

Surname	Centre Number	Candidate Number
Other Names		0

**GCSE**

4471/01

ADDITIONAL SCIENCE/BIOLOGY**BIOLOGY 2
FOUNDATION TIER**

A.M. TUESDAY, 13 May 2014

1 hour

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

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

Answer **all** questions.

1. Read the information about cocoa.

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



healthy cocoa pods



cocoa pods with pod rot

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

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

1.

2.

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

.....

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

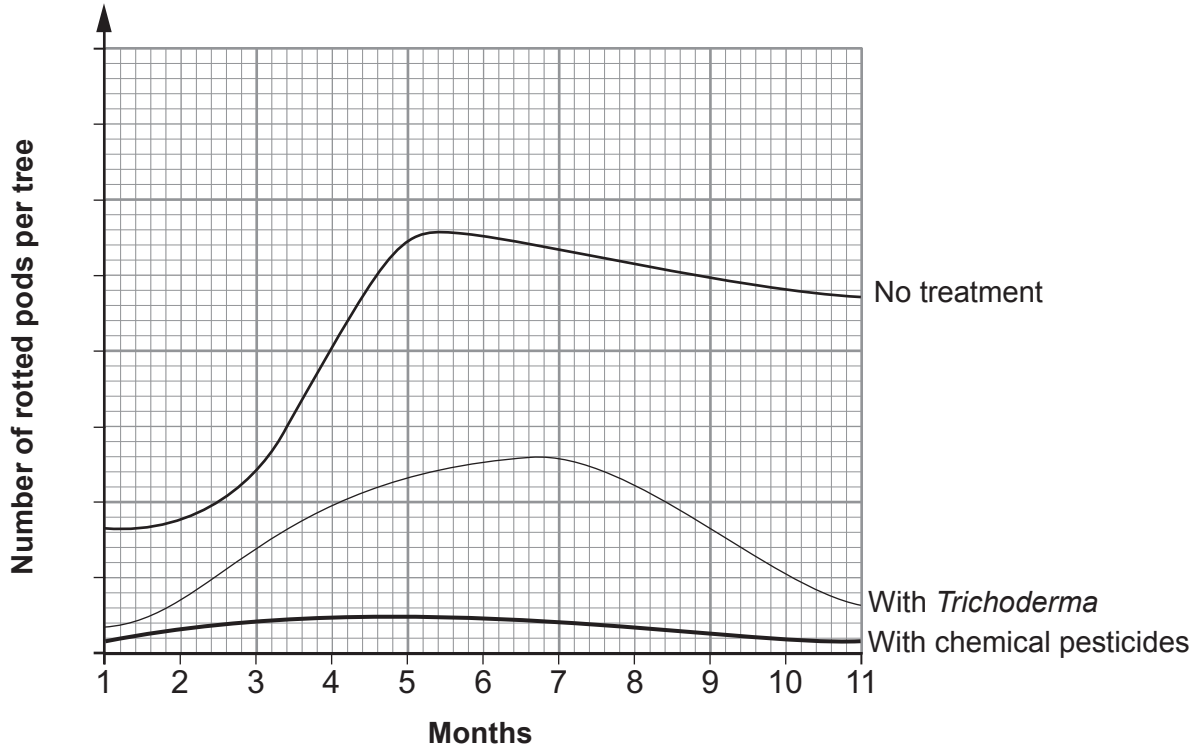
..... %

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

plant animal microbe

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

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

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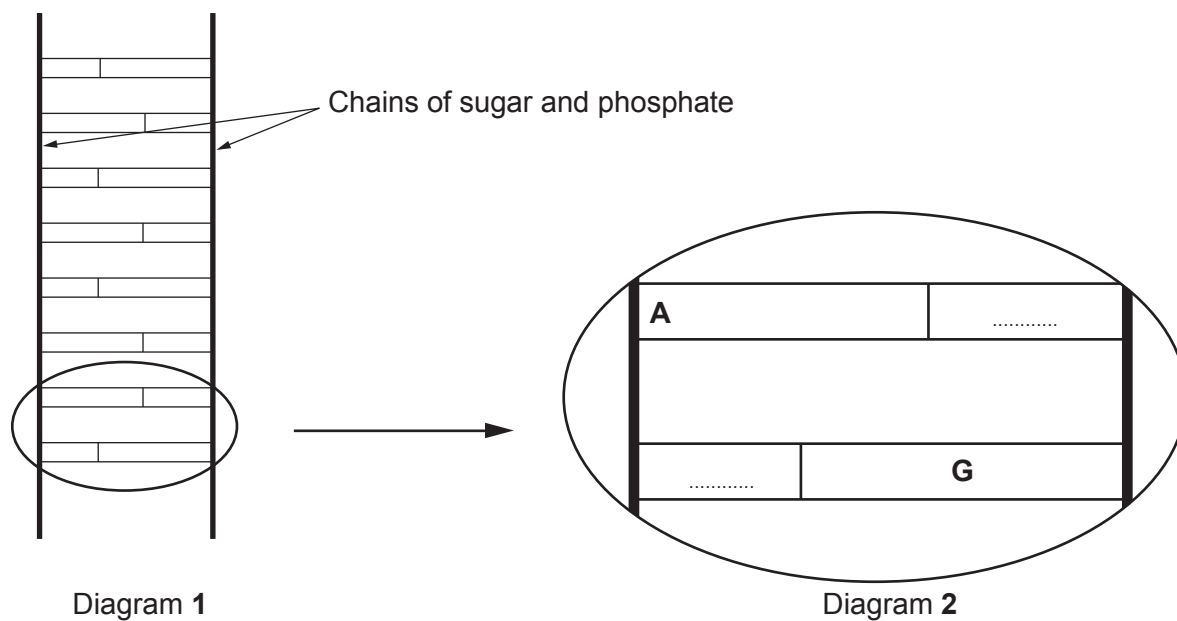
(ii) State **one** advantage of this type of pest control compared with using chemicals. [1]

.....
.....

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

.....

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



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

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

bases

acids

proteins

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

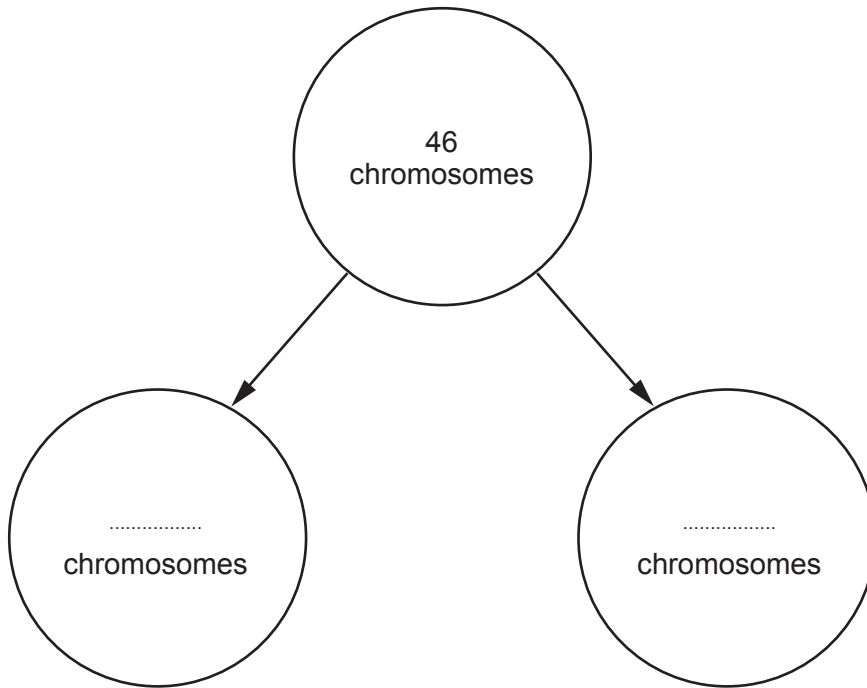
(b) (i) Which part of a living cell contains DNA? [1]

.....

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

.....

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



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

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

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

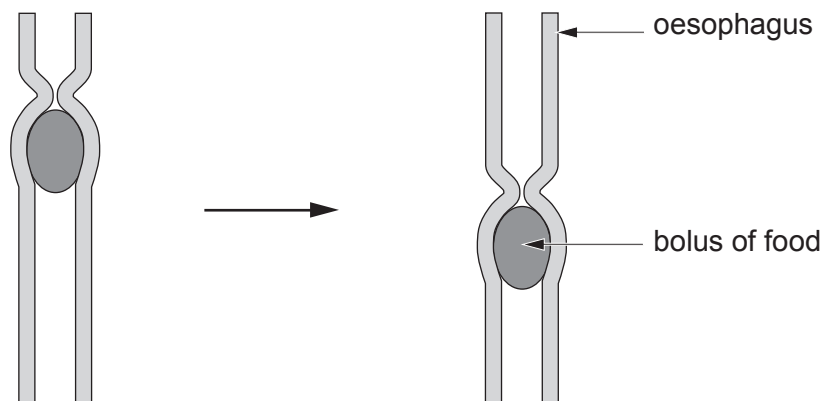
	mitosis	meiosis
number of new cells from each division	two
genes in new cells compared to original cell	different

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

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



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

.....

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

- A** stomach → oesophagus → large intestine → small intestine
- B** oesophagus → stomach → small intestine → large intestine
- C** stomach → small intestine → large intestine → oesophagus
- D** oesophagus → small intestine → stomach → large intestine

Answer

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

[3]

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only

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

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

[1]

.....

6

5. (a) Complete the sentence below.

[2] Examiner only

Enzymes, which are made of, control the rate of, reactions in living cells.

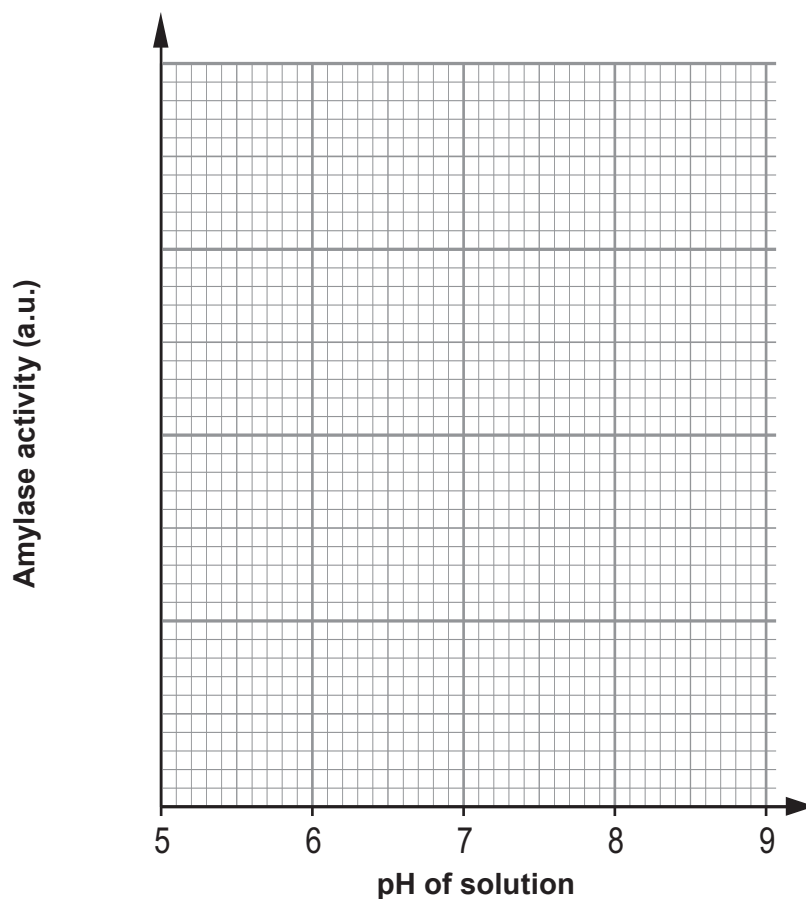
- (b) Students investigated the activity of the enzyme amylase, at different pH values. They used the same volumes of solutions and the same time at each pH.

Results of investigation

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

- (i) Draw a line graph of the results of the investigation on the grid below by
- I. choosing a suitable scale for the amylase activity;
 - II. plotting the results onto the grid;
 - III. joining your plots with a ruler.

[4]



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

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

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

Answer a.u.

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

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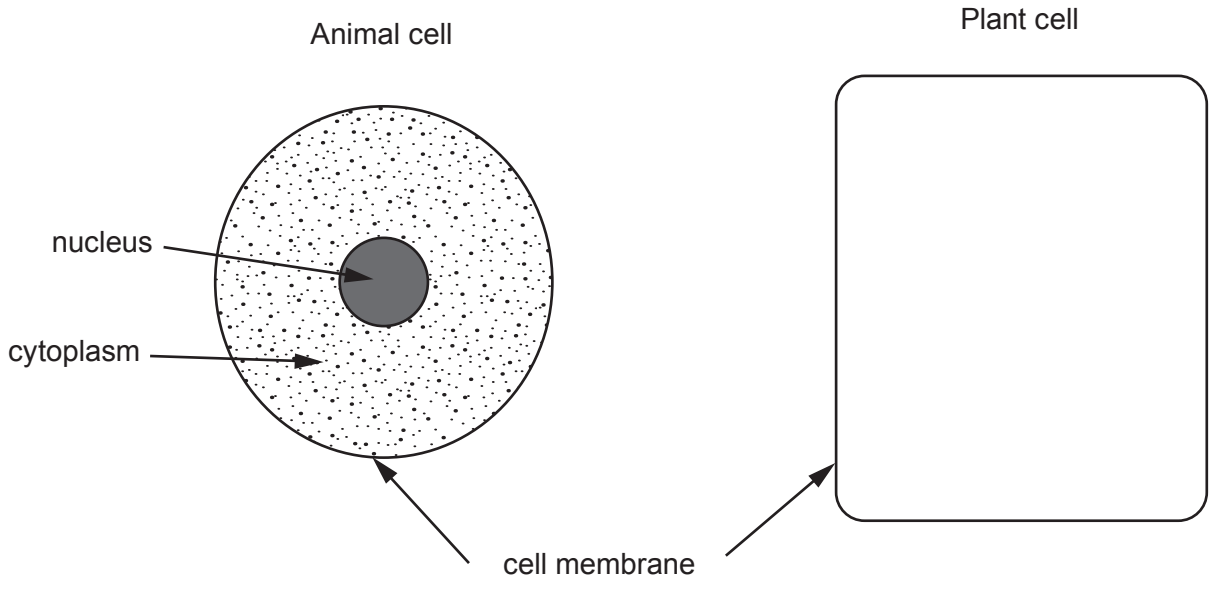
(c) Biological washing powders contain enzymes and are often used in the home. Explain the advantage of these powders. [2]

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

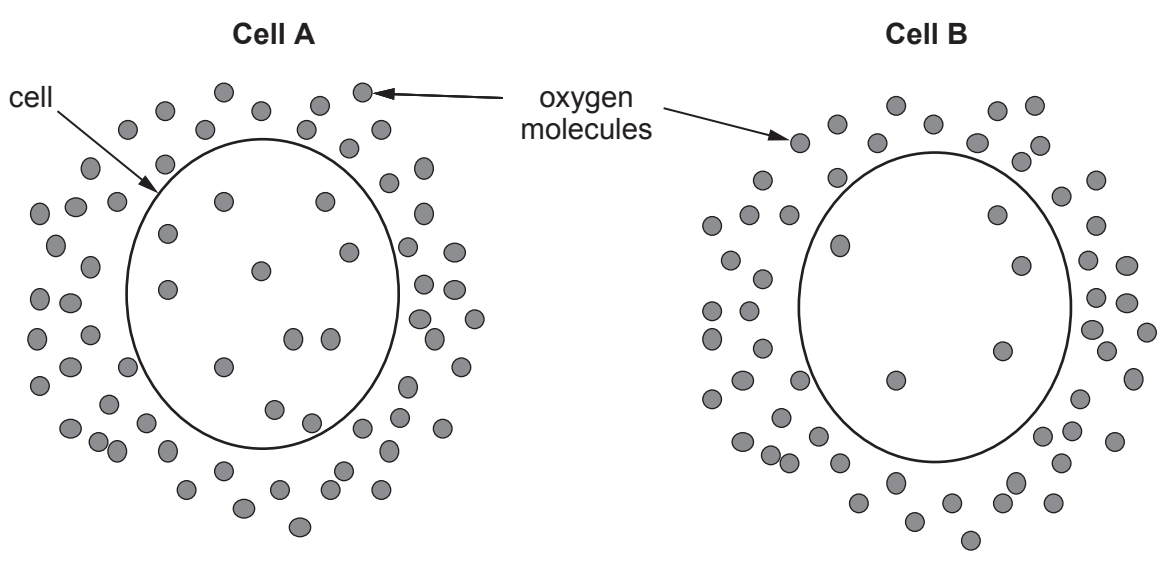


(ii) State the function of the cell membrane. [1]

.....

.....

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



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

[3]

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

into the cell

out of the cell

no net movement.

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

into the cell

out of the cell

no net movement.

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

cell **A**

cell **B**?

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

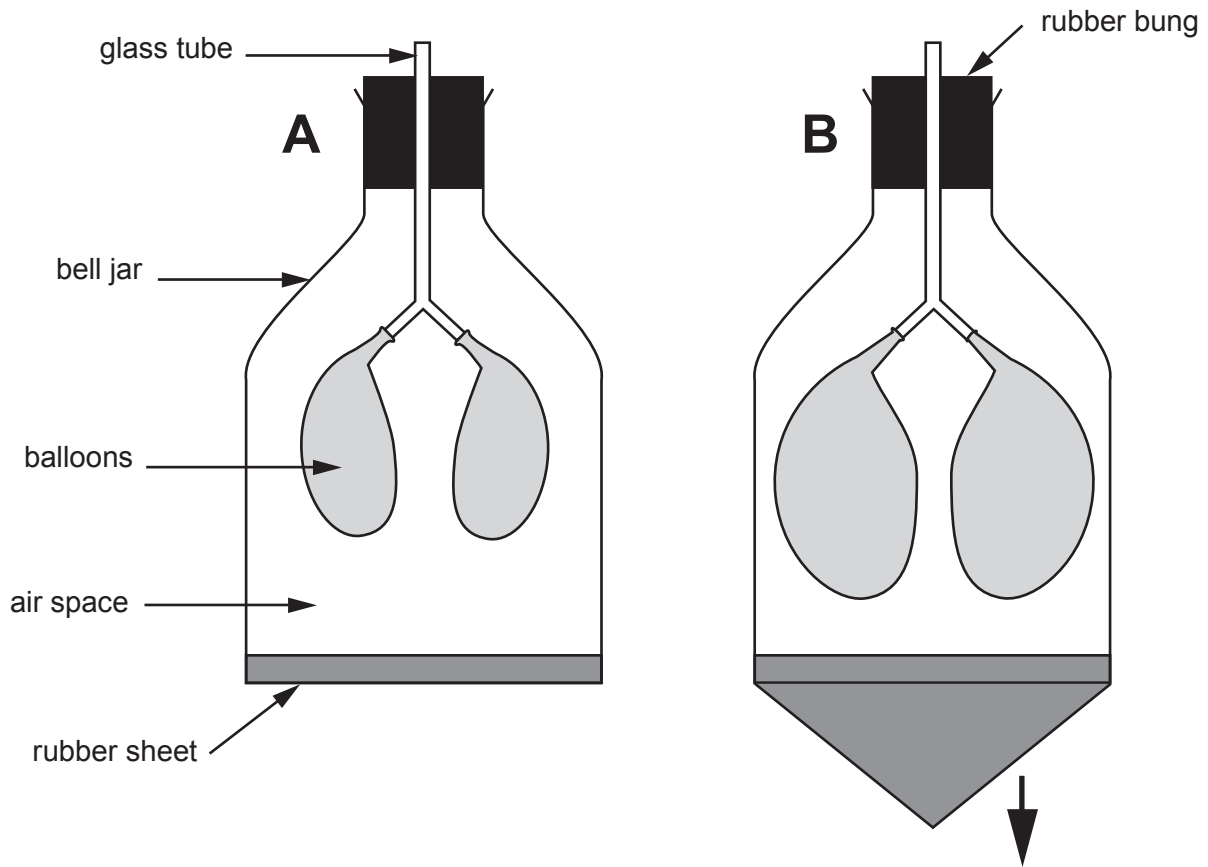
[1]

.....

7

Examiner only

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



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

- the same greater less**

- (i) Compared to diagram A, the 'lung' volume in diagram B is
- (ii) Compared to diagram A, the 'lung' pressure in diagram B is
- (iii) Compared to diagram A, the 'thoracic' volume in diagram B is
- (iv) Compared to diagram A, the 'thoracic' pressure in diagram B is

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

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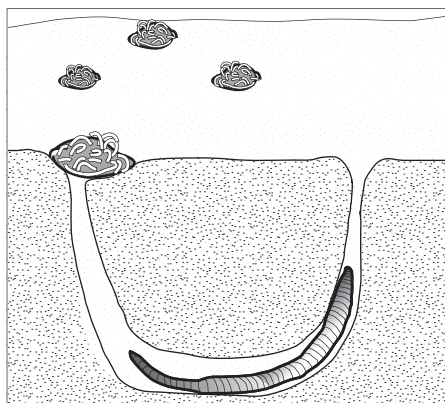
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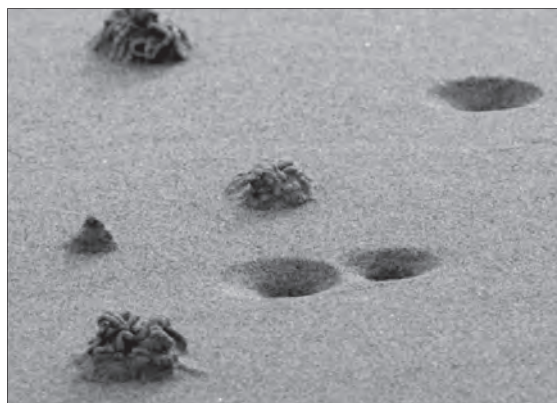
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8. Lugworms (*Arenicola marina*) live in burrows in the sand on beaches. At one end of the burrow is a hole and at the other end is a mound of sand, called the cast, which the lugworm has removed from the burrow. Each burrow is occupied by one lugworm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

Burrow in section



Surface view



© Alan Gravell

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

Owen decided to use 1 m^2 quadrats to estimate the number of lugworms present in an area of the beach measuring $80 \text{ m} \times 40 \text{ m}$.

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

Tick (✓) the correct answer.

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

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

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

- (i) Complete the table above by calculating the mean number of casts per quadrat of Owen's samples. [1]
- (ii) Estimate the number of lugworms in the section of the beach by using the following equation: [2]

$$\begin{array}{l} \text{Estimated} \\ \text{number of} \\ \text{lugworms} \end{array} = \begin{array}{l} \text{Mean number of} \\ \text{casts per quadrat} \end{array} \times \begin{array}{l} \text{Area of section} \\ \text{of beach} \end{array}$$

Estimated number of lugworms

- (c) Suggest why this method of sampling would **not** be suitable for estimating the population of earthworms in an area of grassland. [1]
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TURN OVER FOR QUESTION 9.

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

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END OF PAPER

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