

# Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education  
Foundation Tier

**Additional Science**  
Unit Biology B2

**Biology 2F**

**Biology**  
Unit Biology B2

**F**

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>TOTAL</b>	

**For this paper you must have:**

- a ruler.

You may use a calculator.

**Time allowed**

- 60 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 space 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**

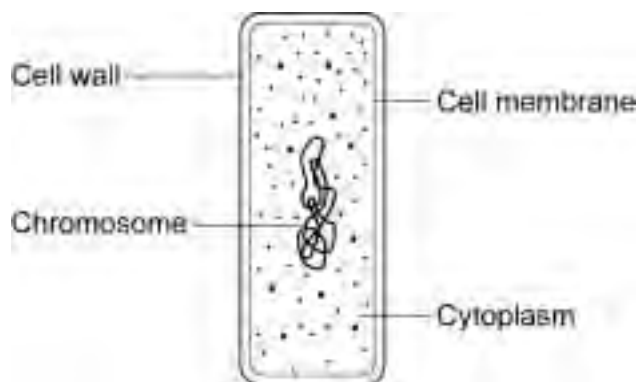
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8(b) should be answered in continuous prose.  
In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

**Advice**

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

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

- 1** The drawing shows the cell of a bacterium.



- 1 (a)** **List A** gives the four structures labelled on the diagram.

**List B** includes information about each structure.

Draw **one** line from each structure in **List A** to the correct information about the structure in **List B**.

List A Structure	List B Information
Cell membrane	controls the passage of substances in and out of the cell
Cell wall	where most of the chemical reactions take place
Cytoplasm	strengthens the cell
Chromosome	where there are genes
	helps the bacterium to move

(4 marks)

1 (b) Give **two** differences between an animal cell and the cell of a bacterium.

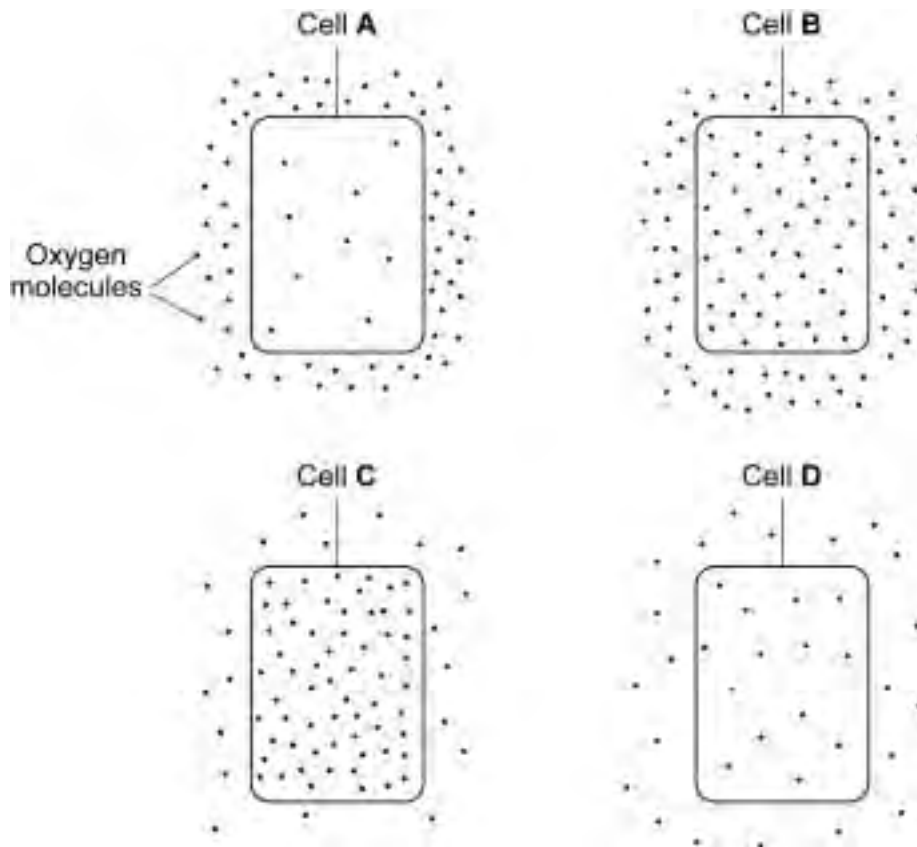
1 .....

2 .....

(2 marks)

1 (c) The diagrams show cells containing and surrounded by oxygen molecules.

Oxygen can move into cells or out of cells.



Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

Write the correct letter, **A**, **B**, **C** or **D**, in the box.

(1 mark)

1 (d) Complete the following sentence.

Oxygen is taken into the cell by the process of .....

(1 mark)

8
---

Turn over ►

**2** Babies find it difficult to digest proteins in their food.



Baby food manufacturers use enzymes to 'pre-digest' the protein in baby food.

**2 (a)** Use words from the box to complete the following sentences.

<b>amino acids</b>	<b>amylases</b>	<b>fatty acids</b>
<b>proteases</b>	<b>glucose</b>	<b>lipases</b>

Proteins are 'pre-digested' using enzymes called .....

The pre-digestion of protein produces .....

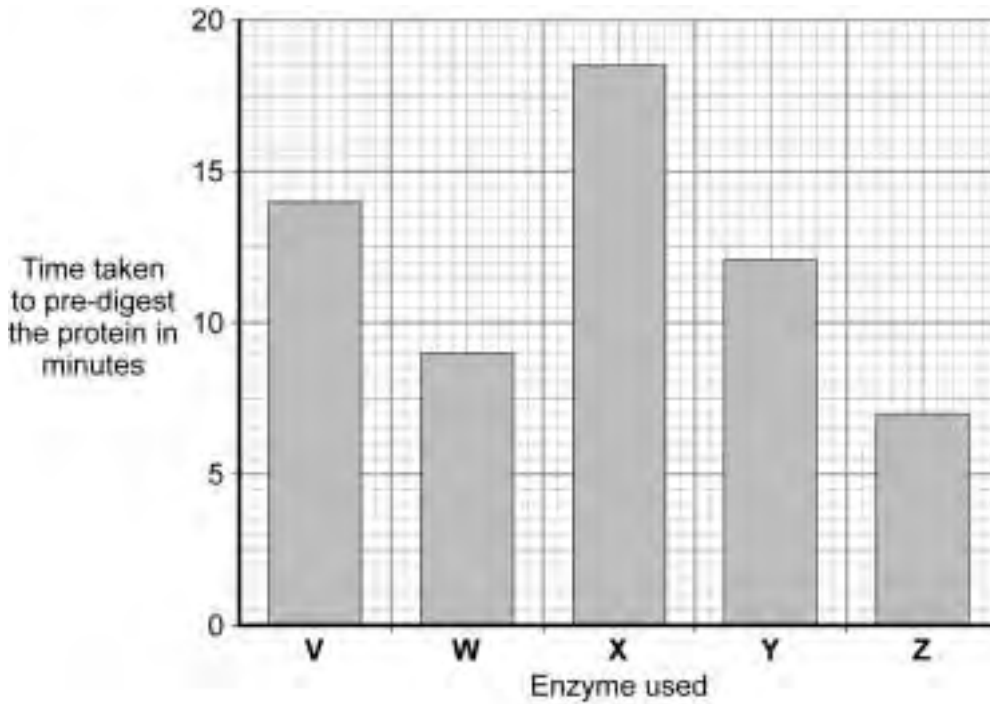
*(2 marks)*

**2 (b)** A baby food manufacturer uses enzyme **V** to pre-digest protein.

He tries four new enzymes, **W**, **X**, **Y** and **Z**, to see if he can reduce the time taken to pre-digest the protein.

The graph shows the time taken for the enzymes to completely pre-digest the protein.

The manufacturer uses the same concentration of enzyme and the same mass of protein in each experiment.



**2 (b) (i)** How long did it take enzyme **V** to pre-digest the protein? ..... minutes  
(1 mark)

**2 (b) (ii)** Which enzyme, **V**, **W**, **X**, **Y** or **Z**, would you advise the baby food manufacturer to use?

Enzyme

(1 mark)

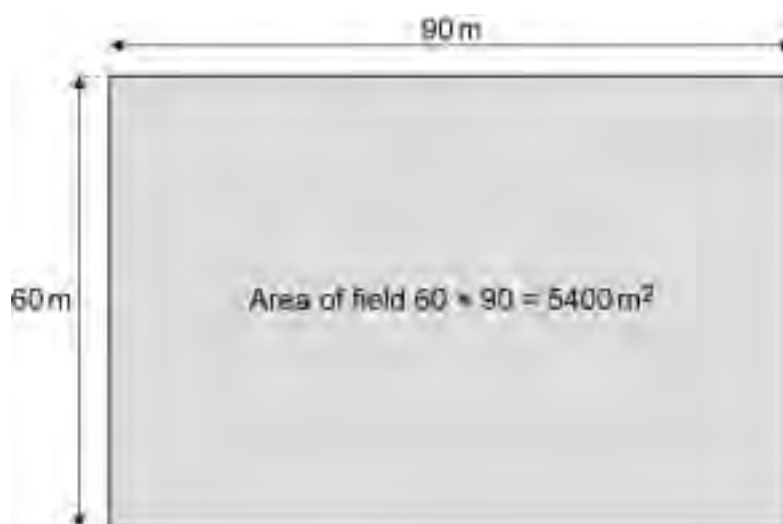
4
---

Turn over ►

- 3** A class of students was set the task of estimating the number of dandelions on the school field.

To do this, they decided to use sampling squares called quadrats.  
Each quadrat had an area of  $1 \text{ m}^2$ .

The diagram shows the dimensions of the school field.



- 3 (a)** Which is the best way of using quadrats in this investigation?

Tick (✓) **one** box.

Statement	Tick (✓)
Place all the quadrats where there are lots of plants.	
Place all the quadrats randomly in two different sample areas.	
Place all the quadrats where all four types of plant are growing.	

(1 mark)

- 3 (b)** Each student collected data by using 10 quadrats.

These are the results for one student, Mary.

Quadrat number	Number of dandelions
1	3
2	3
3	6
4	2
5	1
6	2
7	0
8	3
9	2
10	0

Calculate the mean number of dandelions per quadrat counted by Mary.  
Show clearly how you work out your answer.

.....

.....

Mean number of dandelions .....  
(2 marks)

- 3 (c)** Another student, Sharon, calculated a mean of 2.8 dandelions per quadrat from her results.

Estimate the number of dandelions in the whole field by using:

- a mean of 2.8 dandelions per quadrat
- information from the diagram on the opposite page
- the equation below.

Show clearly how you work out your answer.

estimated number of dandelions on field = mean number of dandelions per quadrat × number of quadrats that would fit into the field

.....

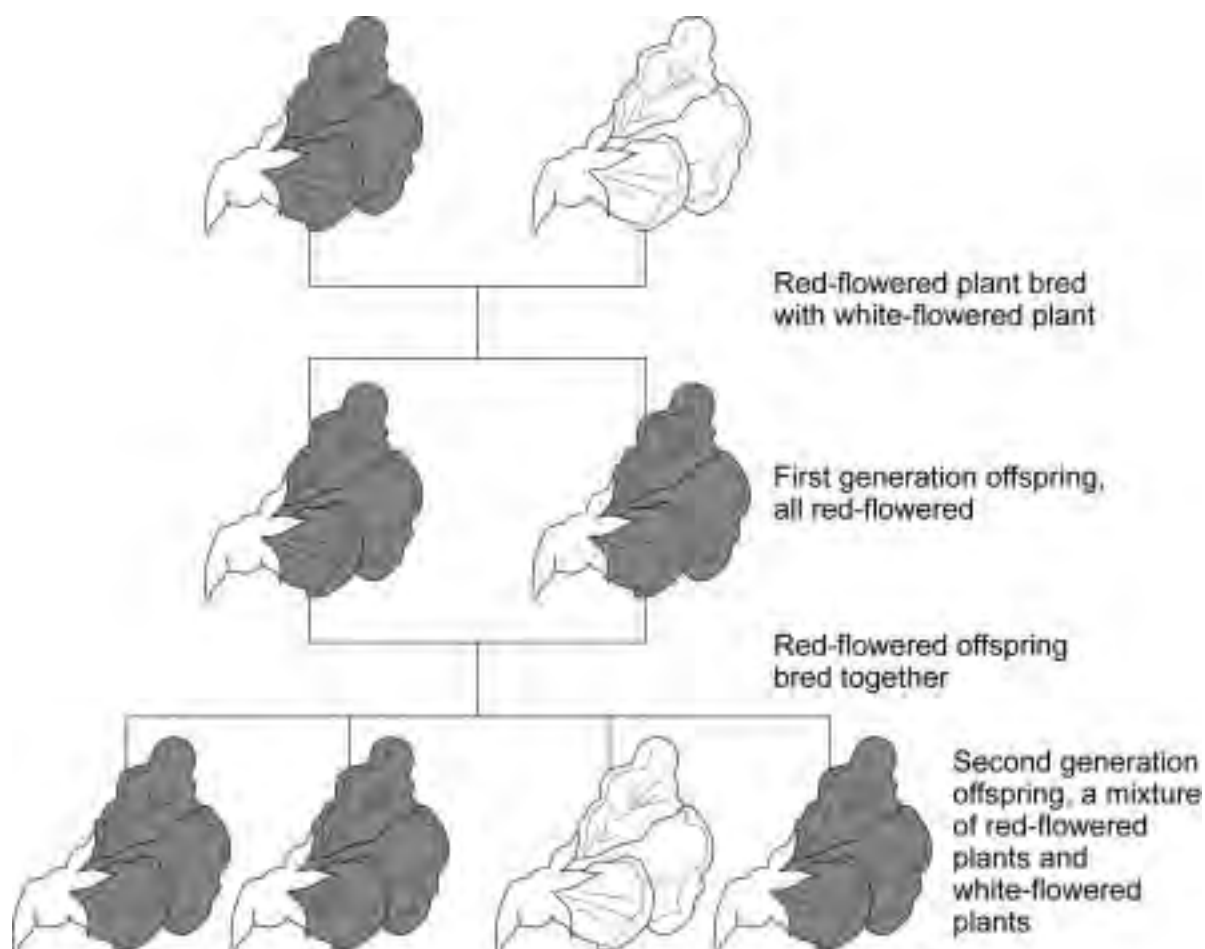
.....

Estimated number of dandelions.....  
(2 marks)

5
---

Turn over ►

- 4 The diagrams show one of Mendel's experiments.  
He bred pea plants.



Mendel suggested that flower colour was controlled by inherited factors.

Draw a ring around the correct answer to complete the following sentences.

- 4 (a) The first generation plants show that the red factor is

dominant.  
environmental.  
recessive.

(1 mark)

- 4 (b) The second generation plants show that the white factor is

dominant.  
environmental.  
recessive.

(1 mark)



4 (c) What do we call inherited factors?

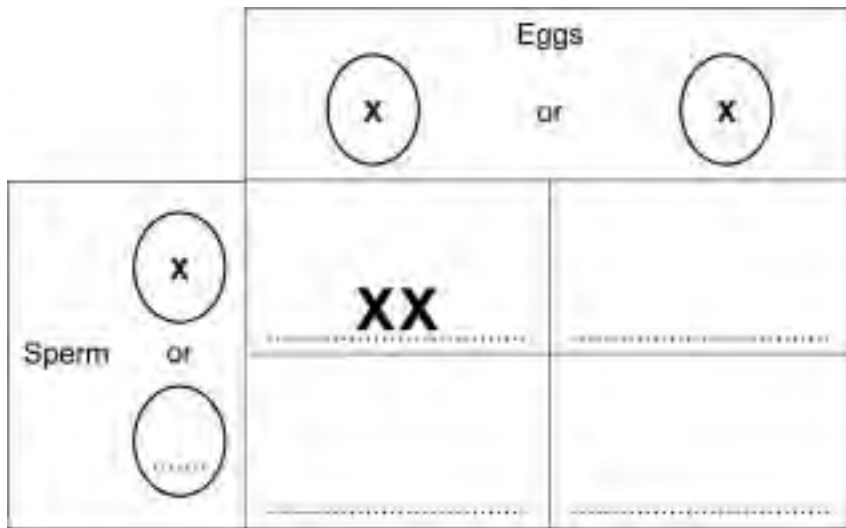
.....  
 (1 mark)

4 (d) How are inherited factors passed from generation to generation?

.....  
 (1 mark)

5 In humans, sex chromosomes control whether a person is male or female.

5 (a) Use letters X and Y to complete the Punnett square for sex inheritance.



(3 marks)

5 (b) A couple already have three boys.

What is the probability that their next child will be a girl?

.....  
 .....  
 (1 mark)

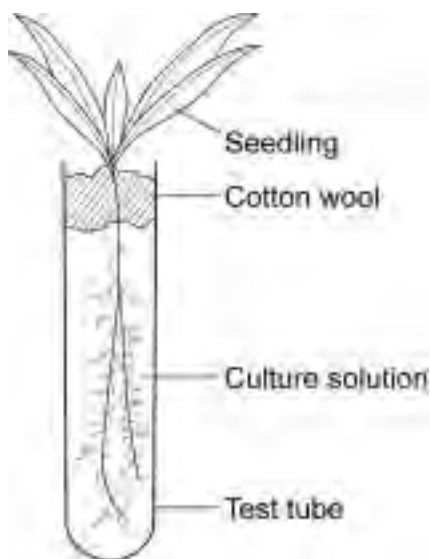
4

4

Turn over ►

6 Some students investigated the effect of nitrates on the growth of seedlings.

The diagram shows the apparatus the students used.



The students set up three test tubes.

- Tube **A** contained pure water.
- Tube **B** contained all the mineral salts that a seedling needs for healthy growth.
- Tube **C** contained all the mineral salts that a seedling needs for healthy growth, but **no** nitrate.

6 (a) Why did the students set up tubes **A** and **B**?

.....

.....

(1 mark)

**6 (b)** To make it a fair test, what should each of the tubes, **A**, **B** and **C**, contain?

.....

.....

(1 mark)

The table shows the students' results.

Tube	Solution in test tube	Mass of seedling after 14 days in g
<b>A</b>	Pure water	0.10
<b>B</b>	All the mineral salts a seedling needs for healthy growth	0.45
<b>C</b>	All the mineral salts a seedling needs for healthy growth but <b>no</b> nitrate	0.30

**6 (c)** Give **two** conclusions that you can make from the students' results.

1 .....

.....

2 .....

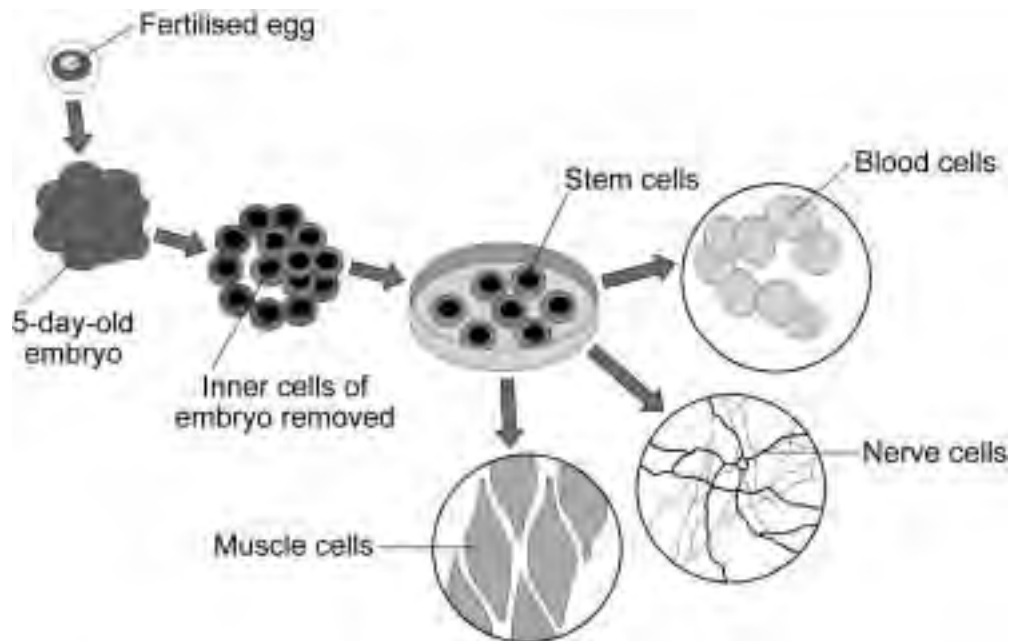
.....

(2 marks)

4
---

Turn over ►

- 7 The diagram shows how cells from human embryos can be used to grow 'replacement body parts' for humans.



- 7 (a) Complete the following sentences.

7 (a) (i) The fertilised egg has ..... sets of genetic information.

(1 mark)

7 (a) (ii) The fertilised egg divides to form the 5-day-old embryo by a process called .....

(1 mark)

**7 (b)** Some statements about stem cells are given below.

Tick (✓) **two** advantages and **two** disadvantages of using stem cells to grow 'replacement body parts' for humans.

	<b>Advantage Tick (✓)</b>	<b>Disadvantage Tick (✓)</b>
Stem cells can grow into many different kinds of body cells.		
Stem cells may grow out of control.		
Large numbers of stem cells can be grown in the laboratory.		
Stem cells may be used to treat some human diseases.		
Collecting and growing stem cells is expensive.		
Patients treated with stem cells may need to take drugs for the rest of their life to prevent rejection.		

(4 marks)

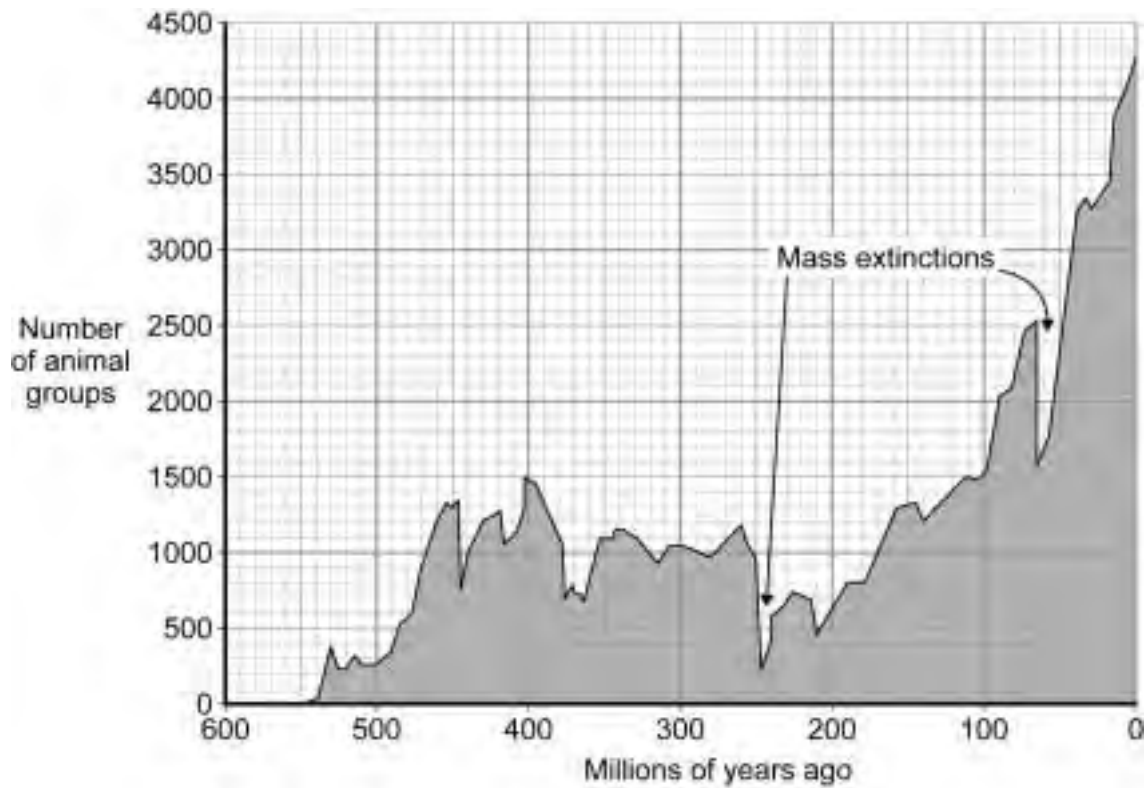
6

**Turn over for the next question**

**Turn over ►**

8 During evolution, many groups of animals have become extinct (died out).

8 (a) The graph shows how the number of animal groups has changed over time.



How has the number of animal groups changed between 200 million years ago and the present day?

.....

.....

(1 mark)

**8 (b)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe the different causes of the extinction of organisms.  
Your description should include possible reasons for the mass extinctions shown on the graph.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

7
---

**9** Energy is obtained from both aerobic and anaerobic respiration during exercise.

**9 (a)** Give **three** differences between aerobic and anaerobic respiration.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

**Question 9 continues on the next page**

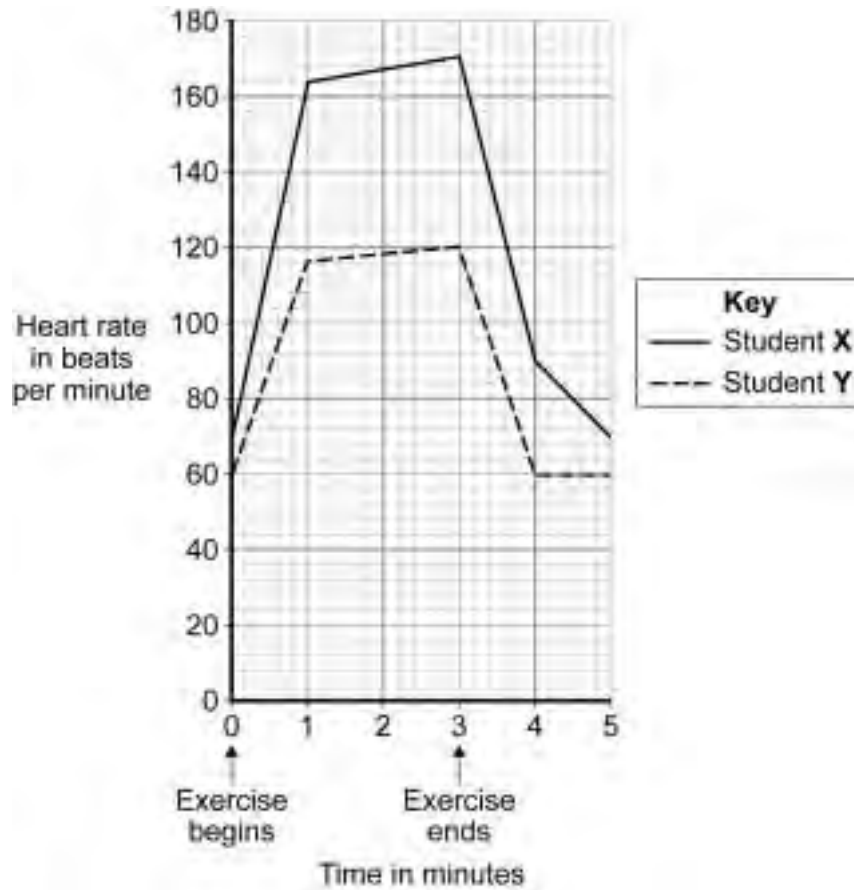
**Turn over ►**

9 (b) Two students did the same step-up exercise for 3 minutes.



One of the students was fit. The other student was unfit.

The graph shows how the students' heart rate changed during the exercise and after the exercise.





**9 (b)** Suggest which student was the fitter.

Draw a ring around your answer. **Student X / Student Y**

Give **three** reasons for your answer.

1 .....

2 .....

3 .....

(3 marks)

**9 (c)** Explain the advantage to the students of the change in heart rate during exercise.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

10

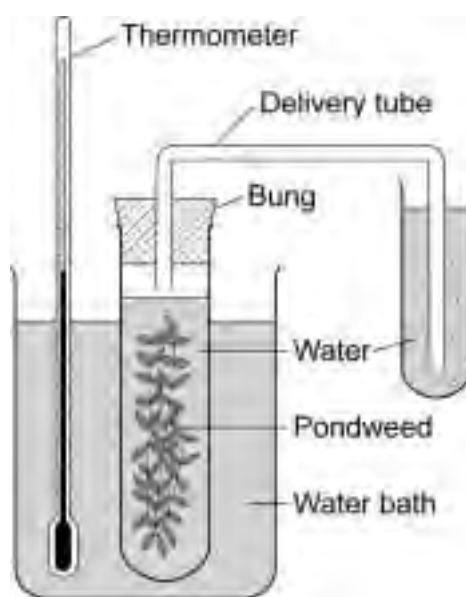
Turn over ►

**10** Plants produce food by photosynthesis.

**10 (a)** Complete the equation for photosynthesis.

carbon dioxide + ..... (+ light energy) → glucose + .....  
(2 marks)

Some students investigated the effect of temperature on the rate of photosynthesis in pond weed. They set up the apparatus and altered the temperature using ice and hot water. They counted the number of bubbles given off in a minute at different temperatures.

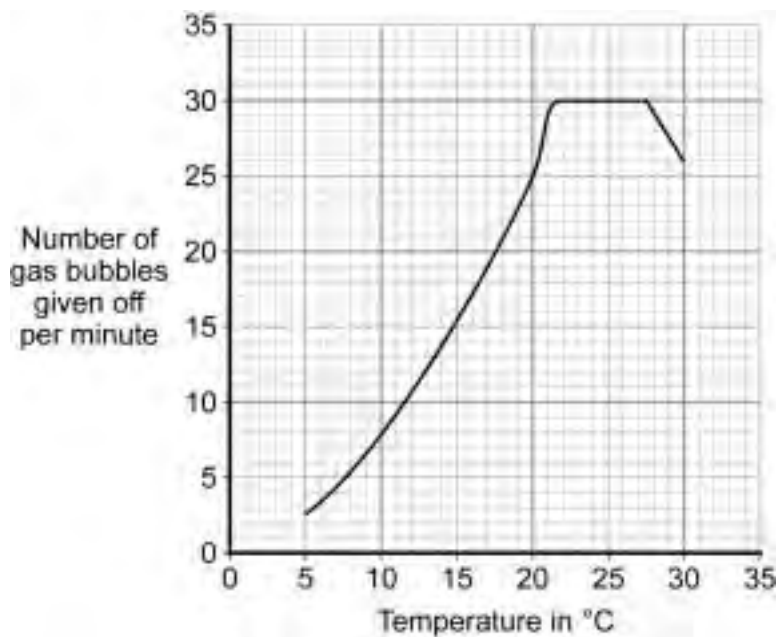


**10 (b)** Why did the students use a water bath?

.....  
.....

(1 mark)

The graph shows the students' results.



10 (c) Explain the shape of the graph between 22 °C and 27 °C.

.....

.....

.....

.....

(2 marks)

Question 10 continues on the next page

Turn over ►

**10 (d)** A farmer wants to grow lettuces as quickly and cheaply as possible in winter.

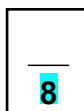
**10 (d) (i)** At what temperature should he keep his greenhouse to grow the lettuces as quickly and cheaply as possible?

.....°C  
(1 mark)

**10 (d) (ii)** Explain the reason for your answer.

.....  
.....  
.....  
.....  
.....  
.....

(2 marks)



**END OF QUESTIONS**

**ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS**

- Question 2 Thinkstock.com
- Question 7 Sue Medaris/University of Wisconsin-Madison
- Question 8 Harold L Levin, *The Earth Through Time*,© 2005, Reprinted with permission of John Wiley & Sons, Inc.
- Question 9 Thinkstock.com