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 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.

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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

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.

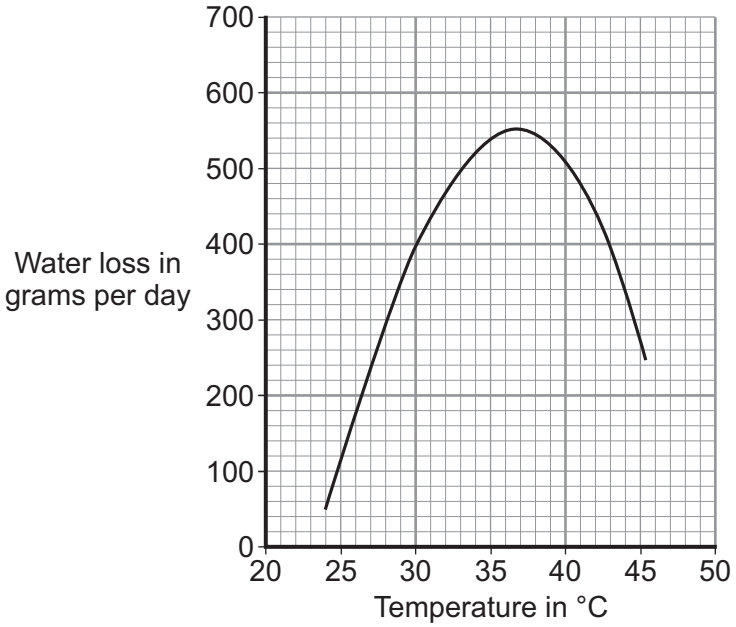
respiration.

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)

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.

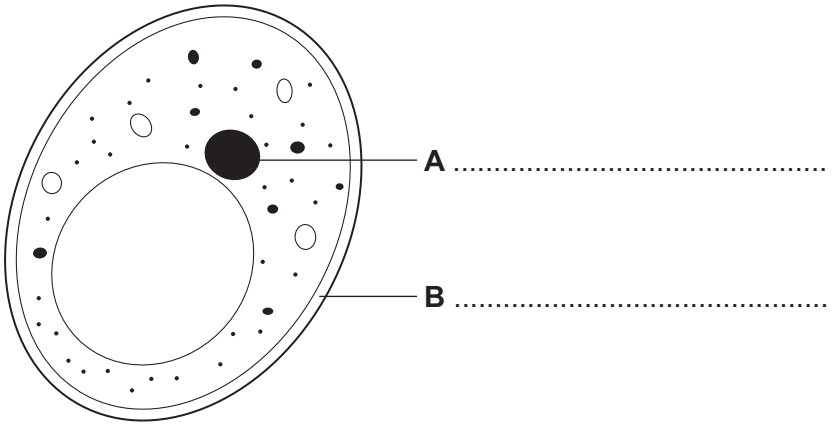
25 – 30 °C **30 – 35 °C** **40 – 45 °C**

(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**.

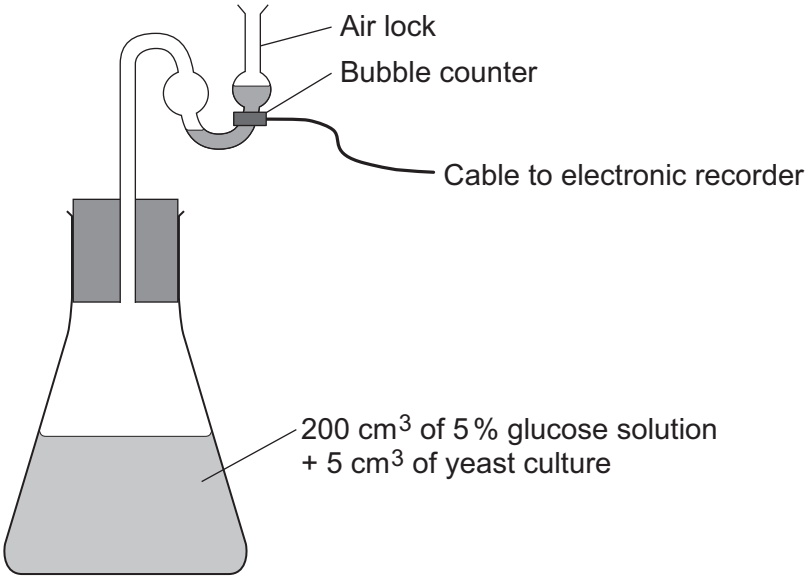
cell membrane	**cell wall**	**nucleus**	**vacuole**

(2 marks)

Question 3 continues on the next page

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)

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

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)

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)

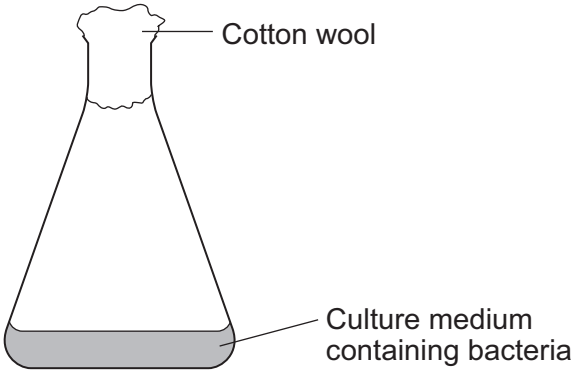
6

Turn over for the next question

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

Diagram 1 shows the flask.

Diagram 1



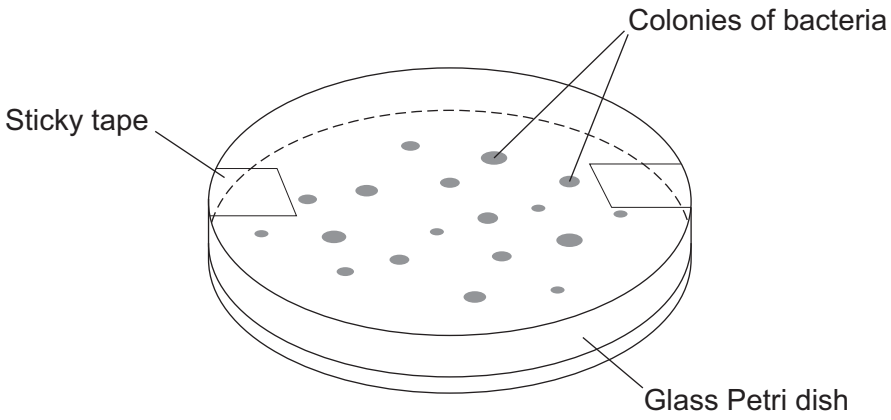
The students wanted to find the number of bacteria in 1 cm^3 of the culture medium.

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



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?

.....

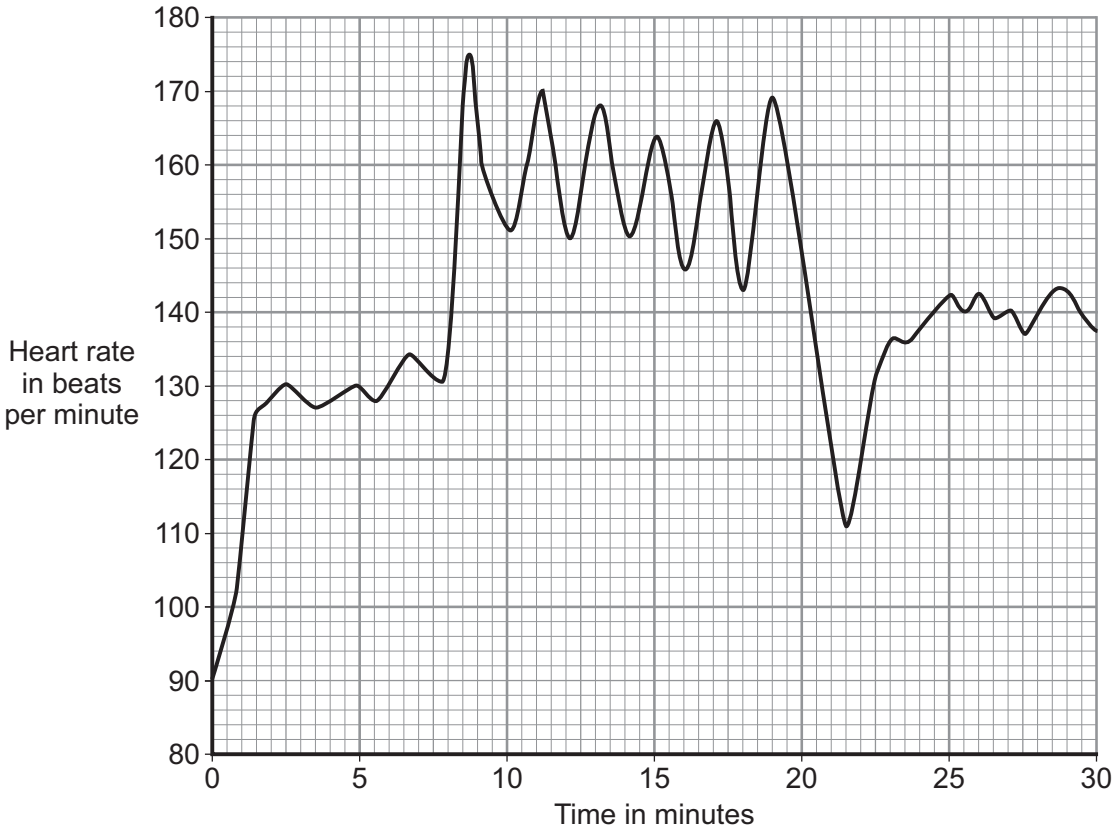
.....

(1 mark)

7

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)

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)

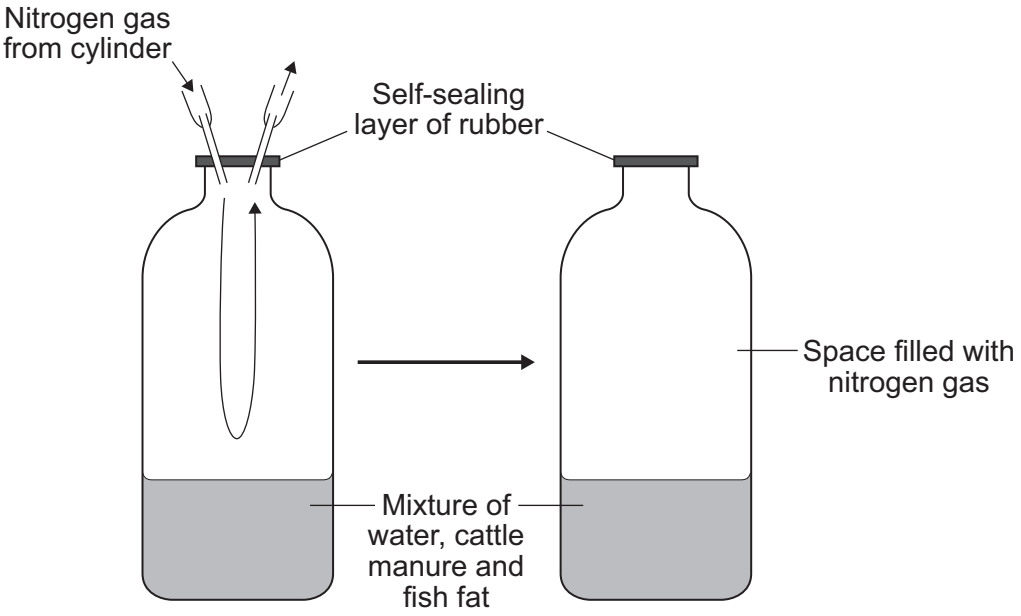
6

Turn over for the next question

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)

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

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