(b)(ii)	more concentrated		1
Total			**6**

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BLY 3F

Question 7

question	answers	extra information	mark
7(a)(i)	A = (cell) wall B = cytoplasm	ignore cellulose	1 1
7(a)(ii)	any **one** from • bacterial cell / it has no nucleus • DNA free in cytoplasm • has no vacuole / no vesicles	 accept has DNA instead of a nucleus but **not** just has DNA allow no mitochondria ignore size ignore strands of DNA	1
7(b)(i)	yeast grows best / better / well **or** optimum temperature for yeast / more yeast present CO_2 made(by yeast) **or** respires / respiration (by yeast)	allow yeast works best / better / well allow fermentation (ignore anaerobic/aerobic)	1 1
7(b)(ii)	bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium (lactic) acid made (by bacterium)	ignore micro organism / microbes allow works / respires best / better / well (ignore anaerobic/aerobic) do **not** allow wrong acid	1 1
7(b)(iii)	bread still rises (in acid conditions) **or** no need to control / monitor pH		1
Total			**8**

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BLY 3F

Question 8

question	answers	extra information	mark
8(a)(i)	to kill (micro)organisms / bacteria / microbes **or** to sterilise	allow get rid of organisms etc allow kill germs	1
8(a)(ii)	(micro)organisms / they could not enter (the broth / flask) **or** (micro)organisms / they get trapped / stuck (in the bend)	apply list principle to air	1
8(b)	(more) reliable **or** to check if anomalous / consistent (same every time)	do **not** allow precise / accurate / valid / fair	1
8(c)	any **two** from: • microorganisms now enter (the broth / flask) • microorganisms from air / bend / neck / x • nutrients / energy source for microorganisms (in broth)	ignore oxygen / air	2
8(d)	biogenesis		1
Total			**6**

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2010

Biology

BLY3F

Unit Biology B3

F

Written Paper

Thursday 14 January 2010 9.00 am to 9.45 am

You will need no other materials.
You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

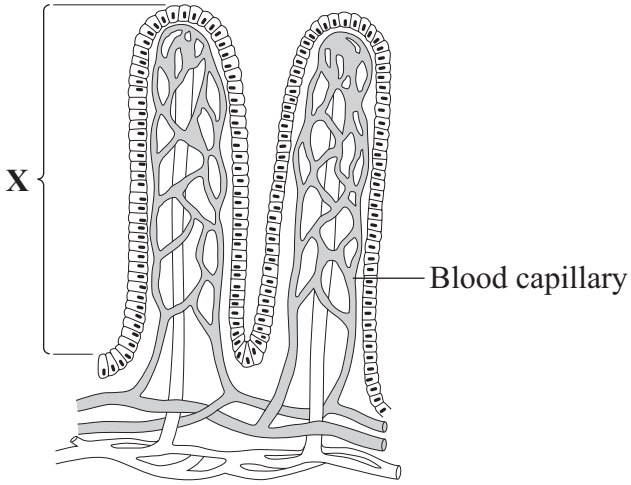
Advice
- In all calculations, show clearly how you work out your answer.

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Areas outside the box will not be scanned for marking

Answer **all** questions in the spaces provided.

1 The diagram shows part of the lining of the small intestine.



1 (a) (i) Name structure **X**.

Draw a ring around **one** answer.

alveolus **thorax** **villus**

(1 mark)

Areas outside the box will not be scanned for marking

1 (a) (ii) Choose **three** ways in which structure **X** is adapted to help the absorption of soluble food.

Tick (✓) **three** boxes.

It is ventilated. ☐

Its outer surface is one cell thick. ☐

It has a large surface area. ☐

It contains a layer of muscle. ☐

It has a good blood supply. ☐

Its cells contain haemoglobin. ☐

(3 marks)

1 (b) Name the process by which soluble food enters the blood.

Draw a ring around **one** answer.

diffusion **fermentation** **transpiration**

(1 mark)

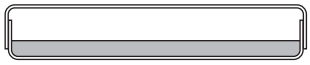
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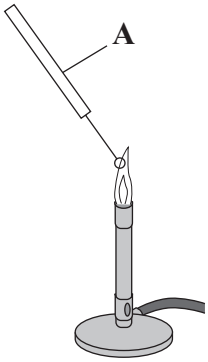
Turn over for the next question

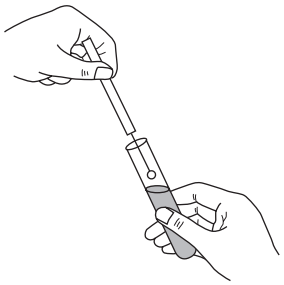
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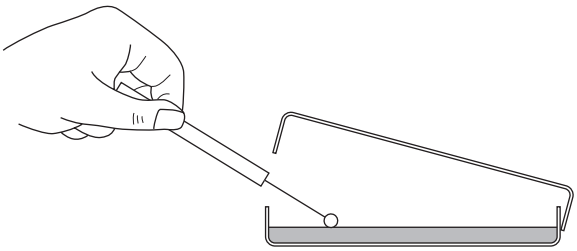
2 (a) It is important to prevent contamination when growing microorganisms.

The diagram shows the transfer and culturing of microorganisms.

Stage V  A Petri dish with agar is heated to 120 °C for 20 minutes, then cooled

Stage W 

Stage X 

Stage Y 

Stage Z  Petri dish kept at 25 °C for 48 hours

2 (a) (i) Name the apparatus labelled **A** in stage **W**.

Draw a ring around **one** answer.

inoculating loop **pipette** **thermometer**

(1 mark)

Areas outside the box will not be scanned for marking

2 (a) (ii) Give the letters of the **two** stages from **V**, **W**, **X**, **Y** and **Z**, which are carried out to kill microorganisms.

Stages ☐ and ☐

(2 marks)

2 (a) (iii) Give the letter of the stage, **V**, **W**, **X**, **Y** or **Z**, where incubation takes place.

Stage ☐

(1 mark)

2 (b) A culture medium used for growing microorganisms contains various nutrients.

Which nutrient is the main source of energy for the microorganisms?

Draw a ring around **one** answer.

carbohydrates **mineral ions** **vitamins**

(1 mark)

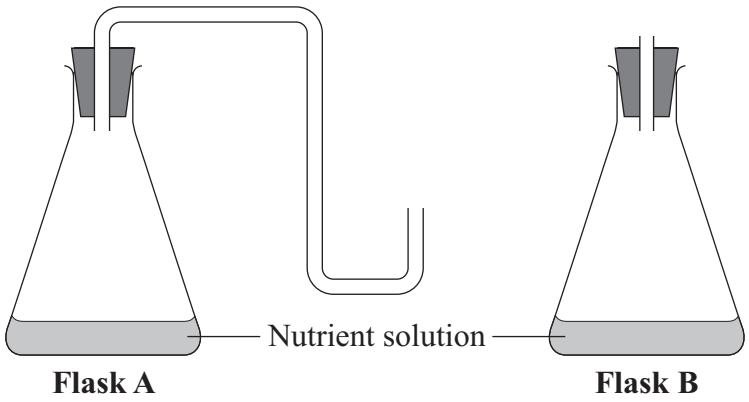
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Turn over for the next question

Areas outside the box will not be scanned for marking

3 Some students investigated biogenesis.

They set up three flasks like **Flask A** and three flasks like **Flask B**, as shown in the diagram.



- The students boiled the nutrient solution in each flask for 40 minutes.
- They left the flasks to cool to room temperature.
- They then kept all six flasks at room temperature for one week.

3 (a) Why did the students set up three flasks like **Flask A** rather than just one?

.....

.....

(1 mark)

3 (b) After one week, the students looked at one drop of liquid from each flask under a microscope.

Their results are given in the table.

Repeat number	Flask A	Flask B
1	No bacteria	Bacteria visible
2	No bacteria	Bacteria visible
3	No bacteria	Bacteria visible

Areas outside the box will not be scanned for marking

Explain the results for **Flask A** and **Flask B**.

Flask A

.....

.....

.....

.....

Flask B

.....

.....

.....

.....

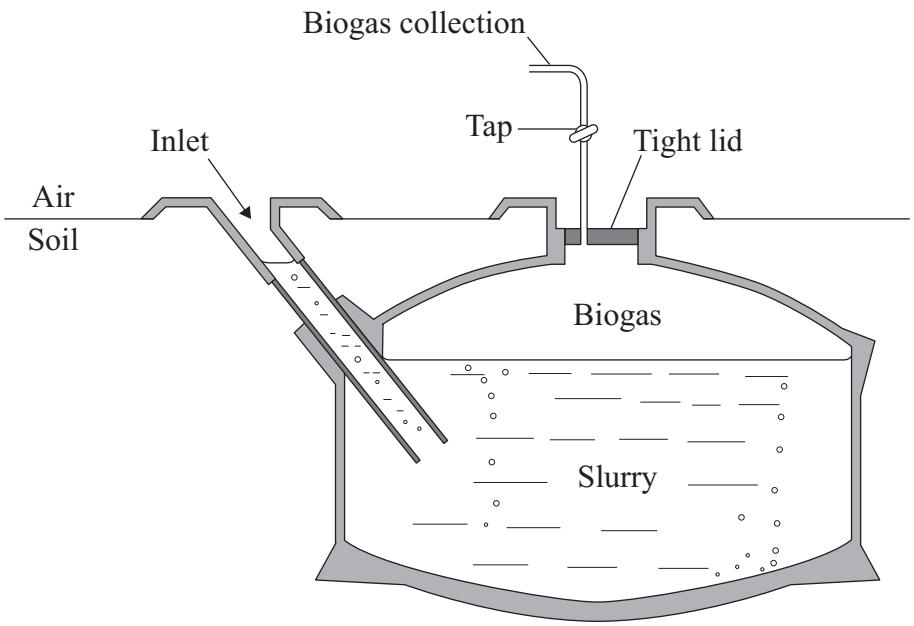
(3 marks)

4

Turn over for the next question

Areas outside the box will not be scanned for marking

4 The diagram shows one type of biogas generator.



4 (a) Give **two** advantages of having the biogas generator underground.

Tick (✓) **two** boxes.

It allows the digested slurry to soak into the soil. ☐

The biogas produced will be at a lower pressure. ☐

Very little of the biogas generator will be seen. ☐

It prevents unpleasant smells escaping. ☐

The temperature inside will not change much. ☐

(2 marks)

Areas outside the box will not be scanned for marking

4 (b) The table shows the percentages of the different gases found in this biogas.

Gas	Percentage
Carbon dioxide	35.0
Hydrogen sulfide	1.5
Ammonia	1.5
Water vapour	2.0
Gas **X**	

Gas **X** is the main fuel gas found in biogas.

4 (b) (i) What is the name of gas **X**?

Draw a ring around **one** answer.

hydrogen **methane** **oxygen**

(1 mark)

4 (b) (ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

.....

.....

.....

Percentage of gas **X** = ...

(2 marks)

5

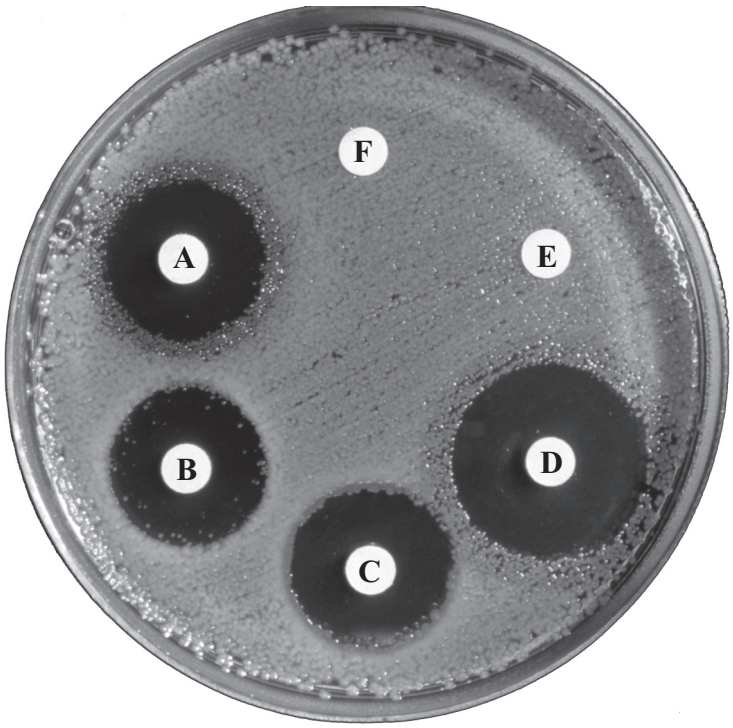
Turn over for the next question

Areas outside the box will not be scanned for marking

5 Some scientists tested the effectiveness of six new antibiotics, **A**, **B**, **C**, **D**, **E** and **F**.

- They mixed a culture of one species of bacterium with nutrient agar in a Petri dish.
- They then prepared separate discs of filter paper, each soaked in a different antibiotic.
- They placed the filter paper discs on the surface of the agar.
- The Petri dish was kept at 35 ºC for 2 days.

The results are shown in the photograph.



5 (a) (i) Which **two** antibiotics from **A**, **B**, **C**, **D**, **E** and **F**, did **not** kill this species of bacterium?

☐ and ☐

(1 mark)

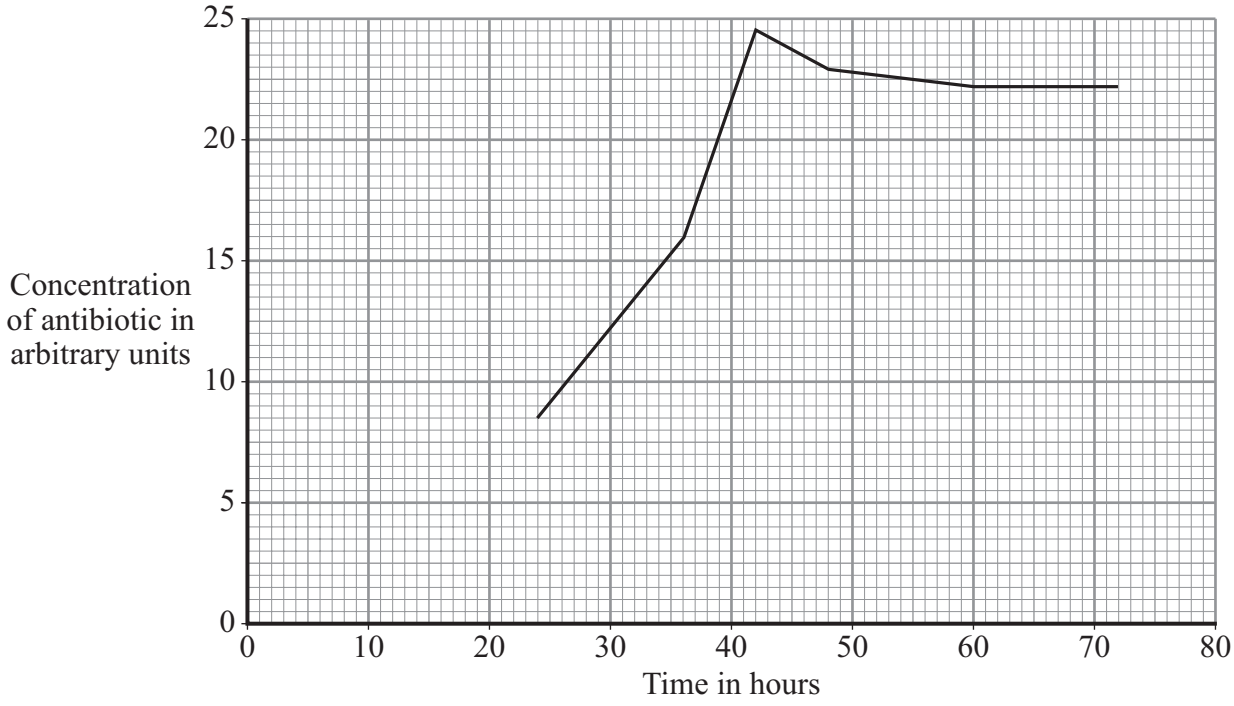
5 (a) (ii) Which would be the best antibiotic, **A**, **B**, **C**, **D**, **E** or **F**, to treat an infection caused by this species of bacterium? ☐

(1 mark)

Areas outside the box will not be scanned for marking

5 (b) The scientists measured the production of an antibiotic by a mould.

The graph shows their results.



5 (b) (i) Describe what happened to the concentration of antibiotic between 24 and 72 hours.

.....

.....

.....

.....

(2 marks)

5 (b) (ii) The scientists decided to grow the mould for 42 hours in future.

Why did they choose this time?

.....

.....

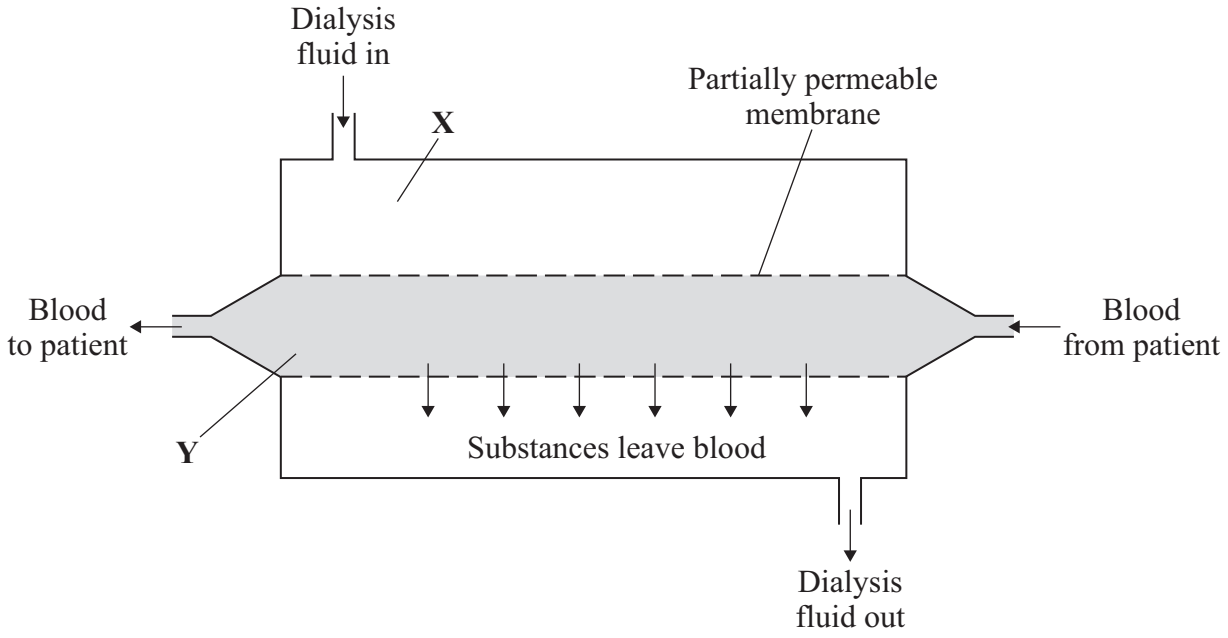
(1 mark)

5

Turn over ▶

Areas outside the box will not be scanned for marking

6 People with kidney disease may be treated by dialysis.
The diagram shows a dialysis machine.



6 (a) Draw a ring around the correct answer to complete each sentence.

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

6 (a) (i) This person lost mass mainly because the substance [salt / urea / water] was removed from the blood.

(1 mark)

6 (a) (ii) This substance was able to pass through the partially permeable membrane

because its molecules are [large. / round. / small.]

(1 mark)

Areas outside the box will not be scanned for marking

6 (a) (iii) The concentration of sodium ions at **X** is 3.15 grams per dm^3.

At the end of a dialysis session, the most likely concentration of sodium ions at **Y** would be

0.00
3.15
6.30

grams per dm^3.

(1 mark)

6 (b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment	**Cost per year in pounds**
Dialysis	30 000
Kidney transplant: operation + first year's medical care medical care in each further year	 51 000 5 000

6 (b) (i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is dialysis treatment? ..... pounds

(1 mark)

6 (b) (ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis.

How many years would it take?

Draw a ring around **one** answer.

2 years **3 years** **4 years**

(1 mark)

6 (b) (iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is this necessary?

.....

.....

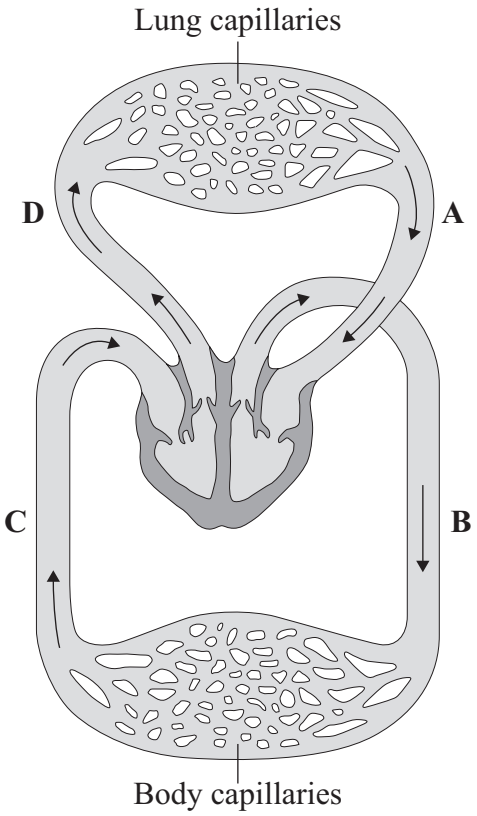
(1 mark)

6

Turn over ▶

Areas outside the box will not be scanned for marking

7 The diagram shows the human circulation system.



7 (a) (i) Give the letter of **one** blood vessel that is an artery. ☐

(1 mark)

7 (a) (ii) Give the letter of **one** blood vessel that carries oxygenated blood. ☐

(1 mark)

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Areas outside the box will not be scanned for marking

7 (b) During exercise, the heart rate increases.

Explain, as fully as you can, why this increase is necessary.

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(4 marks)

6

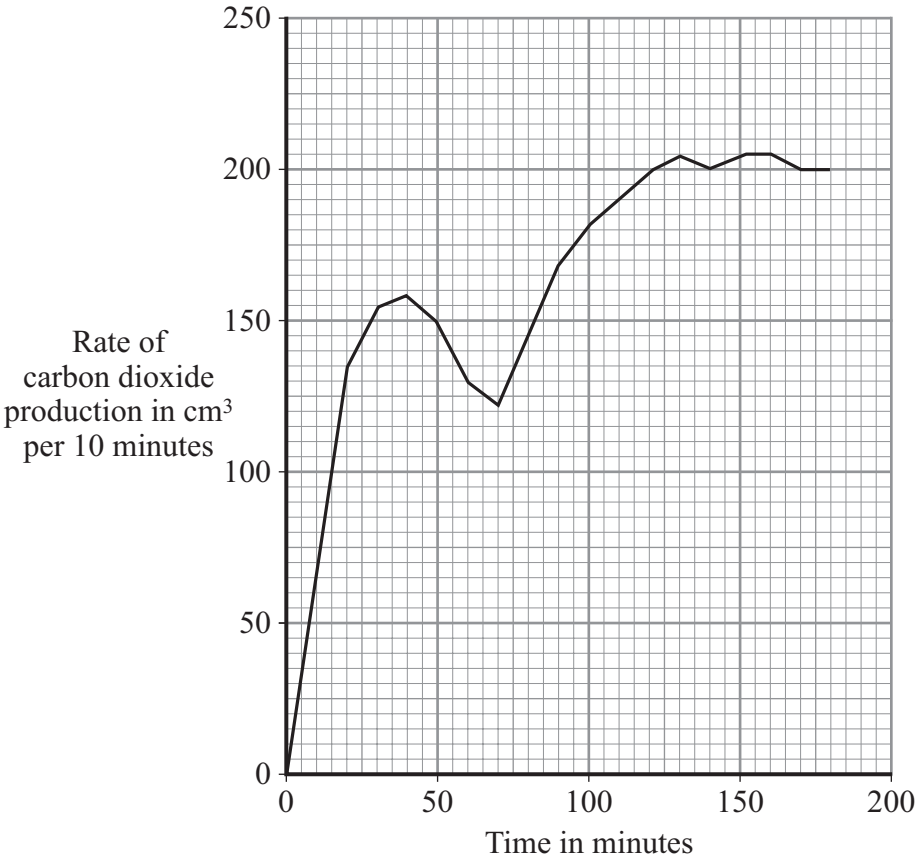
Turn over for the next question

Areas outside the box will not be scanned for marking

8 Bread dough contains flour, sugar, water and yeast. Yeast makes the dough rise.

Some scientists measured the production of carbon dioxide by yeast in bread dough at 35 ºC.

The results are shown in the graph.



8 (a) Over the first 70 minutes, the rate of carbon dioxide production increased at first and then decreased.

Explain why the rate decreased towards the end of this period.

.....

.....

.....

.....

.....

.....

(2 marks)

Areas outside the box will not be scanned for marking

8 (b) The flour contains starch and enzymes similar to those in germinating barley grains.

Use this information to suggest an explanation for the increase in the rate of carbon dioxide production after 70 minutes.

.....

.....

.....

.....

.....

.....

.....

.....

(3 marks)

5

Turn over for the next question

Areas outside the box will not be scanned for marking

9 A student removed three similar leaves from a plant. The student spread petroleum jelly (a waterproofing substance) on some of the leaves, as follows:

Leaf A: on the lower surface
Leaf B: on the upper surface
Leaf C: none.

The student placed each leaf in a separate beaker. He weighed each beaker at intervals. The results are shown in the table.

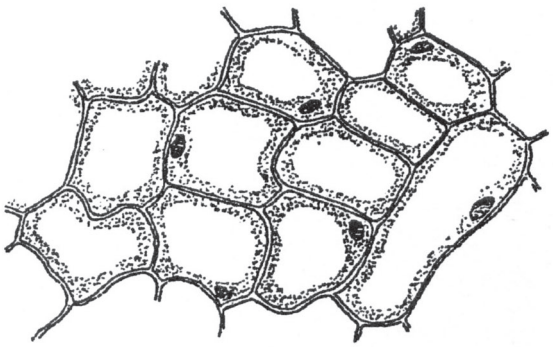
Time in hours	Mass of leaf + beaker in grams		
	Leaf A	Leaf B	Leaf C
0	50.00	55.01	51.99
1	49.99	54.95	51.90
3	49.97	54.90	51.85
5	49.95	54.86	51.80

9 (a) Which leaf, **A**, **B** or **C**, lost most water? ☐

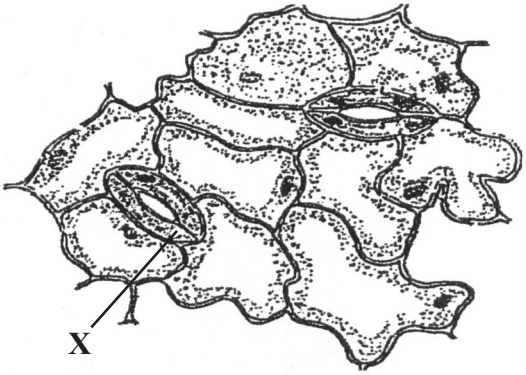
(1 mark)

9 (b) The diagram shows the appearance of the upper and lower surfaces of one of the leaves under a microscope.

Upper surface of leaf



Lower surface of leaf



9 (b) (i) Name cell **X**.....

(1 mark)

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Areas outside the box will not be scanned for marking

9 (b) (ii) The petroleum jelly had a greater effect when it was spread on the lower surface than when it was spread on the upper surface.

Use information from the diagram to explain why.

.....

.....

.....

.....

.....

(2 marks)

4

END OF QUESTIONS

There are no questions printed on this page

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Version : 09/03/2010

General Certificate of Secondary Education

Biology 4411

BLY3F Unit Biology 3

Mark Scheme

2010 examination – January series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Dr Michael Cresswell Director General

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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BLY3F

Question 1

question	answers	extra information	mark
1(a)(i)	villus		1
1(a)(ii)	its outer surface is one cell thick it has a large surface area it has good blood supply	cancel **1** mark for each extra box ticked	1 1 1
1(b)	diffusion		1
Total			**5**

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BLY3F

Question 2

question	answers	extra information	mark
2(a)(i)	inoculating loop		1
2(a)(ii)	V W	either order	1 1
2(a)(iii)	Z		1
2(b)	carbohydrates		1
Total			**5**

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BLY3F

Question 3

question	answers	extra information	mark
3(a)	more reliable **or** in case one does not work / is anomalous	do **not** accept accurate ignore fair test	1
3(b)	any **three** from: **Flask A**: • bacteria could not get in • due to U-tube / bent tube / trapped in bend **Flask B**: • bacteria could get in • due to straight tube / not trapped	allow microorganisms	3
Total			**4**

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BLY3F

Question 4

question	answers	extra information	mark
4(a)	very little of the biogas generator will be seen the temperature inside will not change much	cancel **1** mark for each extra box ticked	1 1
4(b)(i)	methane		1
4(b)(ii)	60	correct answer with or without working 100 – (35 + 1.5 + 1.5 + 2) but incorrect answer allow **1** mark	2
Total			**5**

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BLY3F

Question 5

question	answers	extra information	mark
5(a)(i)	E + F	either order	1
5(a)(ii)	D		1
5(b)(i)	any **2** from: • rises **or** a description • falls / levels off + **or** a description • further details		2
5(b)(ii)	maximum yield		1
Total			**5**

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BLY3F

Question 6

question	answers	extra information	mark
6(a)(i)	water		1
6(a)(ii)	small		1
6(a)(iii)	3.15		1
6(b)(i)	21 000		1
6(b)(ii)	2 years		1
6(b)(iii)	prevent rejection		1
Total			**6**

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BLY3F

Question 7

question	answers	extra information	mark
7(a)(i)	B **or** D		1
7(a)(ii)	A **or** B		1
7(b)	any **four** from: • increased blood (flow) • (more) oxygen supplied **or** aerobic respiration • (more) glucose / sugar / food supplied • (higher rate of) respiration • (more) energy needed / released • (more) carbon dioxide <u>removed</u> • (muscles) doing (more) work **or** muscles contracting • remove heat / cooling • remove lactic acid **or** less lactic acid formed	more / faster must be implied at least once for full marks ignore reference to breathing allow less anaerobic (respiration) **or** and prevents oxygen debt ignore feeding allow made	4
Total			**6**

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BLY3F

Question 8

question	answers	extra information	mark
8(a) **E**	sugar / named eg / energy supply / respiration decreasing / less	allow aerobic respiration allow running out if no other marks awarded allow less oxygen / starch / food **or** toxins produced for **1** mark	1 1
8(b) **E**	any **3** from: • starch → sugar / named eg **or** more sugars • by enzyme • (sugar can be used) by yeast • in respiration / respiration increases	NB yeast respires faster = **2** marks	3
Total			**5**

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BLY3F

Question 9

question	answers	extra information	mark
9(a)	C		1
9(b)(i)	guard (cell)		1
9(b)(ii)	water movement / transpiration through stomata / pores / holes / (region) X **or** petroleum jelly blocks / covers stomata / pores / holes / X stomata / pores / holes / X found on lower surface		1 1
Total			**4**

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Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
June 2009

BIOLOGY **BLY3F**
Unit Biology B3

Foundation Tier

Wednesday 20 May 2009 1.30 pm to 2.15 pm

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

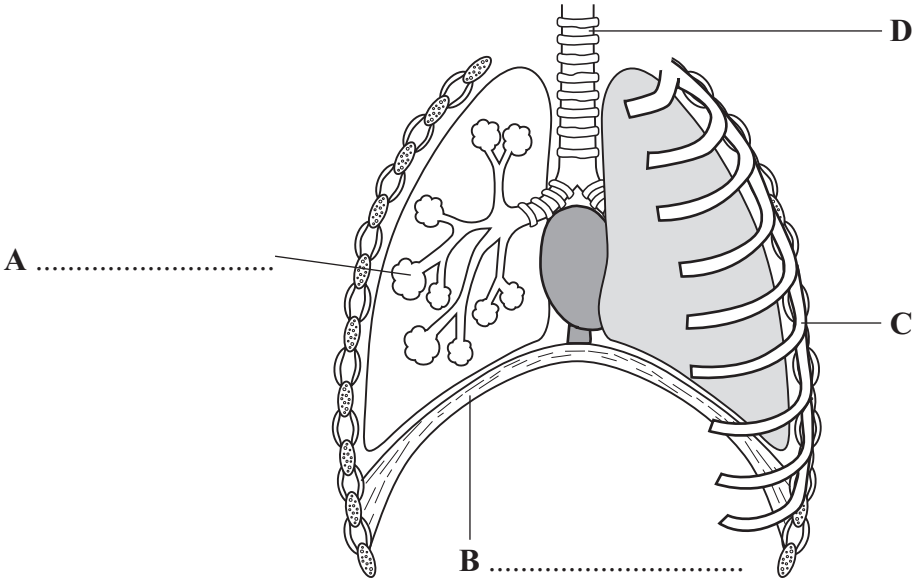
For Examiner's Use			
Question	Mark	Question	Mark
1		6	
2		7	
3			
4			
5			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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Areas outside the box will not be scanned for marking

Answer **all** questions in the spaces provided.

1 The diagram shows the human breathing system.



1 (a) On the diagram, label structures **A** and **B**.

Choose your answers from the words in the box.

alveolus	**capillary**	**diaphragm**	**rib**

(2 marks)

In the lungs, oxygen passes from the air into the blood.
Carbon dioxide passes from the blood into the air.

1 (b) Which letter, **A**, **B**, **C** or **D**, shows where oxygen enters the blood? ☐

(1 mark)

Areas outside the box will not be scanned for marking

1 (c) When oxygen enters the blood it combines with haemoglobin.

Draw a ring around the correct word or phrase to complete each sentence.

1 (c) (i) Haemoglobin is found in the

plasma

red blood cells

white blood cells

.

(1 mark)

1 (c) (ii) Most of the carbon dioxide is carried by the

plasma

red blood cells

white blood cells

.

(1 mark)

5

Turn over for the next question

Areas outside the box will not be scanned for marking

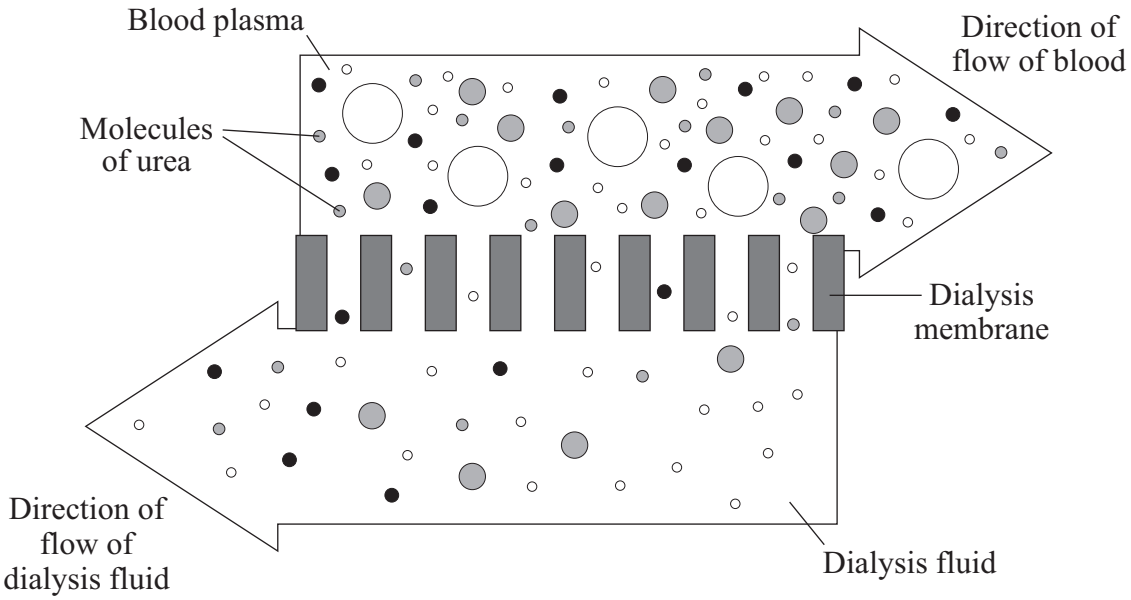
2 (a) Which **two** of the following substances are found in the urine of a healthy person?

Tick (✓) **two** boxes.

Glucose	☐
Mineral ions	☐
Proteins	☐
Water	☐

(2 marks)

2 (b) A person with kidney disease can be treated by dialysis.
The diagram shows how dialysis works.
The circles represent molecules of different substances.



Draw a ring around the correct word or phrase to complete each sentence.

2 (b) (i) During dialysis, urea moves out of the

blood cells
blood plasma
dialysis fluid

.

(1 mark)

Areas outside the box will not be scanned for marking

2 (b) (ii) During dialysis, urea moves into the [blood cells / blood plasma / dialysis fluid] .

(1 mark)

2 (b) (iii) Urea moves by the process of [diffusion / digestion / transpiration] .

(1 mark)

2 (b) (iv) To allow the movement of urea, the dialysis membrane is [impermeable / partially permeable / thick] .

(1 mark)

2 (b) (v) The urea can pass through the membrane because

the urea molecules are [large / round / small] .

(1 mark)

2 (c) For most patients a kidney transplant is better than continued dialysis treatment.

Tick (✓) **one** box to complete the sentence.

One major problem with a kidney transplant is that

drug treatment is needed to suppress the immune system. ☐

hospital visits are needed three times a week. ☐

yearly costs are higher than for dialysis. ☐

(1 mark)

8

Areas outside the box will not be scanned for marking

3 (a) Microorganisms can be grown on agar jelly in a Petri dish.

List A gives three actions used when growing microorganisms.
List B gives four possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.

List A – Action	**List B – Effect**
	To reduce the growth of pathogens
The agar jelly is heated at 120°C for 30 minutes	
	To kill unwanted microorganisms
Make sure the temperature for growing the microorganisms is no higher than 25 °C	
	To prevent microorganisms from the air getting into the Petri dish
The lid of the Petri dish is held on with tape	
	To prevent oxygen entering the Petri dish

(3 marks)

3 (b) UHT milk is milk that has been heated to 135°C, then cooled.

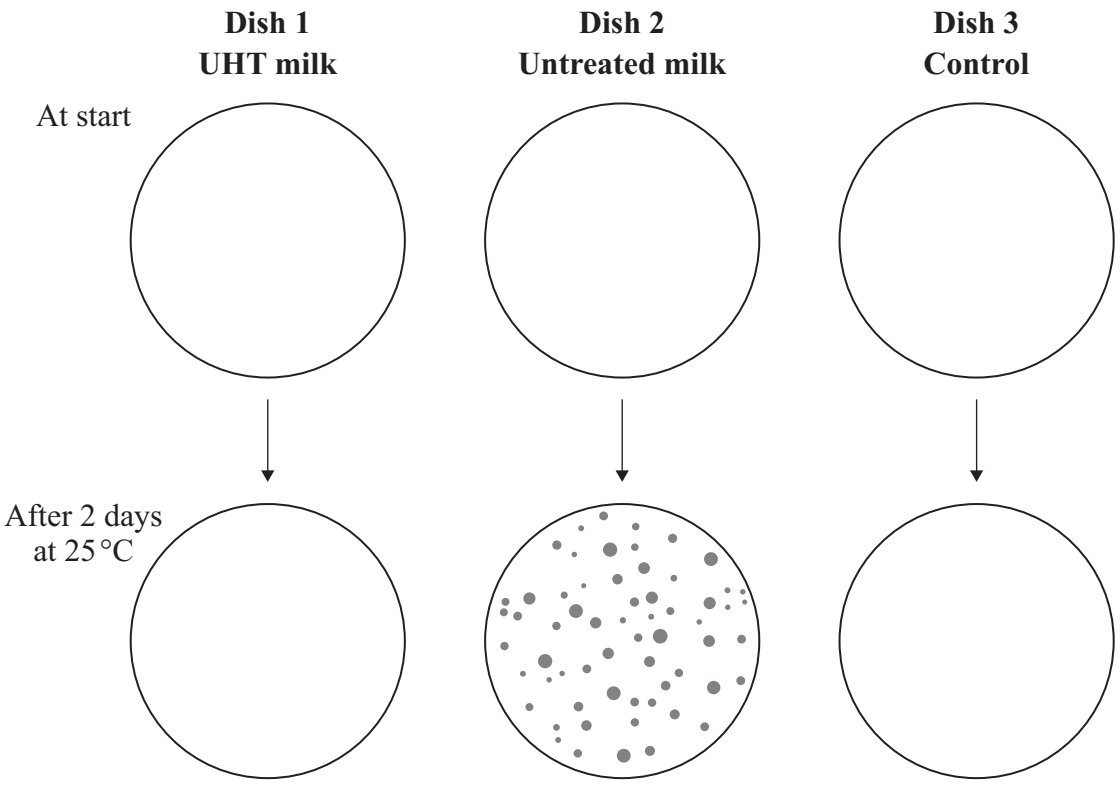
In an investigation, three sterile Petri dishes containing sterile agar jelly were set up as follows.

- UHT milk was added to dish **1**.
- Untreated milk was added to dish **2**.
- Dish **3** was left unopened as a control.
- The dishes were kept at 25 °C for two days.

The results are shown in the diagram on the opposite page.

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3 (b) (i) Describe the difference in appearance between dishes **1** and **2** after two days.

.....

.....

(1 mark)

3 (b) (ii) Give **one** reason for this difference.

.....

.....

(1 mark)

3 (b) (iii) There was no change in the appearance of dish **3** after two days.

Give **one** reason why.

.....

.....

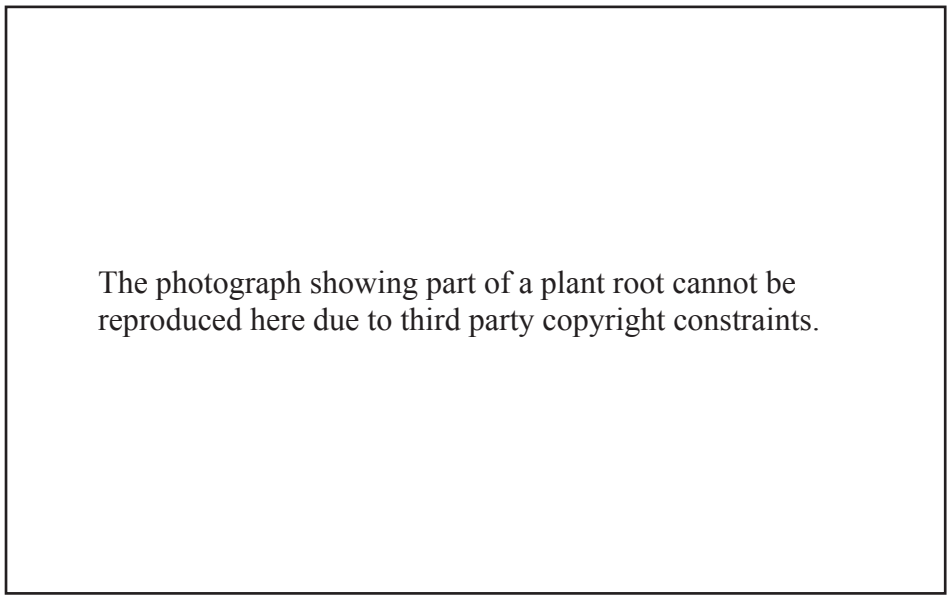
(1 mark)

6

Turn over ▶

Areas outside the box will not be scanned for marking

4 The photograph shows part of the surface of a plant root. This part of the root is covered with hundreds of structures like the one labelled **X**.



4 (a) What is the name of structure **X**?

Draw a ring around **one** answer.

root hair **stoma** **villus**

(1 mark)

4 (b) (i) Use the scale to measure the length **Y**–**Z** on the photograph.

On the photograph, length **Y**–**Z** = ... mm.

(1 mark)

4 (b) (ii) The photograph shows the root magnified 100 times.

Calculate the actual length **Y**–**Z**.

.....

.....

.....

Actual length **Y**–**Z** = ...mm.

(2 marks)

Areas outside the box will not be scanned for marking

4 (b) (iii) Structure **X** is very small. There are thousands of structures like **X** on a plant root.

How does this help the plant?

.....

.....

.....

.....

(2 marks)

6

Turn over for the next question

Areas outside the box will not be scanned for marking

5 The table gives information about the growth of different types of organism.
The figures were obtained during the period of fastest growth for each organism.

Organism	**Time taken to double in mass**
Bacteria	40 minutes
Yeasts	2 hours
Fusarium	4 hours
Algae	5 hours
Soybeans	1 week
Cattle	8 weeks

5 (a) (i) Which type of organism grows the fastest? .....

(1 mark)

5 (a) (ii) How many times faster than cattle do soybeans double in mass?

.....

(1 mark)

5 (a) (iii) *Fusarium* grows at its fastest rate in a fermenter.
Some scientists put **one tonne** of *Fusarium* into a fermenter.

Use data from the table to calculate how much *Fusarium* there would be in the fermenter after 8 hours.

Draw a ring around **one** answer.

2 tonnes **4 tonnes** **8 tonnes**

(1 mark)

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Areas outside the box will not be scanned for marking

5 (b) *Fusarium* is used to make mycoprotein.

Read the information about substances found in mycoprotein.

- Protein – can be used for making cells, enzymes and antibodies.
- Fats – are rich in energy but large amounts in the diet can cause circulatory problems.
- Dietary fibre – helps to reduce the risk of colon cancer.

The table compares the composition of mycoprotein and beef.

Substance	**Percentage of dry mass**	
	Mycoprotein	**Beef**
Protein	47.2	68.3
Fat	13.5	30.1
Dietary fibre	19.2	0.0

Use the information above to answer the questions.

5 (b) (i) Give **two** reasons why it would be better to eat mycoprotein instead of beef.

1 .....

.....

2 .....

.....

(2 marks)

(Extra space) .....

5 (b) (ii) Give **one** reason why it would be better to eat beef instead of mycoprotein.

.....

.....

(1 mark)

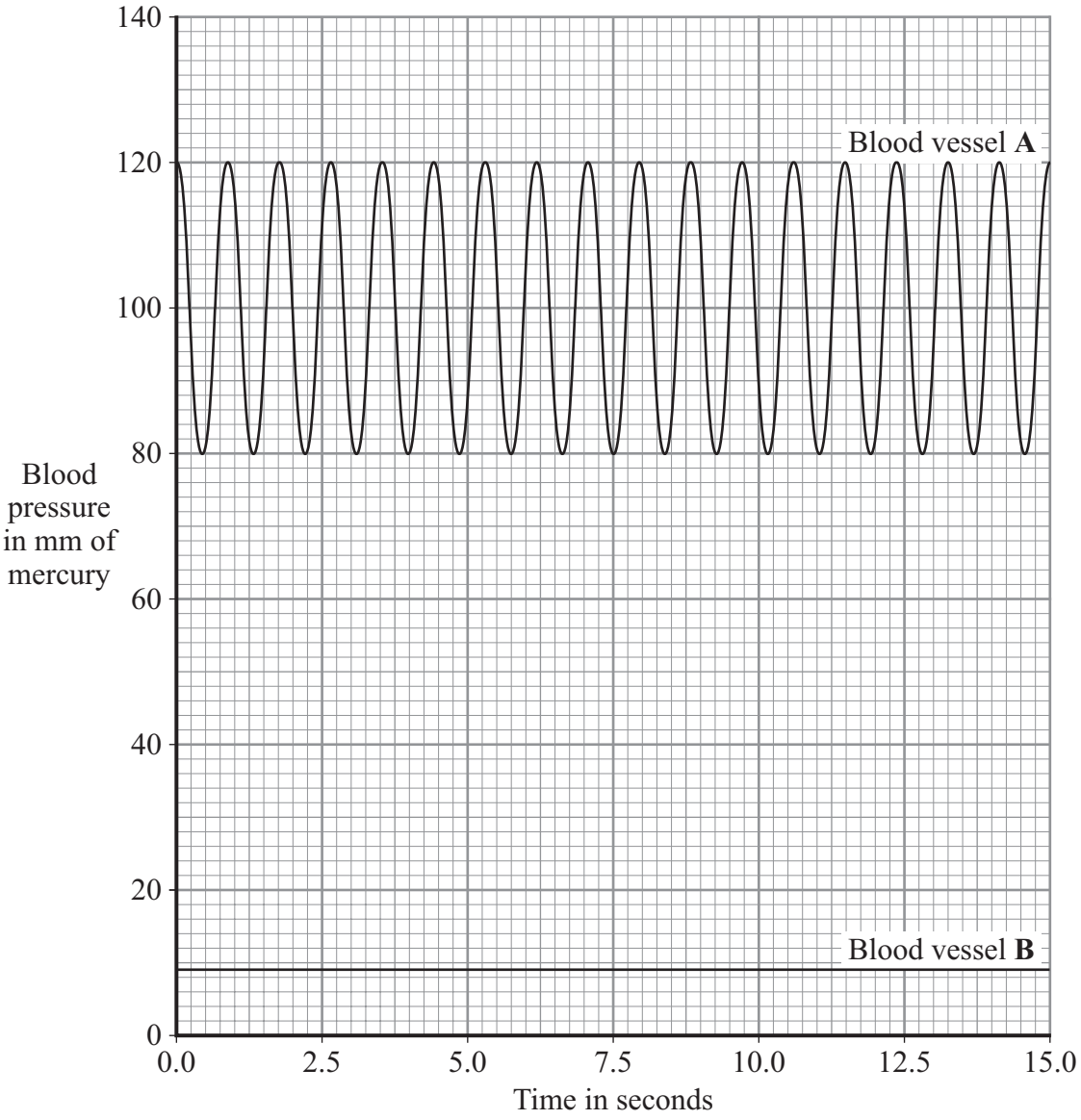
(Extra space) .....

6

Areas outside the box will not be scanned for marking

6 The heart pumps blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



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Areas outside the box will not be scanned for marking

6 (a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

6 (b) Use information from the graph to answer these questions.

6 (b) (i) How many times did the heart beat in 15 seconds? .....

(1 mark)

6 (b) (ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

.....

.....

Heart rate = ... beats per minute

(1 mark)

6 (c) During exercise, the heart rate increases. This supplies useful substances to the muscles and removes waste materials from the muscles at a faster rate.

6 (c) (i) Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1 .....

2 .....

(2 marks)

6 (c) (ii) Name **one** waste substance that must be removed from the muscles at a faster rate during exercise.

.....

(1 mark)

7

Turn over ▶

Areas outside the box will not be scanned for marking

7 Three students each prepared a flask of yoghurt.

- They used equal volumes of the same type of milk.
- They added equal amounts of a 'yoghurt starter culture' (plain yoghurt which contains living bacteria).
- They then placed the three flasks in a water bath at 25 °C.
- They measured the pH of their yoghurt at 50-minute intervals using a pH meter.

The table shows their pH measurements.

Time in minutes	**pH**			
	Flask 1	**Flask 2**	**Flask 3**	**Mean**
0	6.4	6.4	6.5	6.4
50	6.3	6.4	6.5	6.4
100	5.9	6.1	6.3	6.1
150	5.0	5.5	5.7	5.4
200	4.6	5.8	4.9	5.1
250	4.3	4.6	4.6	4.5

7 (a) (i) Give **two** variables that were controlled in this investigation.

1 .....

2 .....

(2 marks)

7 (a) (ii) Why was it helpful to do the investigation three times and to calculate mean values?

.....

.....

(1 mark)

7 (a) (iii) The students chose to use a pH meter rather than pH indicator papers.

Explain why.

.....

.....

(1 mark)

(Extra space) .....

Areas outside the box will not be scanned for marking

7 (b) One of the results in the table appears to be anomalous.

Which result is this?

.....

.....

(1 mark)

7 (c) The students noticed that, after 200 minutes, their yoghurts began to thicken.

What caused this?

.....

.....

.....

.....

(2 marks)

(Extra space) .....

7

END OF QUESTIONS

There are no questions printed on this page

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Version 1.0: 21.07

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Biology 4411

BLY3F Unit 3 Biology

Mark Scheme

2009 examination – June series

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Dr Michael Cresswell Director General

MARK SCHEME

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- the marks available for each part of the question
- the total marks available for the question
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This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

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However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
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3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
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(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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BLY3F

Question 1

question	answers	extra information	mark
1(a)	A = alveolus B = diaphragm	allow air sac / alveoli ignore labelling of C and D	1 1
1(b)	A		1
1(c)(i)	red blood cells		1
1(c)(ii)	plasma		1
Total			**5**

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BLY3F

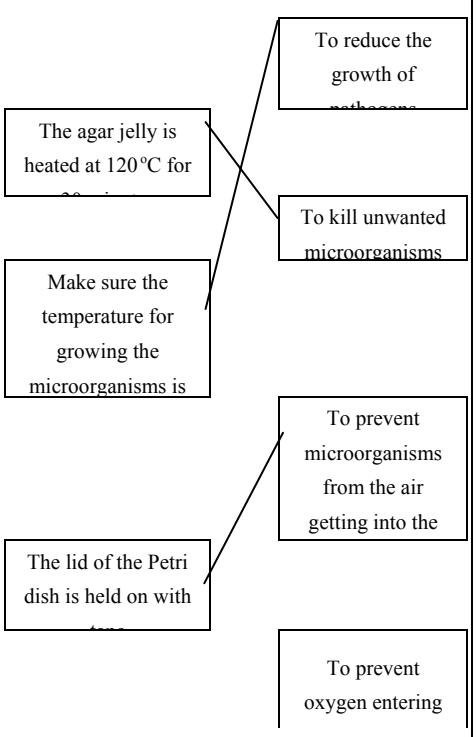
Question 2

question	answers	extra information	mark
2(a)	mineral ions water	each extra box ticked cancels **1** mark	1 1
2(b)(i)	blood plasma		1
2(b)(ii)	dialysis fluid		1
2(b)(iii)	diffusion		1
2(b)(iv)	partially permeable		1
2(b)(v)	small		1
2(c)	drug treatment is needed to suppress the immune system		1
Total			**8**

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BLY3F

Question 3

question	answers	extra information	mark
3(a)		**1** mark per correct line each extra line cancels **1** mark	3
3(b)(i)	dish 2 has (colonies of) microorganisms / bacteria / (but there are none in dish 1)	allow fungi / pathogens / microbes / germs allow more microorganisms in dish 2	1
3(b)(ii)	untreated milk contains <u>living</u> microorganisms **or** microorganisms killed by UHT **or** no <u>living</u> microorganisms in UHT milk	ignore microorganisms enter from the air	1

Question 3 continues on the next page…

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BLY3F

Question 3 Continued

question	answers	extra information	mark
3(b)(iii)	dish 3 was not opened **or** it was sterilised **or** nothing / no milk was added	do **not** allow no growth of microorganisms because of lack of air / oxygen ignore microorganisms cannot enter from the air	1
Total			**6**

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BLY3F

Question 4

question	answers	extra information	mark
4(a)	root hair		1
4(b)(i)	85	if incorrect unit added = 0	1
4(b)(ii)	0.85	ignore working or lack of working accept correct answer from candidate's (i) for **2** marks $\frac{85}{100}$ with no answer or wrong answer gains **1** mark accept ecf	2
4(b)(iii)	absorb <u>more</u> water / ions **or** <u>large</u> surface area to absorb water / ions (2)	allow 'get / collect / take in / take up / soak up / suck up' for absorb allow 'lots' for more allow 'moisture' for water allow 'minerals / salts / nutrients' for ions do **not** allow food or named foods absorb water / ions gains **1** mark large surface area linked to incorrect function = 1 ignore small so short diffusion pathway	2
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)(i)	bacteria		1
5(a)(ii)	8		1
5(a)(iii)	4 tonnes		1
5(b)(i)	mycoprotein contains less fat **or** less circulatory problems mycoprotein contains (more) fibre **or** reduces colon cancer	it = mycoprotein fat must be comparative	1 1
5(b)(ii)	beef contains <u>more</u> protein **or** <u>better</u> for growth / making cells / enzymes / antibodies	it = beef must be comparative	1
Total			**6**

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BLY3F

Question 6

question	answers	extra information	mark
6(a)	A	no mark – can be specified in reason part if B given = no marks throughout if unspecified plus two good reasons = 1 mark	
	high(er) pressure in A	allow opposite for B do not accept 'zero pressure' for B	1
	pulse / described in A	accept fluctuates / 'changes' allow reference to beats / beating ignore reference to artery pumping	1
6(b)(i)	17		1
6(b)(ii)	68	accept correct answer from candidate's (b)(i) x 4	1
6(c)(i)	oxygen / oxygenated blood	allow adrenaline ignore air	1
	glucose / sugar	extra wrong answer cancels eg sucrose / starch / glycogen / glucagon / water allow fructose as an alternative to glucose ignore energy ignore food	1

Question 6 continues on the next page…

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BLY3F

Question 6 Continued

6(c)(ii)	carbon dioxide / CO_2 / lactic acid	allow CO2 / CO^2 ignore water	1
Total			**7**

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Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
January 2009

BIOLOGY **BLY3F**
Unit Biology B3

Foundation Tier

Monday 12 January 2009 9.00 am to 9.45 am

You will need no other materials.
You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use			
Question	Mark	Question	Mark
1		7	
2		8	
3		9	
4			
5			
6			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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Areas outside the box will not be scanned for marking

Answer **all** questions in the spaces provided.

1 (a) Draw a ring around **one** word to answer each of the following questions.

1 (a) (i) Which type of blood vessel carries blood out of the heart?

artery **capillary** **vein**

(1 mark)

1 (a) (ii) Which type of blood vessel allows substances to enter and leave the blood?

artery **capillary** **vein**

(1 mark)

1 (b) Use words from the box to complete the sentences.

alveoli	**cell membrane**	**nucleus**
plasma	**red blood cells**	**villi**

Oxygen enters the blood through the walls of the ..... .

Most of the oxygen transported by the blood is carried in the

..... .

A red blood cell is different from other body cells because it does not have a

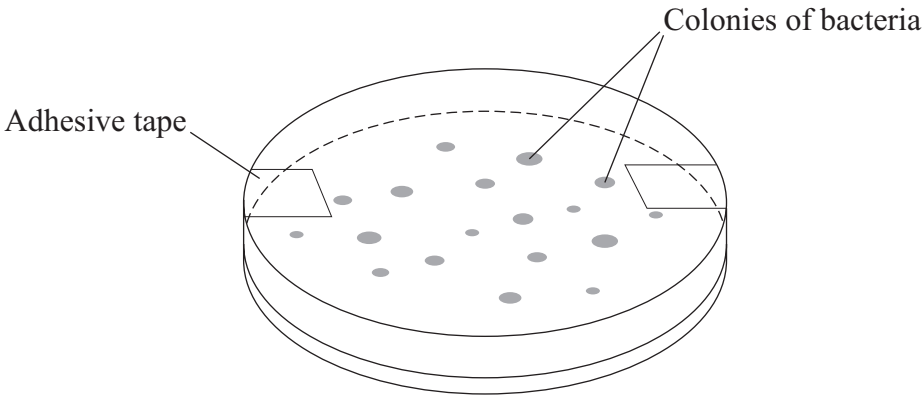
..... .

(3 marks)

5

Areas outside the box will not be scanned for marking

2 The diagram shows a Petri dish containing nutrient agar. Colonies of bacteria are growing on the nutrient agar.



Draw a ring around the correct answer to complete each sentence.

2 (a) (i) Agar jelly contains carbohydrates.

These carbohydrates are a source of [energy / minerals / protein] for the bacteria.

(1 mark)

2 (a) (ii) The dish is sealed with adhesive tape to prevent the entry of

[carbon dioxide / microorganisms / oxygen] from the air.

(1 mark)

2 (b) (i) The dish is placed in an incubator at a temperature of [10 °C / 25 °C / 75 °C] .

(1 mark)

2 (b) (ii) This temperature is used rather than 35 °C so that it is

less likely that [fungi / pathogens / yeasts] will grow in the dish.

(1 mark)

4

Areas outside the box will not be scanned for marking

3 (a) The kidney controls the amount of water in the body.
The table shows the volume of water filtered from the blood and the volume of urine produced in one day.

	Volume in dm^3
Water filtered from blood	180
Urine	2

Calculate the volume of water reabsorbed into the blood.

Show clearly how you work out your answer.

.....

Volume of water reabsorbed = ...dm^3

(2 marks)

3 (b) On a hot sunny afternoon, Man **A** sat in the shade, drinking beer. Man **B** went jogging in the desert.



Man **A**



Man **B**

As a result, the volume and concentration of the urine of the two men were different.

Complete the table by writing the word '**higher**' or '**lower**' in each box.

The first line has been completed for you.

	Man A	**Man B**
Volume of urine produced	higher	lower
Volume of water reabsorbed by the kidneys		
Concentration of urine		

(2 marks)

4

Areas outside the box will not be scanned for marking

4 Ethanol (alcohol) can be mixed with petrol and used as a fuel in motor vehicles.

4 (a) Which type of microorganism is used to make ethanol from sugar?

Draw a ring around **one** answer.

bacterium **mould** **yeast**

(1 mark)

4 (b) Read the information about ethanol and petrol.

Ethanol
- One litre releases 23.5 megajoules of energy when it is burned.
- It releases carbon dioxide and water when it is burned.
- It can be made from crops such as sugar cane and maize.

Petrol
- One litre releases 34.8 megajoules of energy when it is burned.
- It releases carbon dioxide, water, carbon monoxide, sulfur dioxide and oxides of nitrogen when it is burned.
- It is made from crude oil which is pumped out of the ground.

4 (b) (i) Use the information above to explain **two** advantages of using ethanol rather than petrol as a fuel in motor vehicles.

Explanation 1 .....

.....

.....

.....

Explanation 2 .....

.....

.....

.....

(4 marks)

4 (b) (ii) Give **one** disadvantage of using ethanol rather than petrol as a fuel in motor vehicles.

.....

.....

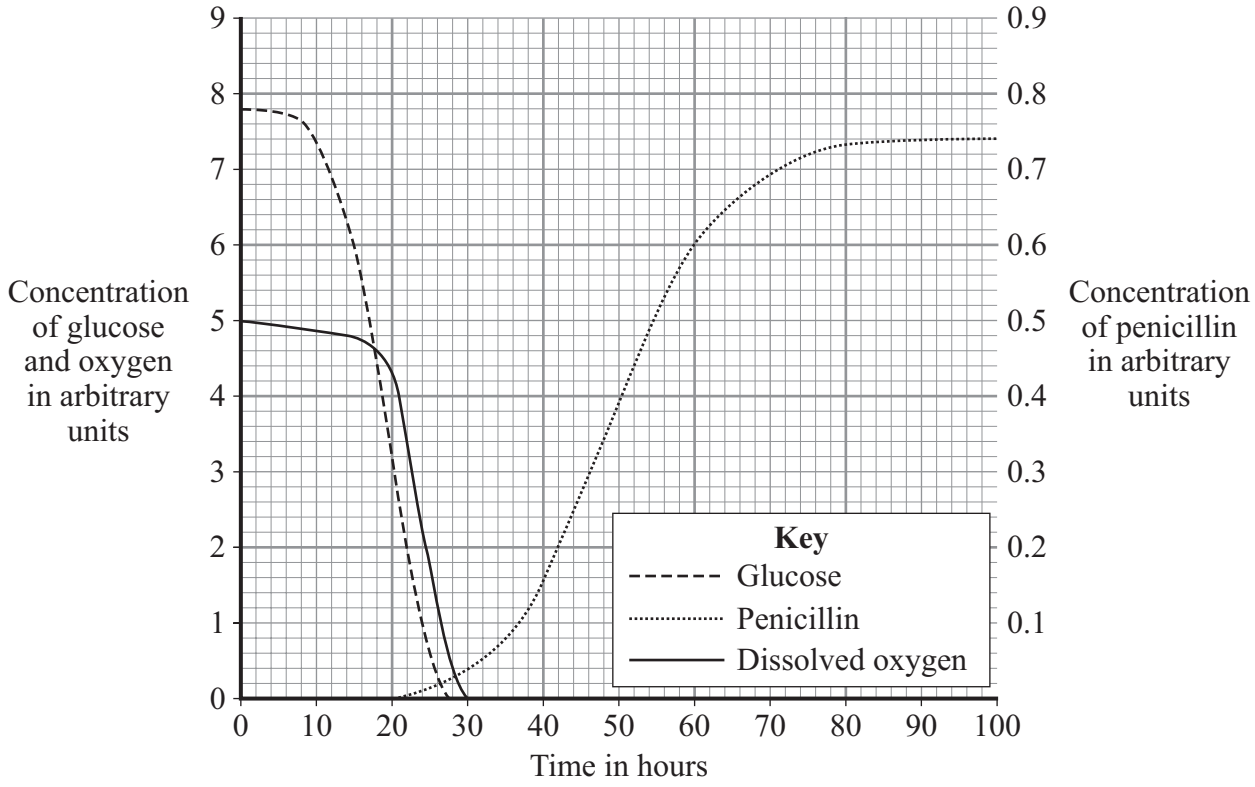
(1 mark)

6

Areas outside the box will not be scanned for marking

5 The mould *Penicillium* can be grown in a fermenter. It produces the antibiotic penicillin.

The graph shows changes that occurred in the fermenter during the production of penicillin.



5 (a) During which time period was penicillin produced most quickly?

Draw a ring around **one** answer.

0 – 20 hours **40 – 60 hours** **80 – 100 hours**

(1 mark)

5 (b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

.....

.....

.....

.....

(2 marks)

Areas outside the box will not be scanned for marking

5 (b) (ii) How does the change in the concentration of oxygen in the fermenter compare with that of glucose between 0 and 30 hours?

Put a tick (✓) in **two** boxes next to your choices.

The oxygen concentration changes after the glucose concentration. ☐

The oxygen concentration changes before the glucose concentration. ☐

The oxygen concentration changes less than the glucose concentration. ☐

The oxygen concentration changes more than the glucose concentration. ☐

(2 marks)

5 (b) (iii) What is the name of the process that uses both glucose and oxygen?

Draw a ring around **one** answer.

aerobic respiration **distillation** **filtration**

(1 mark)

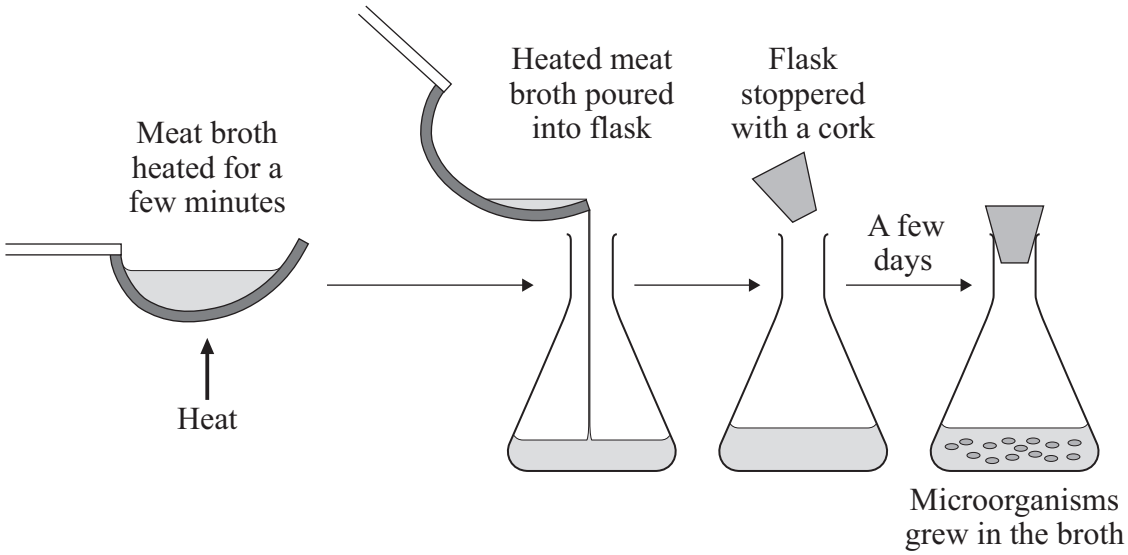
6

Turn over for the next question

Areas outside the box will not be scanned for marking

6 For thousands of years, many people believed that living organisms could be produced from non-living substances.

6 (a) In 1745, John Needham carried out the following investigation.



Needham concluded that the broth produced microorganisms from non-living substances.

6 (a) (i) Why did Needham heat the broth?

.....

.....

(1 mark)

6 (a) (ii) Why did microorganisms grow in the broth?

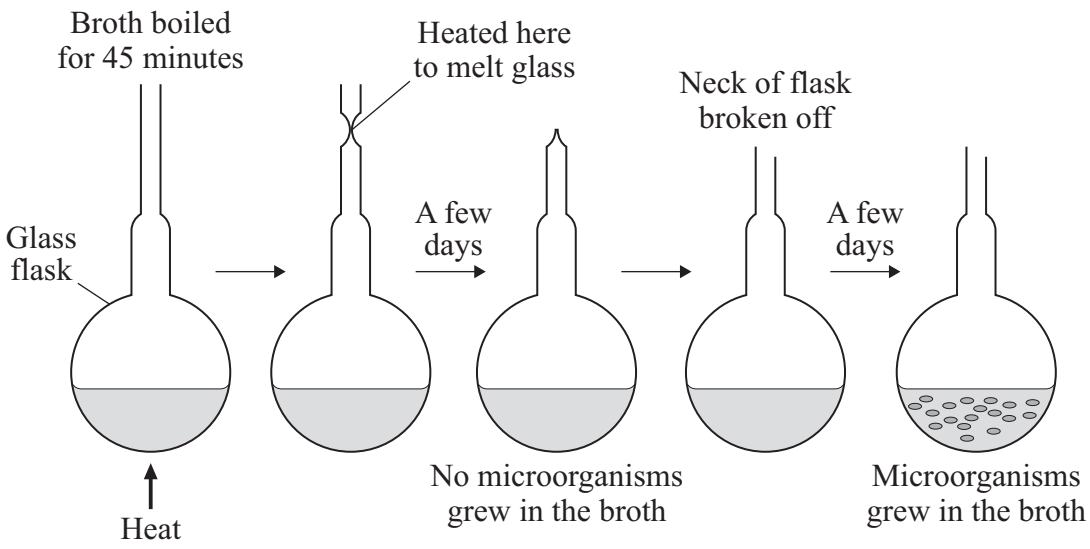
.....

.....

(1 mark)

Areas outside the box will not be scanned for marking

6 (b) In 1767, Spallanzani improved Needham's investigation, as follows.



Explain why Spallanzani's method was better than Needham's.

.....

.....

.....

.....

.....

(2 marks)

6 (c) Complete the sentence.

Spallanzani's investigation provided evidence for the theory of

..... .

(1 mark)

5

Turn over ▶

Areas outside the box will not be scanned for marking

7 (a) The table shows the effect of exercise on the action of one person's heart.

	At rest	**During exercise**
Heart rate in beats per minute	72	165
Volume of blood leaving the heart in each beat in cm^3	75	120
Heart output in cm^3 per minute	5400	

7 (a) (i) Calculate the heart output for this person during exercise.

Show clearly how you work out your answer.

.....

.....

.....

.....

Answer = ... cm^3 per minute

(2 marks)

7 (a) (ii) During exercise, more oxygen is carried to the working muscles.

Explain why this is helpful during exercise.

.....

.....

.....

.....

.....

(2 marks)

Areas outside the box will not be scanned for marking

7 (b) Give **two** other changes in the body that help to increase the amount of oxygen delivered to the working muscles during exercise.

1 .....

.....

2 .....

.....

(2 marks)

6

Turn over for the next question

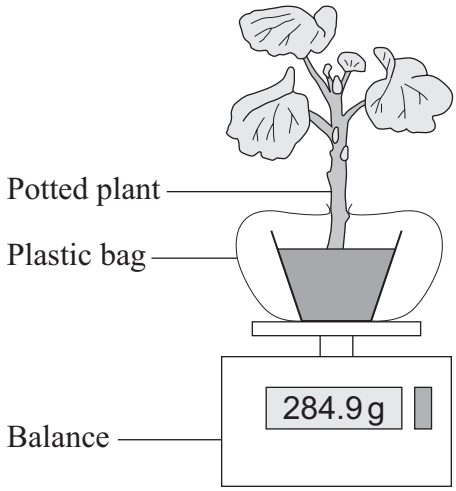
Areas outside the box will not be scanned for marking

8 (a) Name the process by which water is lost from plant leaves.

.....

(1 mark)

8 (b) Some students set up the apparatus shown in the diagram to measure the water loss from a potted plant.



The apparatus was placed in different environmental conditions:

A in still air at 20 °C.
B in still air at 25 °C.
C in a wind at 20 °C.
D in a wind at 25 °C.

Readings from the balance were recorded by a datalogger at 10-minute intervals.

The results are given in the table.

Time in minutes	Balance reading in grams			
	A	**B**	**C**	**D**
0	285.6	284.6	282.9	280.9
10	285.3	284.2	282.4	280.2
20	284.9	283.8	281.9	279.4
30	284.7	283.4	281.4	278.8

Areas outside the box will not be scanned for marking

8 (b) (i) Under which conditions, **A**, **B**, **C** or **D**, was water lost most rapidly? ☐

(1 mark)

8 (b) (ii) Explain, as fully as you can, why water was lost most rapidly under these conditions.

.....

.....

.....

.....

.....

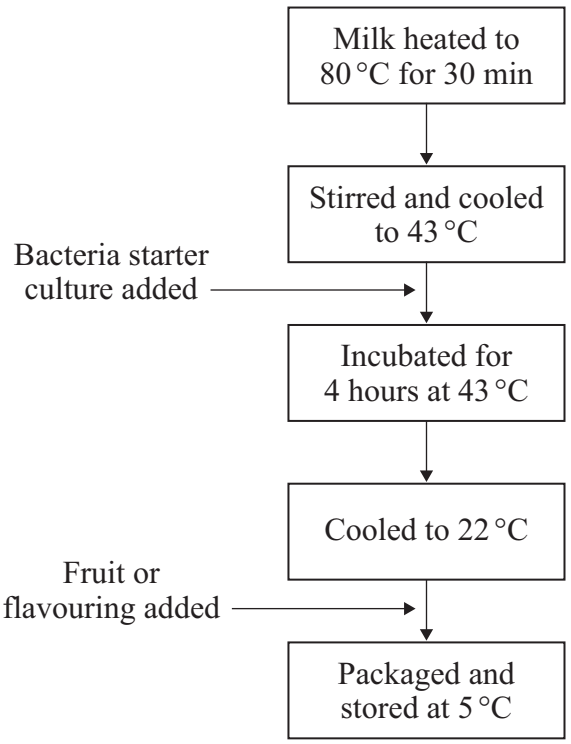
(2 marks)

4

Turn over for the next question

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9 The diagram shows how yoghurt is produced.



9 (a) After being heated to 80 °C, the milk is cooled to 43 °C.

Why is the milk cooled before the bacteria are added?

.....

.....

(1 mark)

9 (b) The pH of milk falls from 6.7 to 4.0 when it is incubated with the bacteria.

9 (b) (i) What causes this fall in pH?

.....

.....

.....

.....

.....

(2 marks)

Areas outside the box will not be scanned for marking

9 (b) (ii) Give **one** way in which this fall in pH is useful in yoghurt production.

.....

.....

(1 mark)

9 (c) Suggest why the yoghurt is stored at 5 °C.

.....

.....

(1 mark)

5

END OF QUESTIONS

There are no questions printed on this page

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BLY3F Unit Biology 3

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Registered address: AQA, Devas Street, Manchester M15 6EX
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Candidate	Response	Marks awarded
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COMPONENT NUMBER: BLY3F

COMPONENT NAME: Biology

STATUS: Final

DATE: January 2009

question	answers	extra information	mark
1(a)(i)	artery		1
1(a)(ii)	capillary		1
1(b)	alveoli		1
	red blood cells		1
	nucleus		1
Total			**5**

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question	answers	extra information	mark
2(a)(i)	energy		1
2(a)(ii)	microorganisms		1
2(b)(i)	25°C		1
2(b)(ii)	pathogens		1
Total			**4**

COMPONENT NUMBER: BLY3F

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<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>3(a)</td><td>178</td><td>ignore working or lack of working

correct working: 180 – 2 but no answer / wrong answer = 1 mark</td><td>2</td></tr>
<tr><td>3(b)</td><td><table><tr><th>Man A</th><th>Man B</th></tr><tr><td>higher</td><td>lower</td></tr><tr><td>lower</td><td>higher</td></tr><tr><td>lower</td><td>higher</td></tr></table></td><td>all 4 cells correct = 2 marks
2 or 3 cells correct = 1 mark
0 or 1 cells correct = 0 mark</td><td>2</td></tr>
<tr><td>Total</td><td></td><td></td><td>4</td></tr>
</table>

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question	answers	extra information	mark
4(a)	yeast		1
4(b)(i)	**two** sensible suggestions, each linked to correct explanation:	max **4** marks	
	does not release CO		1
	gas is toxic / harms living organisms	allow ethanol <u>only</u> releases CO_2 and H_2O for **1** mark	1
	does not release NO_x / SO_2	do **not** allow more pollution / more gases released	1
	gas(es) cause acid rain / eq / harms organisms **or** does not cause acid rain (1) (acid rain) damages building / harms organisms (1)		1
	made from crops / not a fossil fuel (1) crops can re-grow / source is renewable / fossil fuels are non-renewable (1)		
4(b)(ii)	any **one** from • releases less energy (per litre) • need to burn more to cover same distance / travel shorter distance • land not being used for food crops / less food available • raises food prices		1
Total			**6**

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question	answers	extra information	mark
5(a)	40–60 hours		1
5(b)(i)	decrease 1st slowly then faster / appropriate detail from the graph eg from 7.8 to 0 / faster after 4-10 h		1 1
5(b)(ii)	oxygen after glucose oxygen less than glucose	extra box ticked cancels **1** mark	1 1
5(b)(iii)	aerobic respiration		1
Total			**6**

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question	answers	extra information	mark
6(a)(i)	kill / destroys (micro)organisms / bacteria / fungi / living things	do **not** allow get rid of microorganisms	1
6(a)(ii)	entered from environment / already in flask **or** insufficient heating to kill all microorganisms		1
6(b)	any **two** from: • heated more thoroughly / for longer / higher temperature • destroyed / killed all microorganisms • sealed better eg flask melted / sealed immediately after heating / no pouring through air • microorganisms unable to enter (from air) / can only enter when neck broken / open		2
6(c)	biogenesis		1
Total			**5**

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question	answers	extra information	mark
7(a)(i)	19 800	for correct answer ignore working or lack of working 165 × 120 but no answer / wrong answer = **1** mark (ignore extras)	2
7(a)(ii)	any **two** from: • for respiration • energy released • prevents anaerobic respiration • prevents build-up of lactic acid	 ignore oxygen debt allow energy produced	2
7(b)	any **two** from: • increased breathing rate • increased depth of breathing **or** deep breathing • dilation of arteries / vasodilation • blood diverted from elsewhere	 } more breathing is max **1** mark ignore increase in heart rate allow heavier breathing do **not** allow harder breathing allow blood vessels dilate do **not** allow veins / capillaries dilate ignore name of organ	2
Total			**6**

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question	answers	extra information	mark
8(a)	transpiration / evaporation / diffusion	ignore osmosis	1
8(b)(i)	D		1
8(b)(ii)	any **two** from: • more / faster diffusion **or** evaporation **or** transpiration • molecules move faster • maintains concentration gradient **or** keeps water concentration low in the air **or** brings in more dry air **or** removes damp air / water		2
Total			**4**

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question	answers	extra information	mark
9(a)	prevents denaturation / change / damage of proteins / enzymes **or** prevents bacteria being killed / destroyed	allow protein is 'destroyed' do **not** allow 'bacteria denatured' **or** 'protein killed'	1
9(b)(i)	any **two** from: • anaerobic respiration • lactic (production) • acid (produced)	do **not** allow 'bacteria are acidic' allow max **1** mark if incorrect named acid	2
9(b)(ii)	any **one** from: • thickens / clots / solidifies (milk) • kills other microorganisms **or** prevents other microbes growing • preserves yoghurt **or** prevents yoghurt going off **or** makes yoghurt last longer **or** keeps it fresh • reference to (improved) flavour	allow reference to germs	1
9(c)	reduce / prevent growth / reproduction of microorganisms **or** to prevent decay **or** to preserve it **or** to keep it fresh **or** to prevent it becoming <u>too</u> sour	allow reference to germs ignore curdling	1
Total			**5**