

FOR OFFICIAL USE

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Total for
Sections B and C

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X007/201

NATIONAL THURSDAY, 27 MAY
QUALIFICATIONS 9.00 AM – 11.00 AM
2010

BIOLOGY
INTERMEDIATE 2

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

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Surname

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Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

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SECTION A (25 marks)

Instructions for completion of Section A are given on page two.

For this section of the examination you must use an HB pencil.

SECTIONS B AND C (75 marks)

- (a) All questions should be attempted.
(b) It should be noted that in **Section C** questions 1 and 2 each contain a choice.
- The questions may be answered in any order but all answers are to be written in the spaces provided in this answer book, **and must be written clearly and legibly in ink.**
- Additional space for answers will be found at the end of the book. If further space is required, supplementary sheets may be obtained from the Invigilator and should be inserted inside the **front** cover of this book.
- The numbers of questions must be clearly inserted with any answers written in the additional space.
- Rough work, if any should be necessary, should be written in this book and then scored through when the fair copy has been written. If further space is required, a supplementary sheet for rough work may be obtained from the Invigilator.
- Before leaving the examination room you must give this book to the Invigilator. If you do not, you may lose all the marks for this paper.



Read carefully

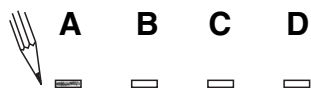
- 1 Check that the answer sheet provided is for **Biology Intermediate 2 (Section A)**.
- 2 For this section of the examination you must use an **HB pencil** and, where necessary, an eraser.
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate Number) and **Centre Name** printed on it.
Do not change any of these details.
- 4 If any of this information is wrong, tell the Invigilator immediately.
- 5 If this information is correct, **print** your name and seat number in the boxes provided.
- 6 The answer to each question is **either** A, B, C or D. Decide what your answer is, then, using your pencil, put a horizontal line in the space provided (see sample question below).
- 7 There is **only one correct** answer to each question.
- 8 Any rough working should be done on the question paper or the rough working sheet, **not** on your answer sheet.
- 9 At the end of the exam, put the **answer sheet for Section A inside the front cover of this answer book**.

Sample Question

Plants compete mainly for

- A water, light and soil nutrients
- B water, food and soil nutrients
- C light, water and food
- D light, food and soil nutrients.

The correct answer is **A**—water, light and soil nutrients. The answer **A** has been clearly marked in **pencil** with a horizontal line (see below).



Changing an answer

If you decide to change your answer, carefully erase your first answer and using your pencil, fill in the answer you want. The answer below has been changed to **D**.



SECTION A

All questions in this Section should be attempted.

1. Four thin sections of onion tissue were immersed in 5% sugar solution.

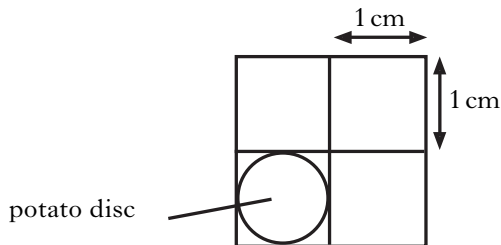
The sections were left for 15 minutes then viewed under a microscope.

The table below shows the percentage of cells plasmolysed in each section.

Section	Cells plasmolysed (%)
1	44
2	44
3	54
4	58

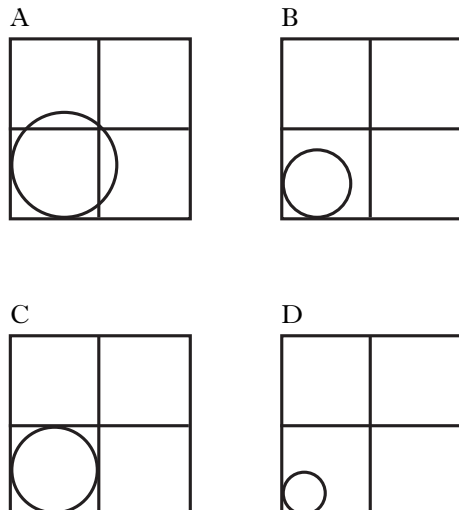
The average percentage of cells plasmolysed is

- A 44
 B 50
 C 54
 D 200.
2. The diagram below shows the initial diameter of a potato disc.



The potato disc was placed in a hypotonic solution for one hour.

Which of the following diagrams shows correctly the change in the diameter of the potato disc?



3. One of the properties of enzymes in the initiation of chemical reactions is that an enzyme

- A does not alter the energy input required
 B raises the energy input required
 C lowers the energy input required
 D raises then lowers the energy input required.

4. Which term refers to the process by which complex molecules are formed from simple molecules?

- A Digestion
 B Synthesis
 C Degradation
 D Respiration

5. Which of the following correctly describes amylase?

- A It breaks down starch into amino acids.
 B It builds up glucose-1-phosphate into starch.
 C It breaks down proteins into peptides.
 D It breaks down starch into maltose.

6. A plant cell, which was placed in a liquid, gained water by osmosis.

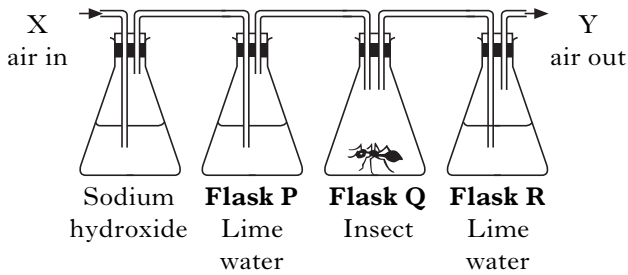
When compared to the liquid, the cell contents are described as being

- A plasmolysed
 B hypertonic
 C hypotonic
 D flaccid.

7. Which of the following increases in the muscles of an athlete and causes muscle fatigue during a race?

- A Lactic acid
 B Glucose
 C Oxygen
 D ATP

8. The following experiment was set up.



Sodium hydroxide solution absorbs carbon dioxide from air.

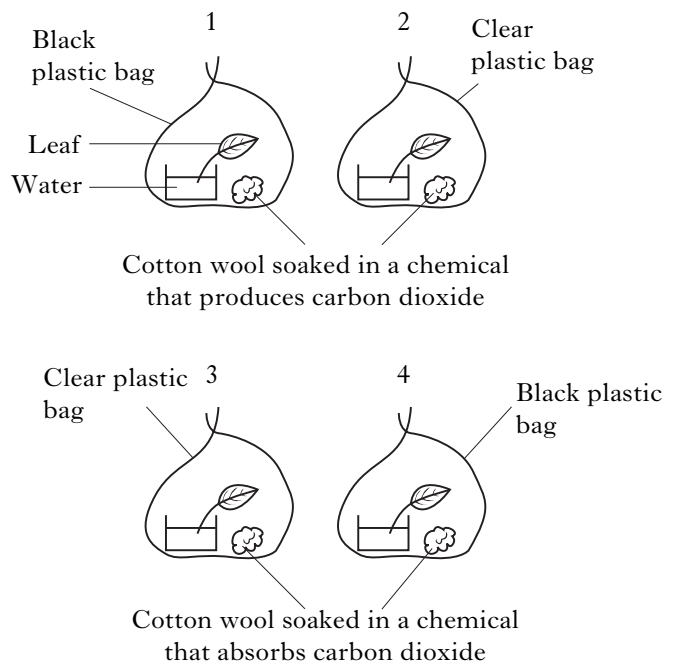
Lime water turns from clear to cloudy in the presence of carbon dioxide.

Air is drawn through the apparatus from X to Y, passing through each flask in turn.

Predict what would happen to the results if two insects were used in flask Q. The lime water in

- A Flask P turns cloudy more slowly
- B Flask P turns cloudy more quickly
- C Flask R turns cloudy more slowly
- D Flask R turns cloudy more quickly.

9. The diagrams below show four experiments used to investigate the conditions needed for photosynthesis.



After two days, the four leaves were tested for the presence of starch.

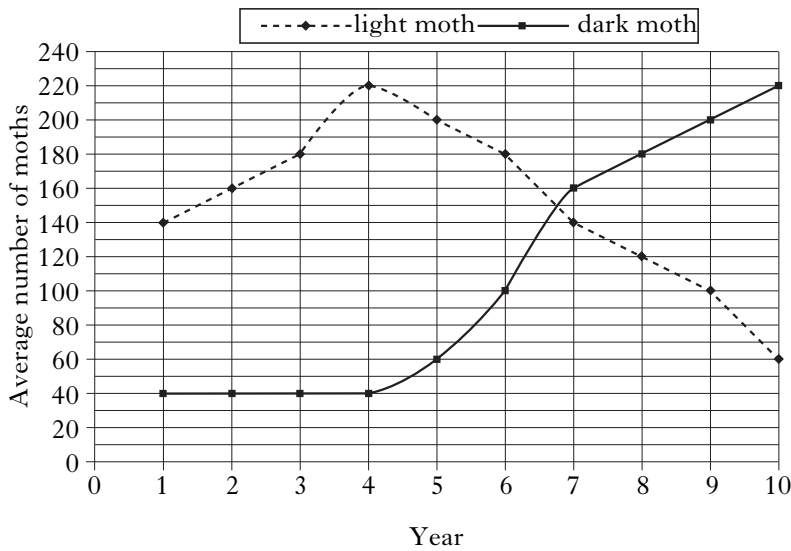
The results from which two experiments should be compared to show that carbon dioxide is needed for photosynthesis?

- A 1 and 2
- B 2 and 4
- C 2 and 3
- D 3 and 4

10. A species can be defined as a group of organisms which

- A breed together to produce fertile offspring
- B have the same phenotypes
- C contain the same number of chromosomes
- D contain identical genetic material.

11. The graph below shows the average number of peppered moths, in a woodland, in June of each year over a 10 year period.

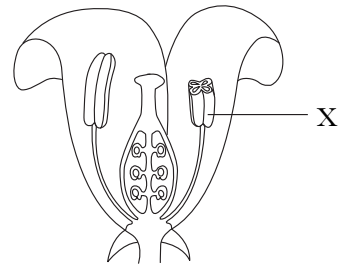


Studies have shown that an increase in the number of dark moths is related to an increase in the level of pollution in the atmosphere.

Which of the following best describes what would happen to the number of moths if measures were introduced to reduce air pollution in year 10?

	<i>Light moth</i>	<i>Dark moth</i>
A	decrease	increase
B	increase	decrease
C	increase	increase
D	decrease	decrease

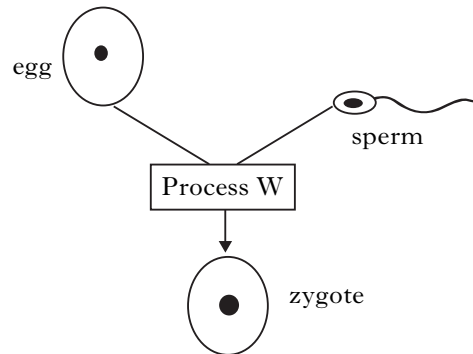
12. The diagram below shows the main parts of a flower.



Which line in the table identifies X and the type of gamete it produces?

	<i>Name of X</i>	<i>Type of gamete produced</i>
A	ovary	male
B	ovary	female
C	anther	female
D	anther	male

13. The diagram below shows a stage in the process of reproduction.



Process W is

- A meiosis
- B fertilisation
- C gamete production
- D random assortment.

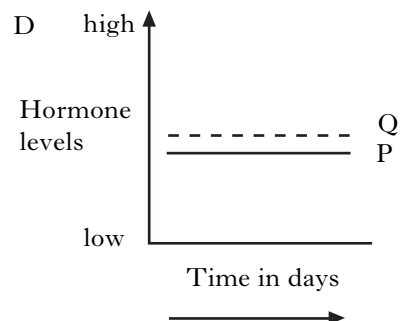
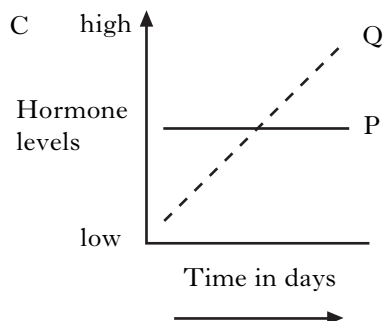
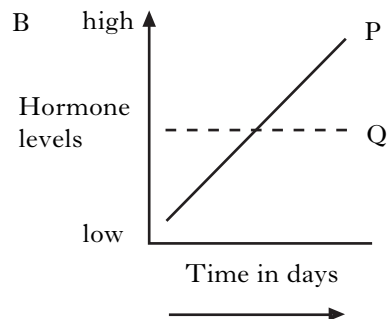
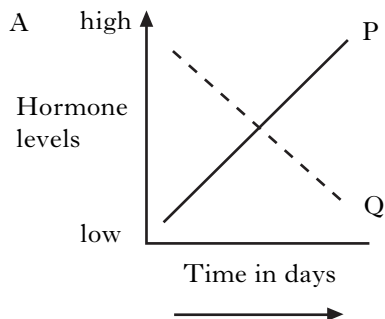
[Turn over

14. Sperm production in humans is controlled by two hormones, P and Q.

As levels of P rise, sperm production increases.

As levels of Q rise, sperm production decreases.

Which of the graphs below shows the changes in hormone levels of a man whose sperm production is decreasing?



15. DNA determines the structure and function of a type of molecule in the cell. The molecule is

- A protein
- B fat
- C amino acid
- D carbohydrate.

16. In humans, the allele for blood group A is dominant to the allele for blood group O.

Two parents both have blood group A. Their child has blood group O.

What is the best explanation for this pattern of inheritance?

- A The child has inherited the blood group directly from a grandparent.
- B The parents are homozygous for the blood group alleles.
- C The parents are heterozygous for the blood group alleles.
- D There has been a mutation in the blood group alleles.

17. Which line in the table below identifies correctly one advantage and one disadvantage of genetic engineering to make desired products?

	<i>Advantage</i>	<i>Disadvantage</i>
A	increased rate of production	cost of development
B	cost of development	possible release of genetically engineered bacteria into the environment
C	increased range of products	increased rate of production
D	increased rate of production	increased range of products

18. The table below shows the composition of a 200 cm³ serving of low fat milk.

Composition	200 cm ³ low fat milk provides
protein	6.0 g
carbohydrate	10.0 g
fat	0.2 g

What is the simplest whole number ratio of the mass of protein to carbohydrate to fat?

- A 3 : 5 : 0.1
 B 6 : 10 : 0.2
 C 30 : 50 : 1
 D 60 : 100 : 2
19. The table below shows the composition of inhaled air and exhaled air.

	Inhaled air (%)	Exhaled air (%)
Oxygen	20	16
Carbon dioxide	0.04	4

How many times greater is the oxygen concentration in inhaled air than in exhaled air?

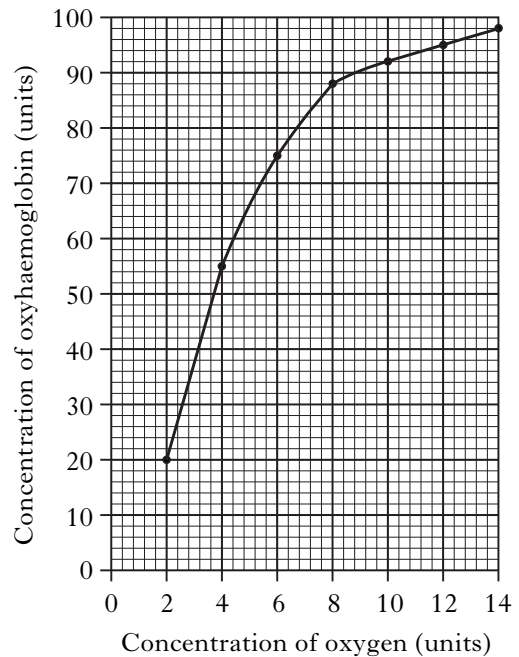
- A 0.08
 B 1.25
 C 4
 D 320
20. The list below refers to features of a capillary network.

- 1 It has a large surface area.
- 2 It is in close contact with tissue cells.
- 3 Capillaries are thin walled.

Which statements refer to features that allow efficient gas exchange?

- A 1 and 2 only
 B 1 and 3 only
 C 2 and 3 only
 D 1, 2 and 3

21. The graph below shows the relationship between oxygen concentration and the concentration of oxyhaemoglobin.

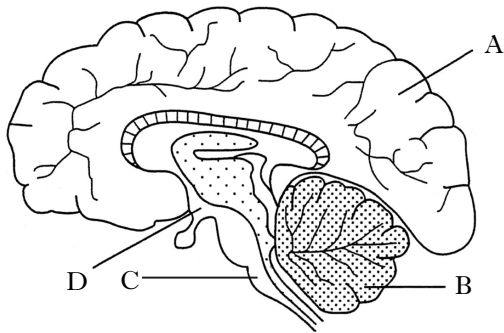


What is the percentage increase in the concentration of oxyhaemoglobin when the concentration of oxygen increases from 2 units to 4 units?

- A 2
 B 35
 C 55
 D 175
22. Which of the following produce antibodies?
- A Blood plasma
 B Lymphocytes
 C Macrophages
 D Red blood cells

[Turn over

23. The diagram below shows a human brain.



Which letter shows the site that controls heart rate and breathing rate?

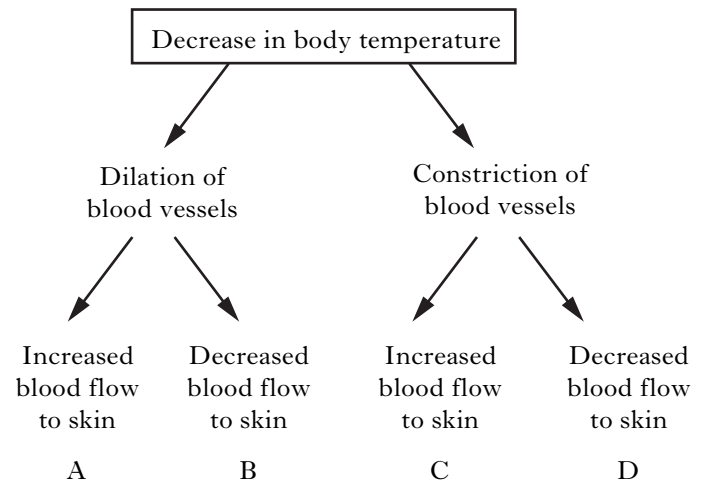
24. The following stages occur in a reflex action.

- 1 The effector produces a response.
- 2 A sense organ is stimulated.
- 3 An impulse passes along a sensory neurone.
- 4 An impulse passes along a motor neurone.

The correct order of the stages is

- A 2, 3, 4, 1
- B 2, 1, 4, 3
- C 1, 2, 3, 4
- D 3, 4, 1, 2.

25. Which of the following pathways shows the correct response by blood vessels in the skin to a decrease in body temperature?



Candidates are reminded that the answer sheet for Section A MUST be placed INSIDE the front cover of this answer book.

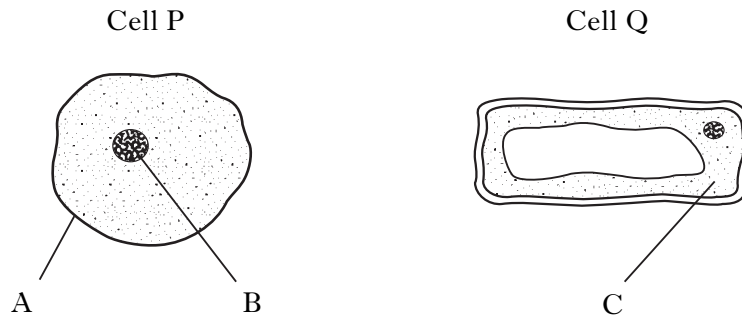
[Turn over for Section B on *Page ten*

Marks

SECTION B

**All questions in this section should be attempted.
All answers must be written clearly and legibly in ink.**

1. (a) The diagram below shows two cells P and Q.



(i) Complete the table below to give the name and function of the parts labelled A, B and C.

<i>Letter</i>	<i>Part</i>	<i>Function</i>
A	cell membrane	
B	nucleus	
C		site of cell activities

2

(ii) Which cell is a plant cell? Give a reason for your choice.

Cell _____

Reason _____

1

(b) Cells have commercial and industrial uses.

(i) One type of cell is used in the production of yoghurt.

(A) Name the type of cell used in the production of yoghurt.

1

(B) Name the milk sugar used by these cells.

1

Marks

1. (b) (continued)

- (ii) Underline **one** option in each set of brackets to make the following sentence correct.

Gasohol is produced when cells act on sugar to produce $\left\{ \begin{array}{l} \text{alcohol} \\ \text{methane} \end{array} \right\}$

which is then mixed with $\left\{ \begin{array}{l} \text{ethanol} \\ \text{petrol} \end{array} \right\}$.

1

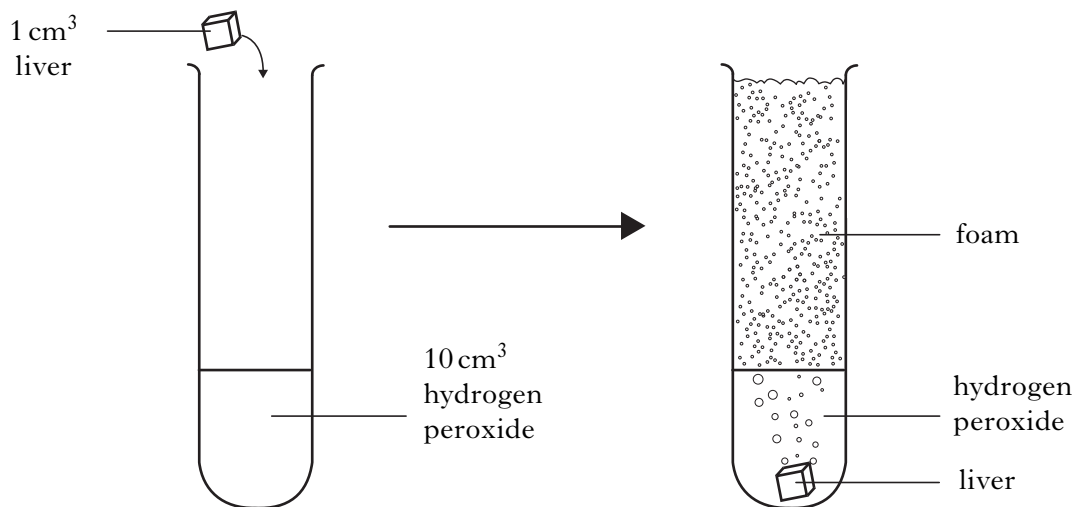
- (iii) Fungal cells are used to produce antibiotics. What is the function of antibiotics in the treatment of disease?

1

[Turn over

Marks

2. (a) Liver contains the enzyme catalase. A piece of liver was added to hydrogen peroxide and foam was produced as shown below.



- (i) Name the gas in the foam.

1

- (ii) Which other product was formed during this reaction?

1

- (iii) Describe a control which would be used to show that active catalase is needed for this experiment.

1

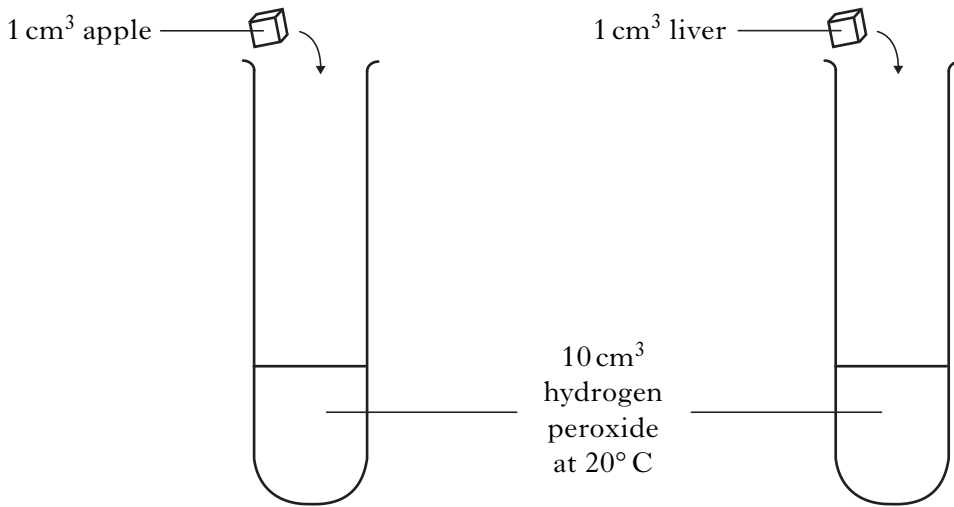
- (iv) How could the activity of catalase be measured in this experiment?

1

Marks

2. (continued)

(b) The diagram below shows an investigation to compare the activity of catalase in apple and liver.



State **two** variables, not shown in the diagram, that must be kept constant for a valid comparison.

1 _____

2 _____

2

(c) Explain why enzyme activity decreases at temperatures above the optimum.

1

[Turn over

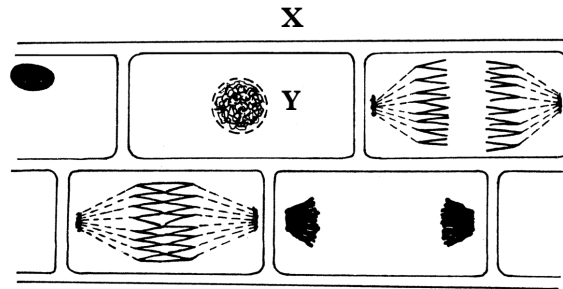
Marks

3. (a) Cells need ATP for cell division. ATP is produced during the aerobic respiration of glucose.

How many ATP molecules are produced per glucose molecule in this process?

1

- (b) The diagram below shows dividing root cells which carry out aerobic respiration.



Carbon dioxide is one waste product of aerobic respiration.

Tick (✓) the appropriate box below to show the direction of diffusion of carbon dioxide.

X → Y

Y → X

1

- (c) Aerobic respiration occurs in two stages. Name the first stage of aerobic respiration and a product, other than ATP.

Name _____

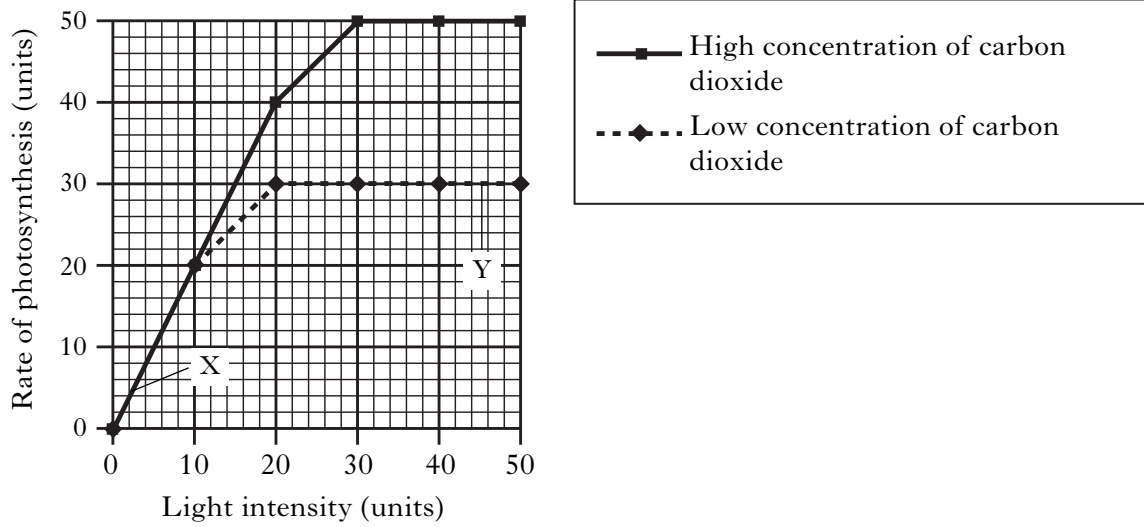
1

Product _____

1

Marks

4. The graph below shows the effects of two different environmental factors on the rate of photosynthesis.



- (a) What are the limiting factors at points X and Y?

X _____ 1

Y _____ 1

- (b) Suggest **one** way that the rate of photosynthesis can be measured.

_____ 1

- (c) During the first stage of photosynthesis, light energy is used.

- (i) Where is light energy trapped in the cell?

_____ 1

- (ii) State **one** use of this light energy.

_____ 1

- (d) (i) Name the second stage of photosynthesis.

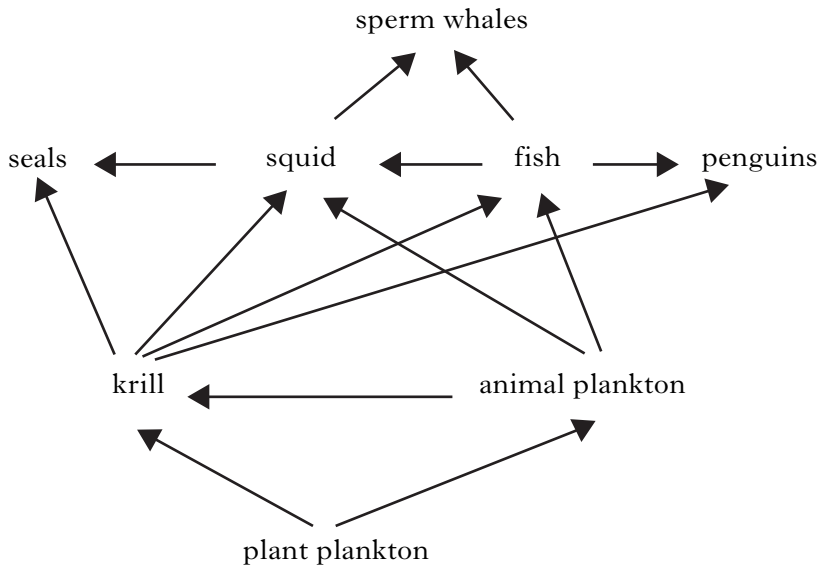
_____ 1

- (ii) Name the carbohydrate produced during the second stage of photosynthesis.

_____ 1

Marks

5. The diagram below shows part of an Antarctic food web.



(a) Explain why a decrease in sperm whale numbers may lead to an increase in seal numbers.

1

(b) Decide if each of the following statements is **True** or **False**, and tick (✓) the appropriate box.

If the statement is **False**, write the correct word in the **Correction box** to replace the word(s) underlined in the statement.

<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
In this food web, krill are <u>herbivores</u> .			
The population of <u>sperm whales</u> has the highest biomass.			
The range of species in a <u>population</u> is called biodiversity.			

3

Marks

6. (a) In shorthorn cattle, the allele for red coat colour (R) is co-dominant with the allele for white coat colour (W). Heterozygous shorthorn cattle have a mixture of red and white hairs and are described as “roan”.



- (i) State the genotype of white cattle.

1

- (ii) A red female and roan male were crossed. Complete the Punnett square below to show the expected results of this cross.

		<i>Genotype of gametes of roan male</i>	
<i>Genotype of gametes of red female</i>	R		
	R		

2

- (b) Seed mass in plants is controlled by several genes. Name this type of inheritance.

1

- (c) Decide if each of the following human characteristics shows **continuous** or **discontinuous** variation. Tick (✓) the appropriate boxes.

<i>Human characteristic</i>	<i>Type of variation</i>	
	<i>continuous</i>	<i>discontinuous</i>
Blood group		
Height		

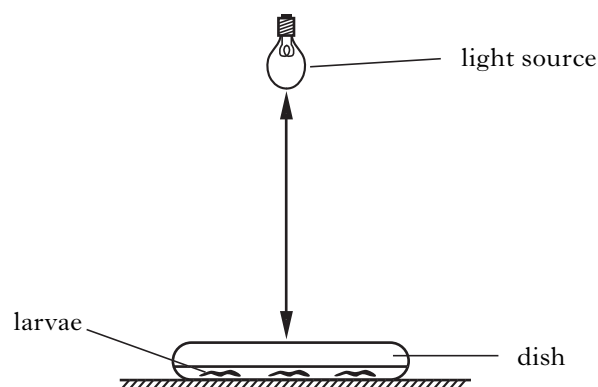
1

- (d) As an organism grows and develops, it is affected by environmental impact. What is the meaning of the term environmental impact?

1

Marks

7. Four groups of students investigated the effect of light intensity on the time taken for larvae to travel 10 cm. The light intensity was varied by moving the light source. The diagram below shows the apparatus.



The table below shows the results of this investigation.

<i>Light intensity</i>	<i>Time taken for larvae to travel 10 cm (s)</i>				
	<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>	<i>Group 4</i>	<i>Average</i>
High	20	22	24	22	22
Medium	39	42	47	44	43
Low	48	50	50	52	50
Very low	66	70	64	76	

- (a) Complete the table to show the average time taken to travel 10 cm in very low light intensity.

Space for calculation

1

- (b) Which light intensity showed the greatest **range** of results?

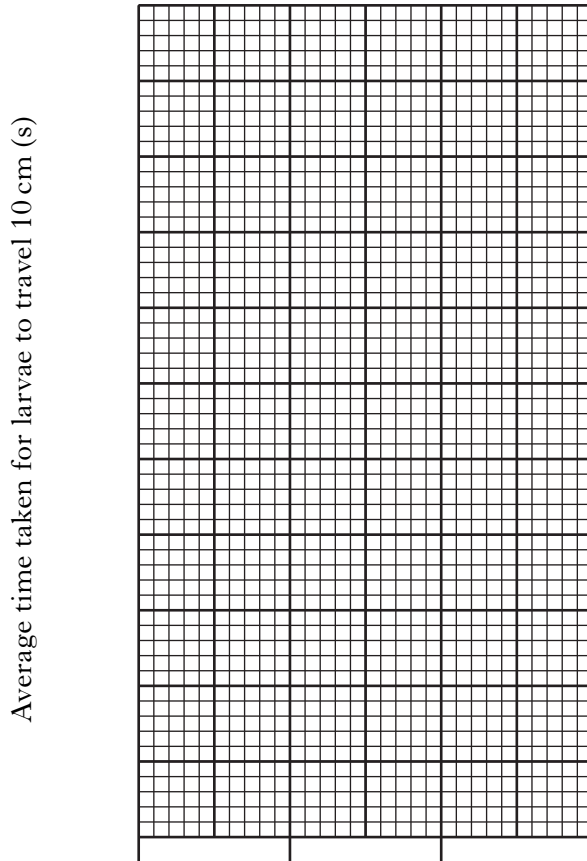
1

Marks

7. (continued)

- (c) On the grid below, plot a **bar graph** to show the **average** time taken for larvae to travel 10 cm in high, medium and low light intensity levels **only**.

(Additional graph paper, if required, will be found on *Page thirty*.)



3

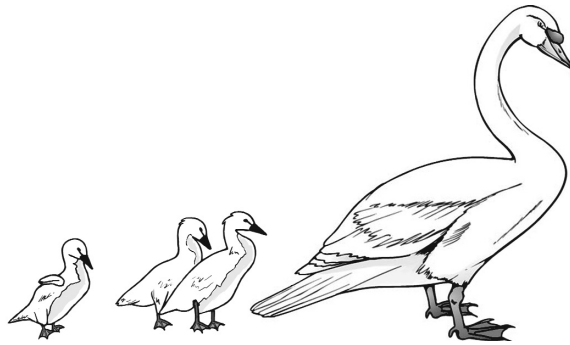
- (d) Describe the relationship between light intensity and time taken for larvae to travel 10 cm.

1

[Turn over

Marks

8. Swans and cygnets (young swans) live on the River Ayr. Foxes in the area kill and eat cygnets.



- (a) (i) Underline one option in each set of brackets to make the following sentences correct.

Cygnets are the $\left\{ \begin{array}{l} \text{predators} \\ \text{prey} \end{array} \right\}$ of foxes.

The foxes are $\left\{ \begin{array}{l} \text{primary} \\ \text{secondary} \end{array} \right\}$ consumers.

1

- (ii) Fifty cygnets were counted in 2008. By 2009, 18 of these cygnets had been killed by foxes. What percentage of the cygnets survived to 2009?

Space for calculation

_____ % 1

- (b) Dead adult swans were found throughout the year. It was discovered that the use of lead weights by anglers was poisoning the swans. Other animals in the river were also affected by the lead.

Suggest the effect of the lead on the biodiversity of a river ecosystem.

Explain your answer.

Effect _____

Explanation _____

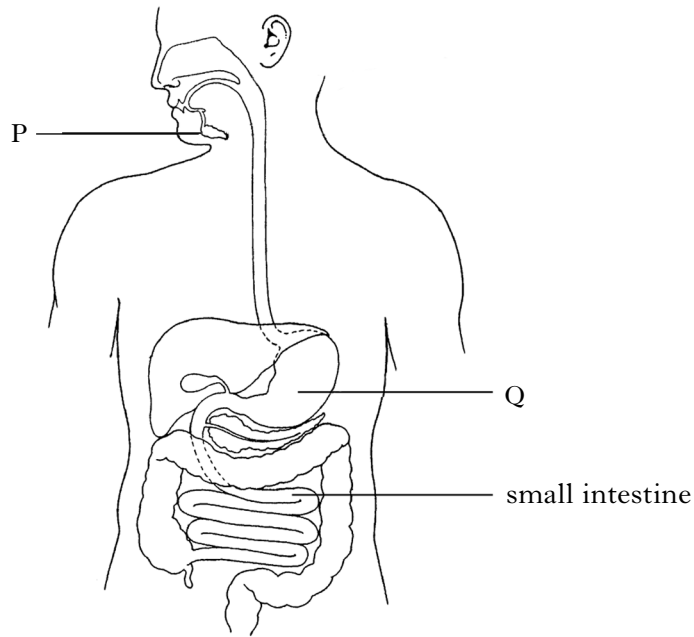
1

- (c) State another type of pollution which may affect biodiversity in the river.

_____ 1

Marks

9. The diagram below shows the human digestive system.



(a) Name the digestive enzymes produced by P and Q.

P _____

1

Q _____

1

(b) Describe how the action of peristalsis moves food through the small intestine.

2

(c) Give **two** features of the small intestine which increases the rate of absorption.

1 _____

1

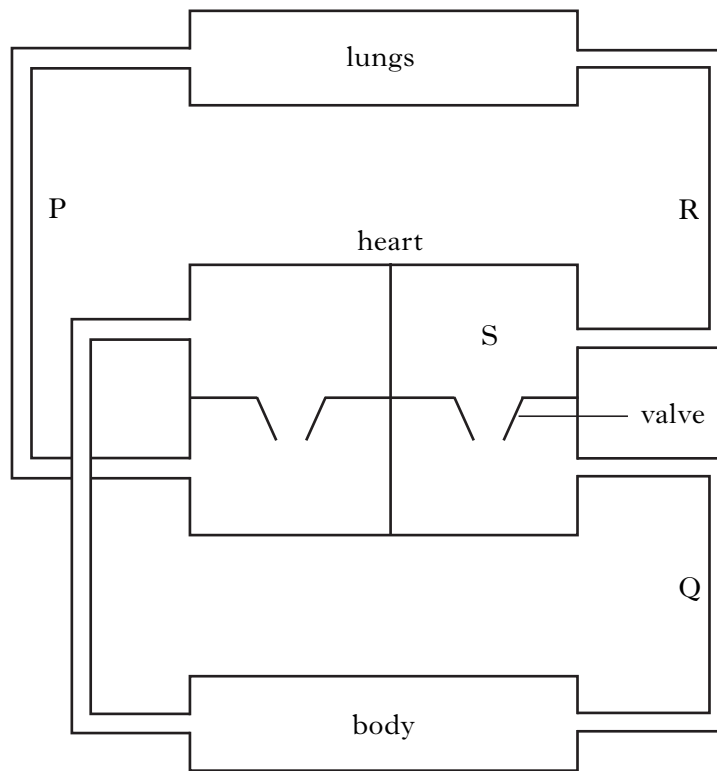
2 _____

1

[Turn over

Marks

10. The diagram below represents the human circulatory system.



(a) (i) Draw arrows at P and Q to show the direction of blood flow in these vessels.

1

(ii) State whether the blood is oxygenated or deoxygenated in vessels P and Q.

P _____

Q _____

1

(b) Name heart chamber S and blood vessel R.

Heart chamber S _____

1

Blood vessel R _____

1

(c) What is the function of the heart valves?

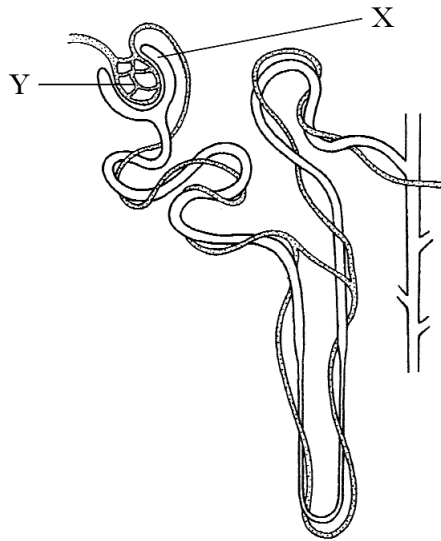
1

(d) Explain why a blocked coronary artery damages heart muscle.

1

Marks

11. The following diagram represents a kidney nephron.



- (a) The following sentences describe some processes that occur in the nephron.
Underline one option in each set of brackets to make the sentences correct.

The glomerulus is shown by letter $\left\{ \begin{array}{c} X \\ Y \end{array} \right\}$ and the process carried out in this structure is $\left\{ \begin{array}{c} \text{absorption} \\ \text{filtration} \end{array} \right\}$.

An increase in the hormone ADH causes $\left\{ \begin{array}{c} \text{less} \\ \text{more} \end{array} \right\}$ water to be taken back into the blood.

2

- (b) Urea is the nitrogenous waste product removed in the urine.
Where is urea produced?

1

- (c) What term is used for the control of water content in organisms?

1

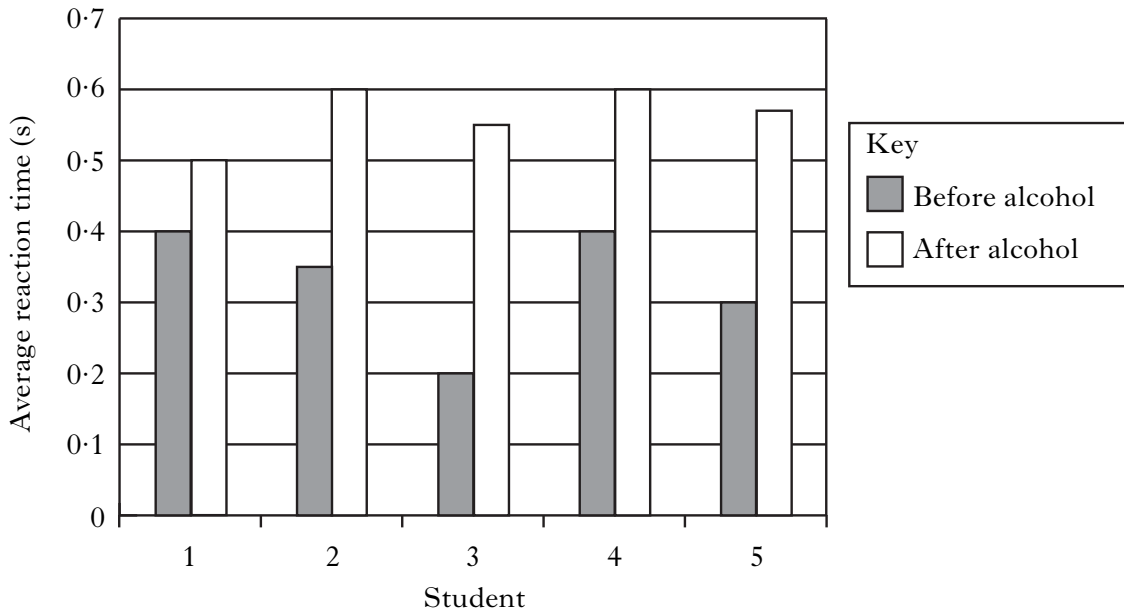
[Turn over

Marks

12. A scientist measured the reaction times of five students before and after drinking alcohol.

Average reaction times were calculated for each student.

The graph below shows their average reaction times before and after drinking alcohol.



- (a) What conclusion can be drawn from the results?

1

- (b) Why did the scientist calculate the **average** reaction times?

1

- (c) What is the percentage increase in the average reaction time for student 4 after drinking alcohol?

Space for calculation

_____ %

1

- (d) In this investigation, the students had to press a switch when a light flashed.
Which part of the brain coordinates this movement?

1

[Turn over for Section C on *Page twenty-six*

Marks

SECTION C

Both questions in this section should be attempted.

Note that each question contains a choice.

Questions 1 and 2 should be attempted on the blank pages which follow.

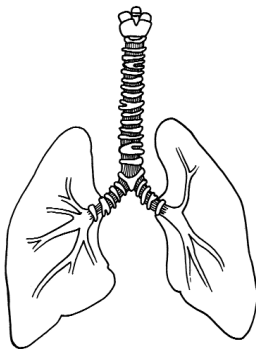
All answers must be written clearly and legibly in ink.

Supplementary sheets, if required, may be obtained from the Invigilator.

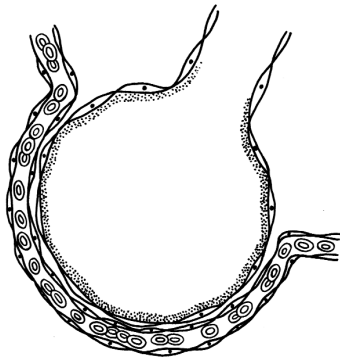
1. Answer **either A or B.**

A. The diagrams below show structures which are involved in the transport of oxygen.

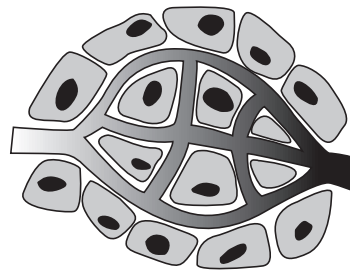
Lungs



Air sac



Capillary bed in the skin



Describe the path taken by oxygen through these structures from the air to a skin cell.

5

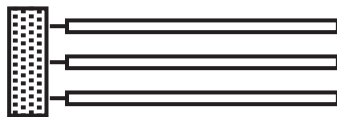
OR

B. The diagrams below represent the complex molecules of the three main food groups.

Carbohydrate



Fat



Protein



Give a role of each food group and describe these three molecules in terms of their chemical elements and simple structures.

5

Question 2 is on Page twenty-eight.

SPACE FOR ANSWER TO QUESTION 1

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[Turn over for Question 2 on *Page twenty-eight*

Marks

2. Answer **either** A **or** B.

Labelled diagrams may be included where appropriate.

A. Describe **three** structural adaptations of desert plants and explain how these adaptations increase their chances of survival.

5

OR

B. Describe the differences between the chromosomes in human body cells and human gametes. Explain how these chromosomes are involved in sex determination.

5

[END OF QUESTION PAPER]

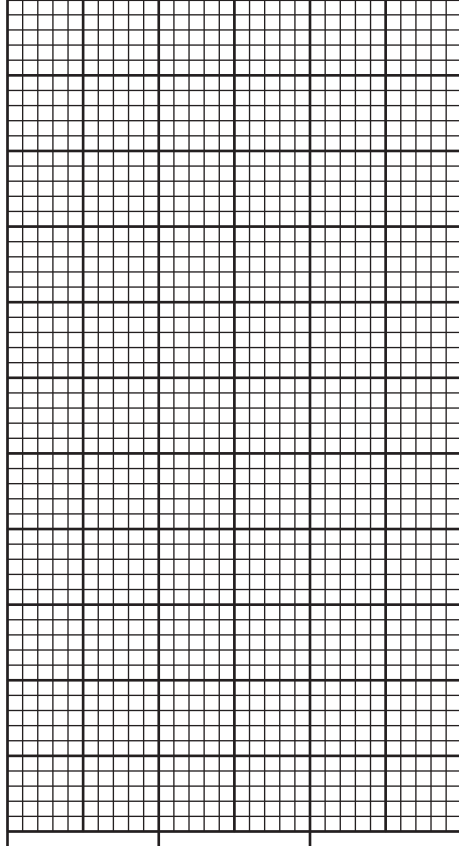
SPACE FOR ANSWER TO QUESTION 2

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ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 7(c)

Average time taken for larvae to travel 10 cm (s)



ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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