

FOR OFFICIAL USE

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Total for
Sections B and C

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X007/11/02

NATIONAL WEDNESDAY, 15 MAY
QUALIFICATIONS 9.00 AM – 11.00 AM
2013

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 examination, put the **answer sheet for Section A inside the front cover of this answer book**.

Sample Question

The thigh bone is called the

- A femur
- B humerus
- C tibia
- D fibula.

The correct answer is **A**—femur. 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**.



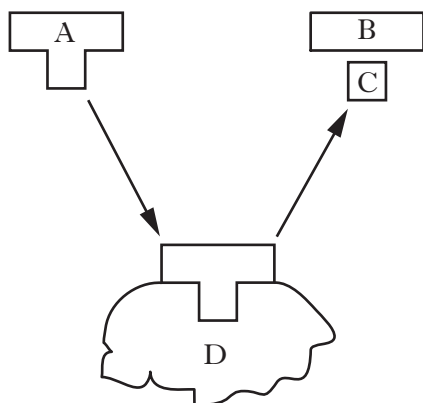
SECTION A

All questions in this Section should be attempted.

1. Enzymes act as catalysts because they

- A raise energy input
- B lower energy input
- C act on all substrates
- D are composed of protein.

2. The diagram below represents a degradation reaction involving an enzyme.



Which letter identifies the substrate?

3. The enzyme phosphorylase was added to a 4% glucose-1-phosphate solution. After one hour, the concentration of glucose-1-phosphate had fallen to 0.1%.

How many times lower was the concentration after one hour than at the start?

- A 97.5
- B 40.0
- C 3.9
- D 0.1

4. Which line in the table below correctly identifies the yield of ATP per glucose molecule in aerobic and anaerobic respiration?

	<i>Number of ATP molecules</i>	
	<i>Aerobic respiration</i>	<i>Anaerobic respiration</i>
A	2	18
B	2	38
C	18	2
D	38	2

5. Four reactions in the respiration pathway are shown below.

- 1 Glucose → pyruvic acid
- 2 Pyruvic acid → carbon dioxide + water
- 3 Pyruvic acid → lactic acid
- 4 Pyruvic acid → carbon dioxide + ethanol

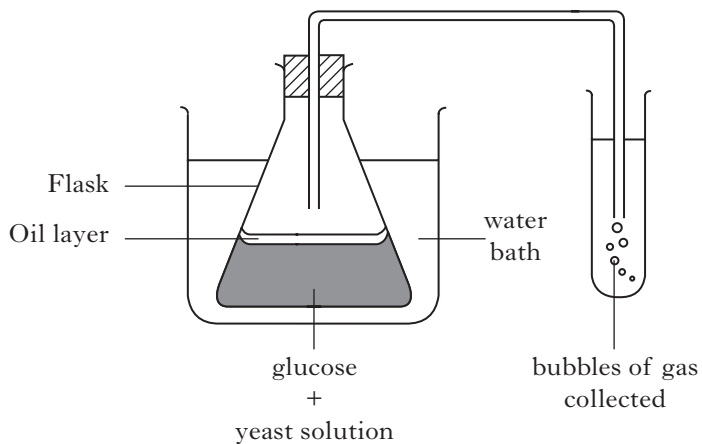
Which of the reactions can occur in yeast?

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

[Turn over

Questions 6 and 7 are based on the following information.

An investigation into anaerobic respiration in yeast was carried out.



6. The purpose of the oil layer in the flask is to ensure that

- A oxygen from the solution is not released into the flask
- B carbon dioxide from the flask does not enter the solution
- C oxygen from the air does not enter the solution
- D carbon dioxide from the solution is not released into the flask.

7. A control flask was set up to show that anaerobic respiration is due to the activity of yeast. The solution in the control flask was

- A yeast and glucose
- B dead yeast and glucose
- C yeast and water
- D dead yeast and water.

8. The table below shows the rate of photosynthesis in a plant, at 10°C and 15°C, in different light intensities.

Light Intensity (units)	Rate of Photosynthesis	
	10°C	15°C
2	4	5
4	10	15
6	15	30
8	22	45

At which light intensity was the rate of photosynthesis at 15°C found to be 50% greater than the rate at 10°C?

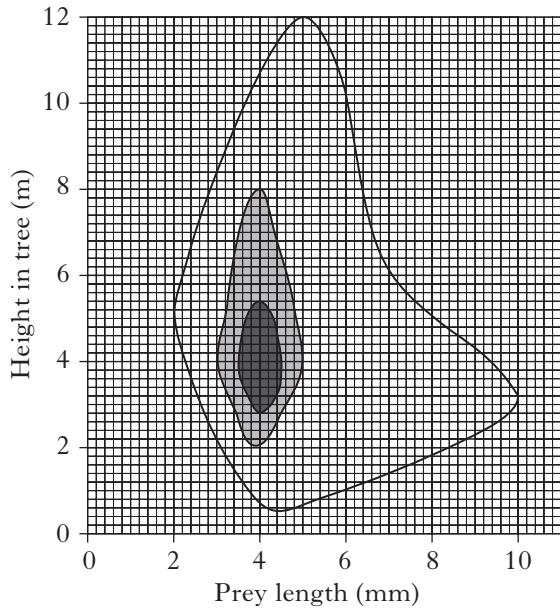
- A 2 units
- B 4 units
- C 6 units
- D 8 units

9. The Treecreeper is a bird which feeds on small insects on the bark of trees during the day.

What is the correct description of the Treecreeper's niche?

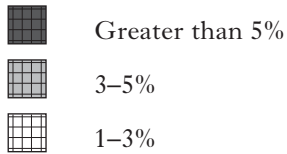
- A The place where it lives
- B The insects on which it feeds
- C The plants and animals in the woodland environment
- D Its role within the woodland ecosystem

10. The graph below shows information about the height a bird feeds at and the length of its prey.



Key

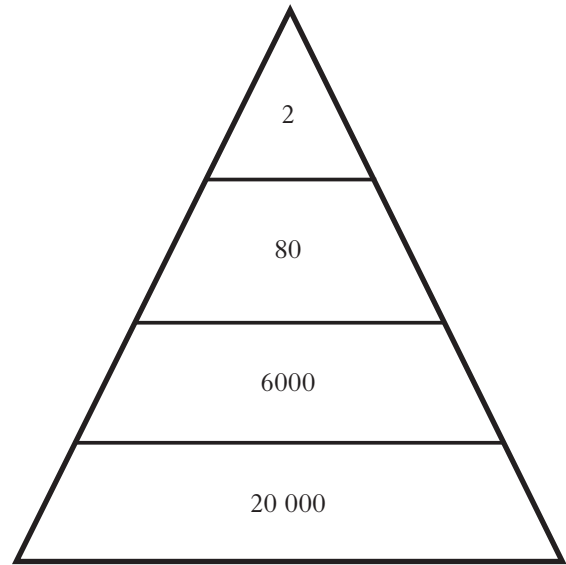
Percentage of diet



A correct conclusion would be that these birds eat most prey of length

- A 4 mm
- B 5 mm
- C 10 mm
- D 12 mm.

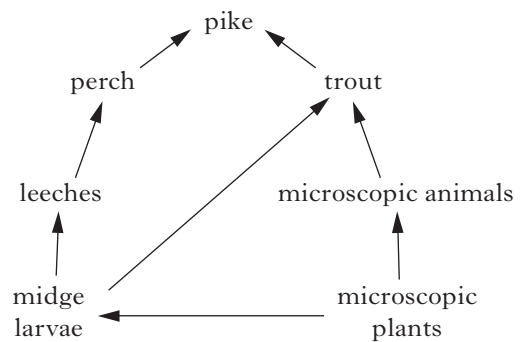
11. The diagram below shows the number of organisms at each level in a pyramid of numbers.



How many organisms are consumers?

- A 2
- B 82
- C 6000
- D 6082

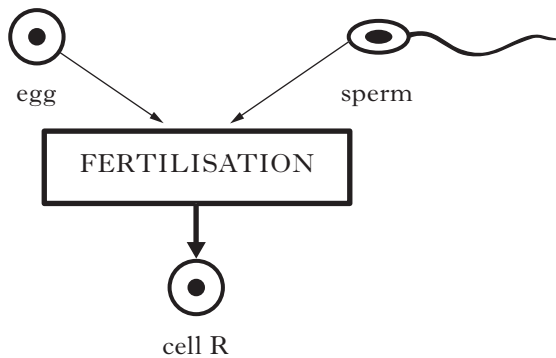
12. The diagram below shows the feeding relationships of some of the organisms found in a fresh water loch.



Which population of organisms in this food web would have the smallest biomass?

- A Pike
- B Trout
- C Microscopic animals
- D Microscopic plants

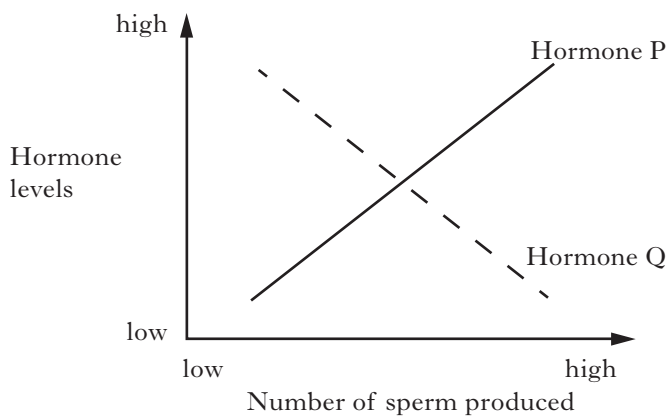
13. The diagram below shows the process of fertilisation.



Cell R is

- A a zygote
- B a gamete
- C an ovule
- D an embryo.

14. The effects of 2 hormones, P and Q, on human sperm production are shown in the graph below.



A possible conclusion from the graph is that when the level of

- A hormone P is high and hormone Q is high, sperm production is low
- B hormone P is low and hormone Q is low, sperm production is low
- C hormone P is low and hormone Q is high, sperm production is high
- D hormone P is high and hormone Q is low, sperm production is high.

15. Methylene blue can be used to compare oxygen levels in water samples.

As oxygen levels decrease, the colour of methylene blue changes from blue to colourless.

The table below shows the appearance of methylene blue after being added to four water samples.

Water sample	Colour of Samples			
	Start	After 1 hour	After 3 days	After 5 days
A	blue	blue	blue	light blue
B	blue	blue	light blue	colourless
C	blue	light blue	colourless	colourless
D	blue	blue	blue	blue

One sample was collected below a sewage pipe.

Which sample is this most likely to be?

16. Which of the following crosses shows the effects of co-dominant genes?

	Parental phenotypes		Ratio of F_1 phenotypes
A	black fur mouse	× white fur mouse	1 black fur mouse : 1 white fur mouse
B	white flowered snapdragon	× red flowered snapdragon	all pink flowered snapdragons
C	pea plants with round seeds	× pea plants with wrinkled seeds	all pea plants with round seeds
D	smooth haired hamster	× smooth haired hamster	3 smooth haired hamsters : 1 rough haired hamster

17. Which of the following is a benefit of selective breeding in dairy cattle?
- A Desired results are guaranteed.
 - B It leads to increased genetic variation.
 - C Increased yields can eventually be produced.
 - D Improvements are produced in one generation.

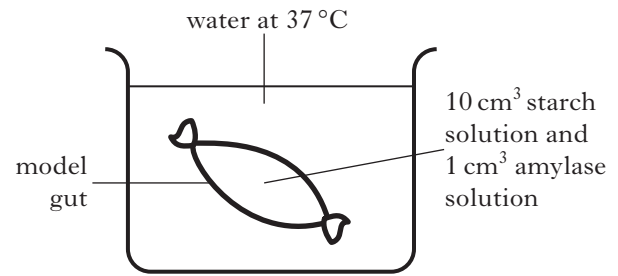
18. The table below shows some of the functions and sources of minerals.

<i>Mineral</i>	<i>Function</i>	<i>Food sources</i>
calcium	hardens bones and teeth; muscle contraction	milk, other dairy products, green vegetables
iron	component of haemoglobin and some enzymes	meat, nuts, cereals, green vegetables
sodium	transmission of nerve impulses; muscle contraction	meat, fish, salt
potassium	transmission of nerve impulses; muscle contraction	fish, meat, green vegetables

Which of the following minerals involved in contraction of muscles would be supplied by a meal of fish and green vegetables?

- A Calcium and potassium only
- B Iron, sodium and potassium only
- C Calcium, sodium and potassium only
- D Sodium and potassium only

19. The diagram below shows an investigation into the digestion of starch by amylase, using a model gut.

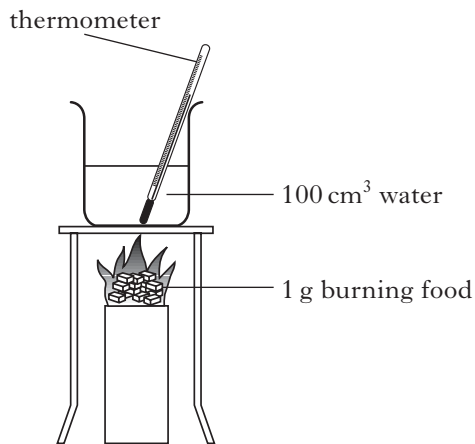


Which line in the table below describes correctly the content of a model gut which should be used as a control?

	<i>Starch solution (cm³)</i>	<i>Amylase solution (cm³)</i>	<i>Water (cm³)</i>
A	10	0	1
B	0	10	1
C	10	1	0
D	1	0	10

[Turn over

20. The diagram below shows the apparatus used to investigate the energy content of different foods.



When different foods were burned, the following results were obtained.

Food	Temperature rise (°C)
potato	12
margarine	30
egg	15

The following equation can be used to calculate the energy value of food.

$$\text{Energy value (kJ per gram)} = 0.42 \times \text{temperature rise (°C)}$$

Using this equation, the energy value of margarine is

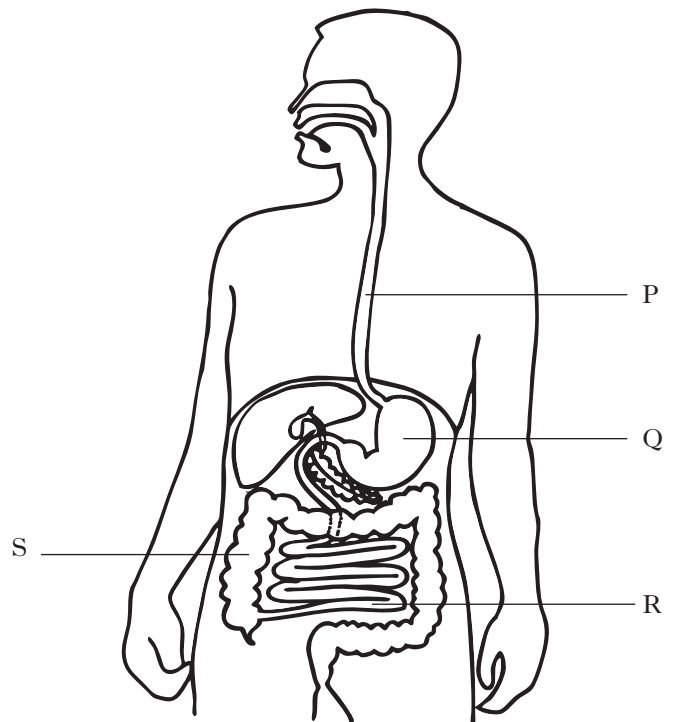
- A 1260
- B 126
- C 30.42
- D 12.6.

21. Marine bony fish have to overcome an osmoregulation problem.

Which line in the table is correct for how marine bony fish overcome the problem?

	Salts	Concentration of urine produced
A	absorbed	concentrated
B	excreted	dilute
C	excreted	concentrated
D	absorbed	dilute

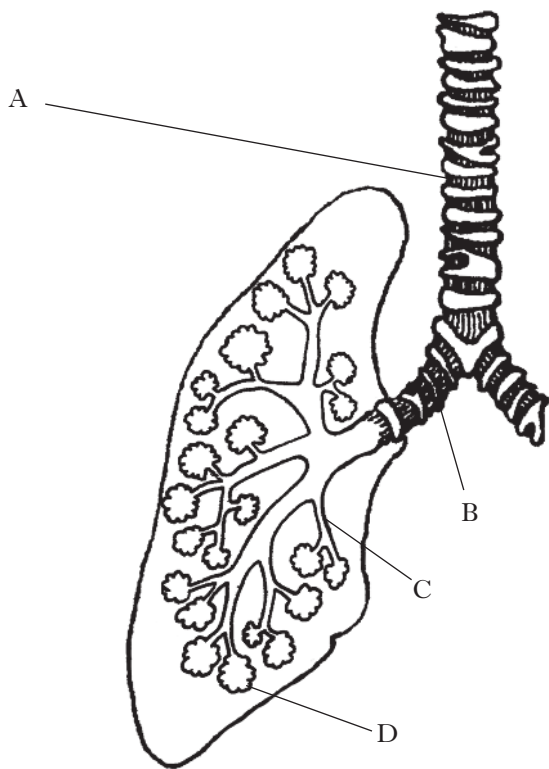
22. The diagram below shows the human alimentary canal.



Peristalsis occurs in

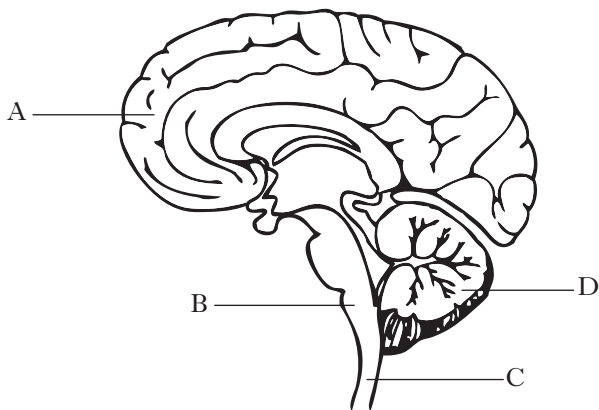
- A P only
- B P and R only
- C P, R and S only
- D P, Q, R and S.

23. The diagram below shows the structure of the lungs.



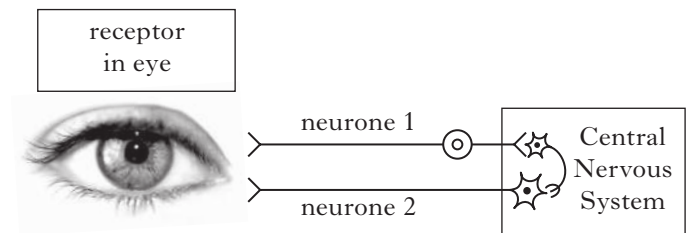
Which letter identifies a bronchiole?

24. The following diagram shows a human brain.



Which letter indicates the site of memory and conscious responses?

25. The diagram below shows neurones connecting the eye with the central nervous system.



Which line in the table below identifies correctly the types of neurones and the direction of impulses which travel along them?

	<i>Neurone 1</i>	<i>Neurone 2</i>
A	Motor →	← Sensory
B	Sensory →	← Motor
C	← Motor	← Sensory
D	← Sensory	Motor →

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

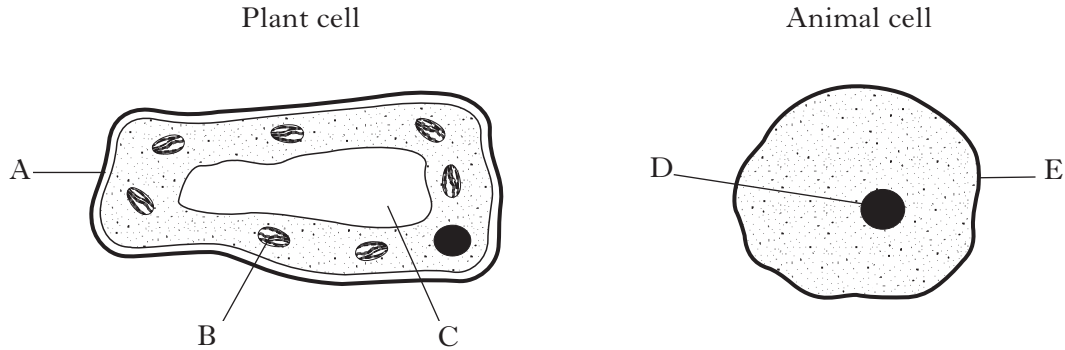
[Turn over for Section B on Page ten

SECTION B

Marks

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

1. The diagrams below show two cells.



(a) Complete the table below to show the names and functions of some of these labelled parts.

<i>Part</i>	<i>Name</i>	<i>Function</i>
B	chloroplast	
C		contains cell sap
E	cell membrane	

2

(b) (i) The plant cell is placed in a hypertonic solution.
Describe the appearance of the plant cell after one hour.

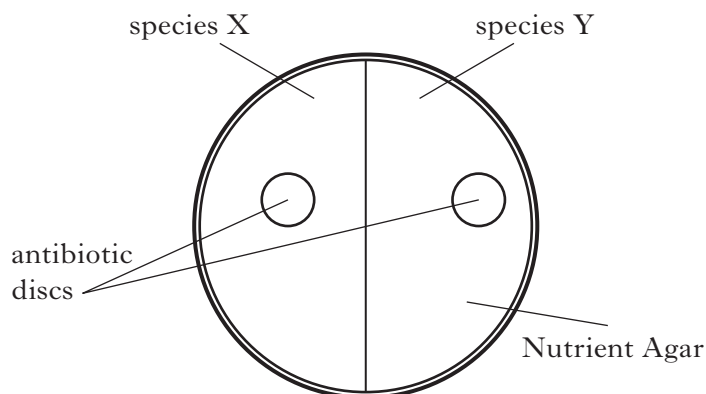
1

(ii) Explain why the animal cell would stay the same size when it is placed in an isotonic solution.

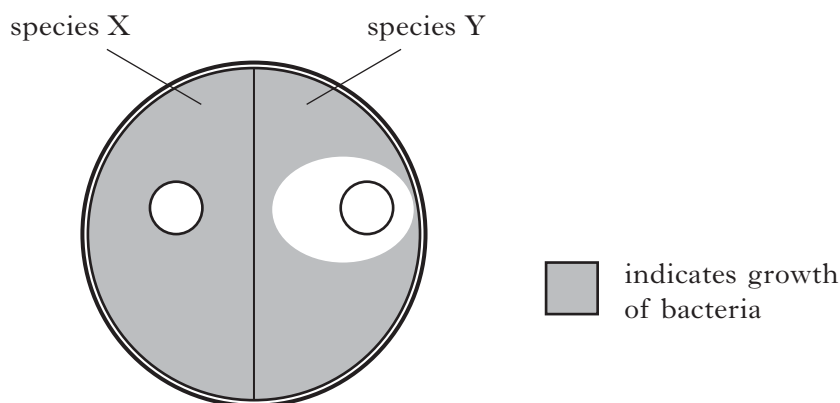
2

Marks

2. (a) A nutrient agar plate was set up to find out the effect of one antibiotic on the growth of two different bacterial species. Two discs containing the same antibiotic were added, one to each half, as shown below.



The plate was left in a warm place for 48 hours for the bacteria to grow on the nutrient agar. The results are shown below.



Which bacterial species is resistant to the antibiotic?

Give a reason for your answer.

Species _____

1

Reason _____

1

- (b) Antibiotic resistant bacteria are on the increase. Give a reason for this.

1

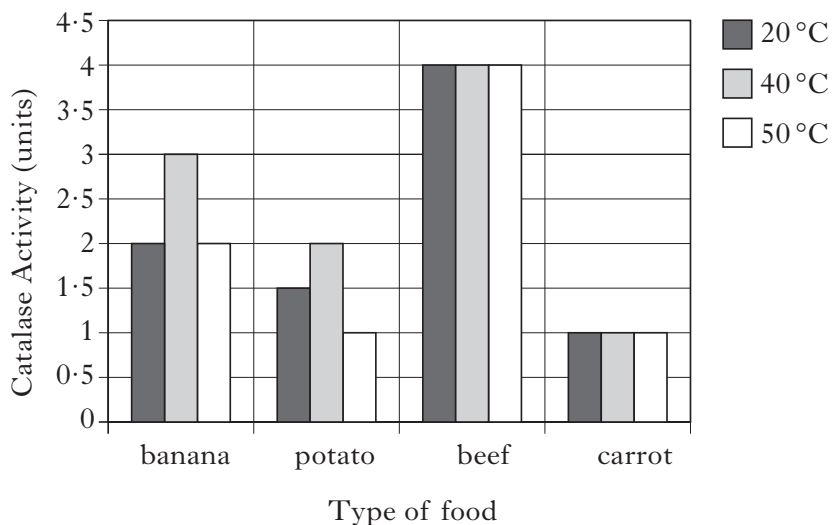
- (c) Which type of organisms produce antibiotics?

1

3. A student set up an investigation to measure the activity of catalase in a variety of foods at three different temperatures.

Marks

The bar graph below shows the results recorded by the student.



- (a) Describe the changes in catalase activity in banana when the temperature increased from 20 °C to 50 °C.

1

- (b) Calculate the percentage decrease in catalase activity in potato when the temperature increased from 40 °C to 50 °C.

Space for calculation

_____ % 1

- (c) Using the results for **banana and potato** only, state the temperature that gave the highest catalase activity.

_____ °C 1

- (d) What conclusion can be drawn about catalase activity using the results for **carrots** only?

1

- (e) Predict the catalase activity in beef at 100 °C. Give a reason for your answer.

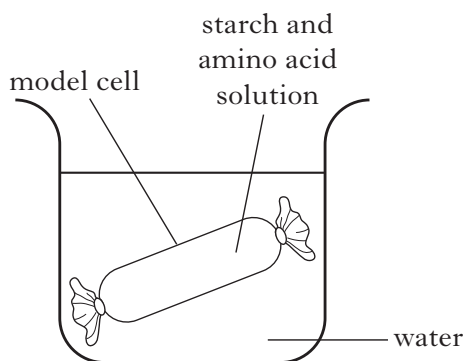
Prediction _____ units

Reason _____

1

Marks

4. (a) A model cell was made using a visking tubing bag filled with a starch and amino acid solution. It was placed into a beaker of water and left for two hours.



- (i) Amino acids were detected in the water outside the model cell.
What process is responsible for this movement?

1

- (ii) Why would no starch be detected in the water outside the model cell?

1

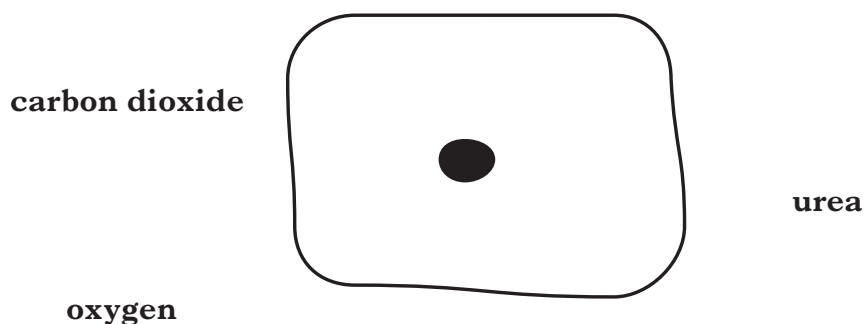
- (iii) What would happen to the mass of the model cell during the two hour period? Explain your answer.

Mass of model cell _____

Explanation _____

2

- (b) The diagram below represents a respiring liver cell carrying out deamination.



Complete the diagram above by adding **arrows** to show the direction of movement of urea, carbon dioxide and oxygen into or out of the cell.

2

[Turn over

5. (a) The sentences below give some information about photosynthesis.

Underline one option in each set of brackets to make the sentences correct.

Photosynthesis uses $\left\{ \begin{array}{l} \text{carbon dioxide} \\ \text{oxygen} \end{array} \right\}$ to allow $\left\{ \begin{array}{l} \text{fungi} \\ \text{green plants} \end{array} \right\}$ to make

their own food.

Some of this food is converted to $\left\{ \begin{array}{l} \text{cellulose} \\ \text{starch} \end{array} \right\}$ for making cell walls.

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

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

Marks

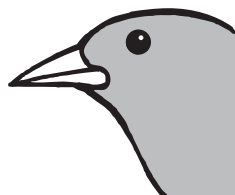
2

3

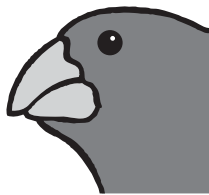
<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
The first reaction in photosynthesis is called <u>carbon fixation</u> .			
<u>Hydrogen</u> is transferred from the first reaction to the second reaction.			
<u>ADP</u> is used as the energy source for the second reaction in photosynthesis.			

Marks

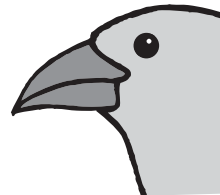
6. (a) The diagrams below give some information about three species of Darwin's Finches which live on the Galapagos Islands.



Feeds on insects



Feeds on seeds



Feeds on seeds

Using evidence from the diagrams, explain why these three finch species occupy different niches.

2

- (b) Some areas on the islands have a thin layer of soil and low rainfall.

Describe **two** adaptations which plants growing in these areas will have to help them survive.

1 _____

2 _____

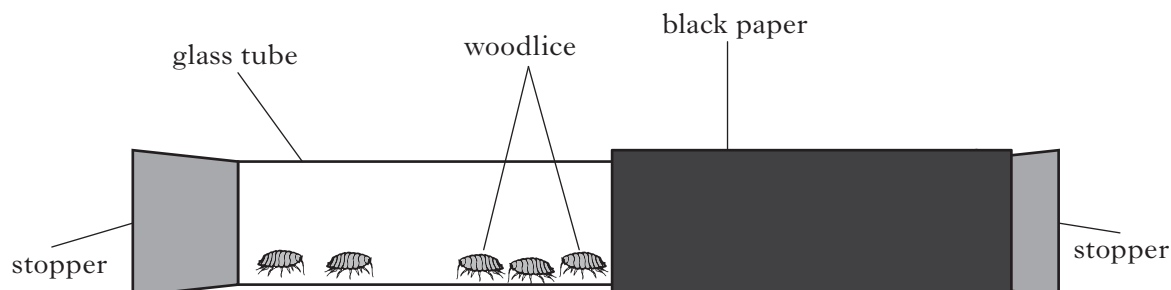
2

[Turn over

Marks

7. An experiment was set up to study the response of woodlice to light. Ten woodlice were placed in a glass tube. After five minutes one end of the tube was covered with black paper to make it dark. The number of woodlice in light and dark was then recorded every minute for five minutes.

The diagram below shows the apparatus used.



The table below shows the results of the experiment.

<i>Time (minutes)</i>	<i>Number of woodlice</i>	
	<i>In light</i>	<i>In dark</i>
0	5	5
1	6	4
2	4	6
3	3	7
4	2	8
5	1	9

- (a) Why were the woodlice left for five minutes before the black paper was placed on the tube?

1

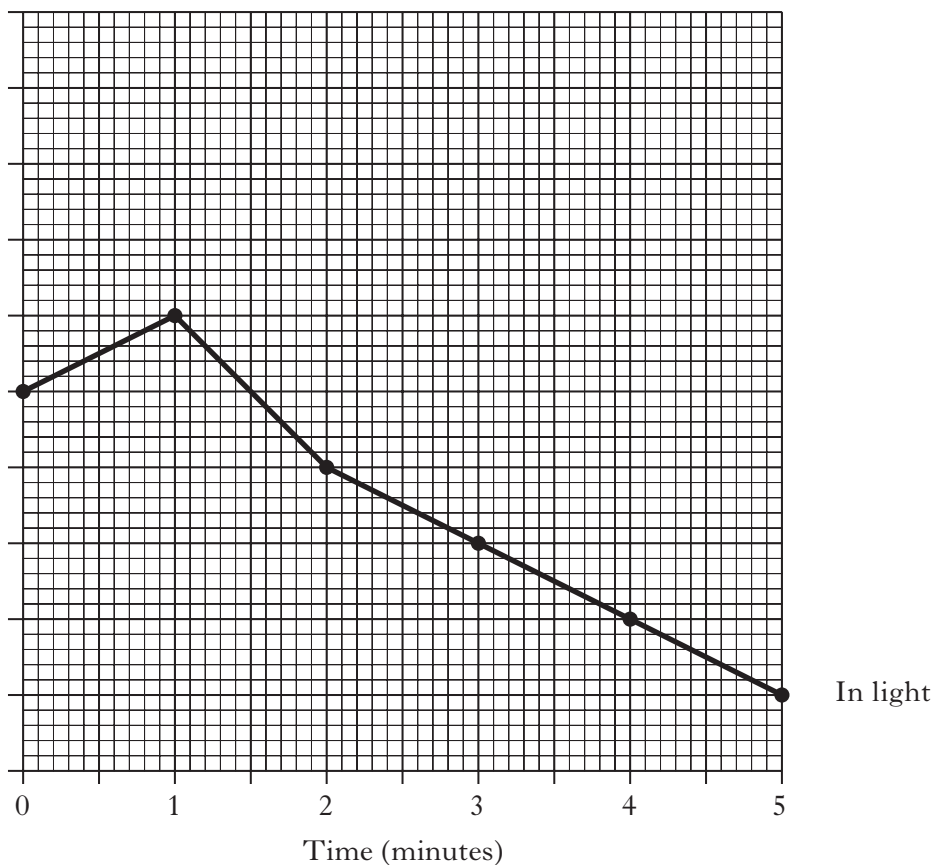
7. (continued)

Marks

- (b) Complete the line graph on the grid below to show the number of woodlice found in the dark at each minute during the experiment.

The results for woodlice in light have already been plotted.

(Additional graph paper, if required, will be found on *Page twenty-eight*.)



2

- (c) State a conclusion which can be drawn from the results of this experiment.

1

- (d) A student repeated this experiment.

- (i) How could the design be changed to make the results more reliable?

1

- (ii) State one environmental factor which would be kept the same to allow a valid comparison with the first experiment.

1

Marks

8. Sorghum is an important food crop in some parts of the world. The colour of the seed husk (coat) is controlled by a single gene. Purple husk colour (H) is dominant to tan husk colour (h).



- (a) A true breeding purple husk plant is crossed with a true breeding tan husk plant.

- (i) What other term is used in genetics to indicate true breeding?

Circle the correct term below.

heterozygous polygenic homozygous recessive

1

- (ii) Complete the genotypes of the parental (P) generation below:

P purple X tan
P genotypes _____ _____

1

- (iii) State the phenotype(s) of the F₁ plants.

F₁ phenotype(s) _____

1

- (b) An individual from the F₁ generation is crossed with a true breeding tan husk plant.

- (i) Complete the Punnett square to show the expected results of this cross.

		Genotypes of gametes from F ₁ plant	
Genotype of gametes from tan husk plant			

2

- (ii) State the expected phenotype ratio for the offspring of this cross.

_____ : _____
purple tan

1

Marks

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

Chromosomes are made of DNA. The chain of $\left\{ \begin{array}{l} \text{acids} \\ \text{bases} \end{array} \right\}$ in DNA

code for $\left\{ \begin{array}{l} \text{amino acids} \\ \text{fatty acids} \end{array} \right\}$ in $\left\{ \begin{array}{l} \text{fats} \\ \text{proteins} \end{array} \right\}$.

2

- (b) Match each human cell with its possible chromosome complements by connecting them with a line.

Each human cell may be connected to more than one chromosome complement.

Human cell

Chromosome complement

white blood cell

22 + X

female gamete

22 + Y

male gamete

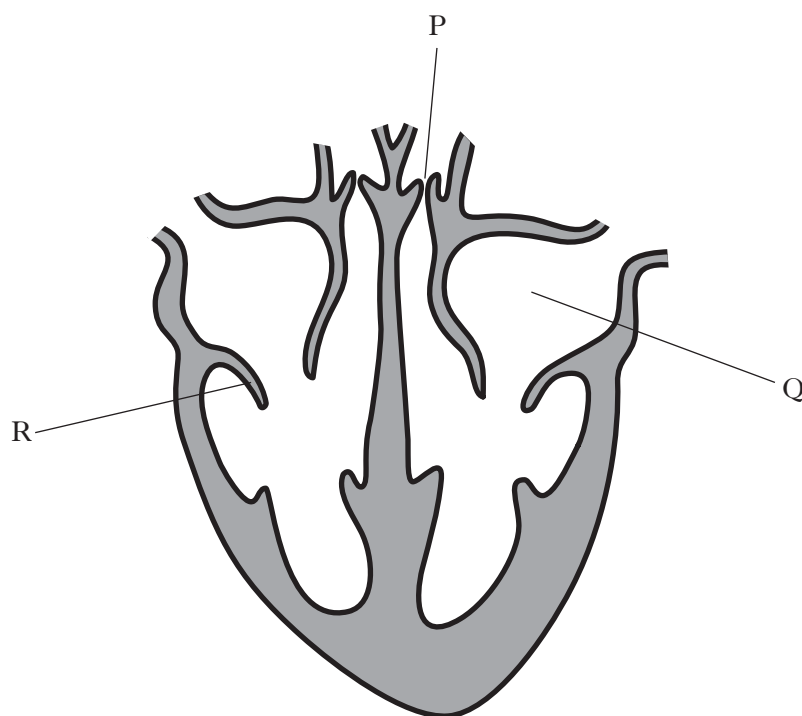
44 + XX

2

[Turn over

Marks

10. The following diagram shows the human heart.



(a) (i) Name chamber Q and valve R.

Q _____

1

R _____

1

(ii) Describe the function of valve P.

2

(iii) **Add** an arrow **to the diagram** showing where blood enters the heart from the lungs.

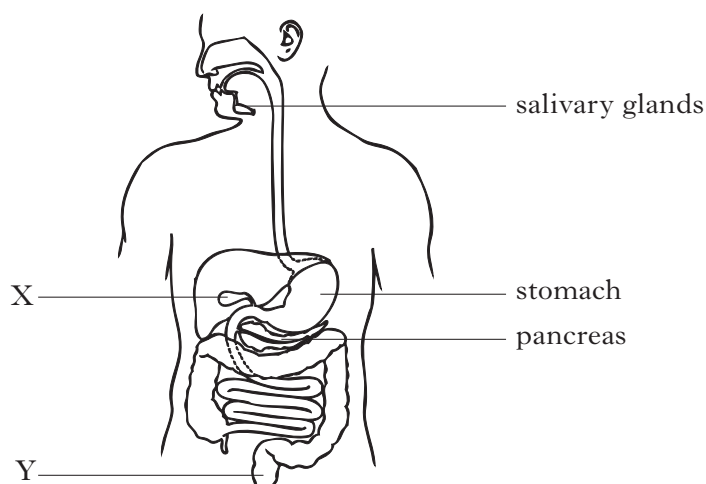
1

(b) Name the blood vessel that carries blood to the lungs.

1

Marks

11. (a) The diagram below shows the human digestive system.



(i) Name structures X and Y.

X _____

Y _____

1

(ii) Draw lines to link each structure with the enzyme(s) that it produces.
Each structure may be linked to more than one enzyme.

<i>Structure</i>	<i>Enzyme</i>
Salivary glands	Amylase
Stomach	Lipase
Pancreas	Pepsin

2

(b) Glucose is absorbed from the small intestine into blood capillaries in the villi before being transported to the liver.

(i) State **one** feature of a villus that increases the rate of absorption of glucose.

1

(ii) Name the blood vessel that transports glucose from the small intestine to the liver.

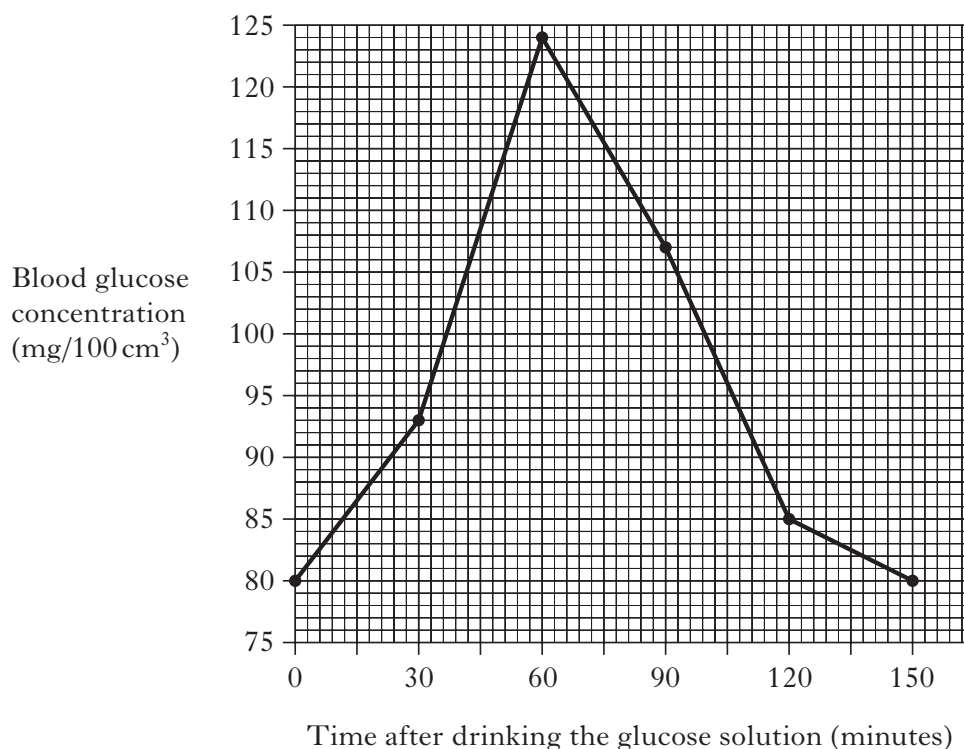
1

(iii) Excess glucose is stored in the liver. Name the storage carbohydrate found in the liver.

1

Marks

12. A person's blood glucose concentration was measured. The person then drank a glass of 25% glucose solution. The blood glucose concentration was measured over the next 150 minutes. The graph below shows the results.



- (a) Use data from the graph to describe the changes in blood glucose concentration over this 150 minute period.

2

- (b) Calculate the percentage increase in blood glucose concentration from 0 to 60 minutes.

Space for calculation

_____ %

1

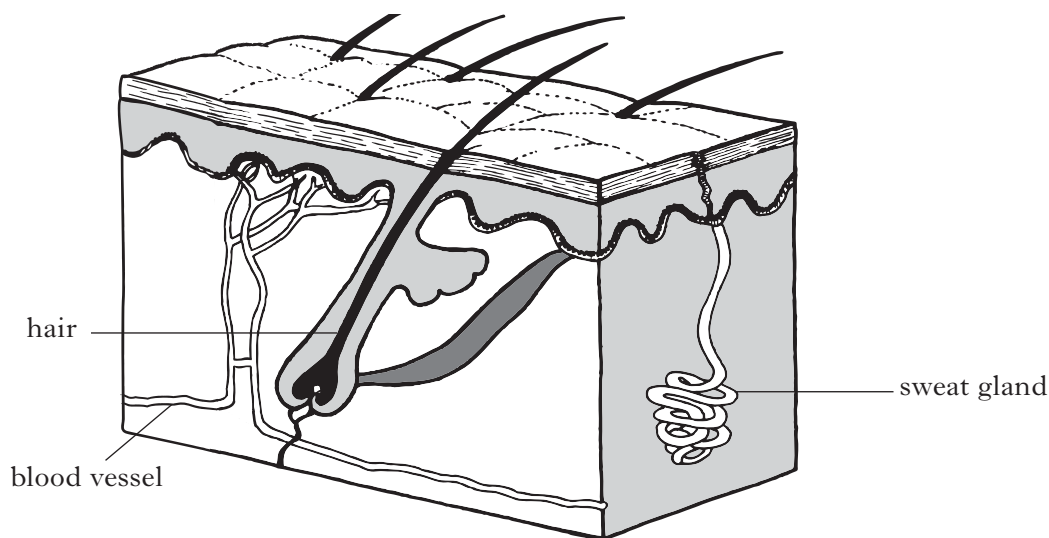
- (c) It was predicted that drinking a glass of 10% glucose solution would give a lower blood glucose concentration after 60 minutes. When this test was carried out, the result was the same as shown on the graph.

Give **one** possible source of error that caused this result.

1

Marks

13. The diagram below represents a section of human skin. Skin is involved in temperature regulation. Sweating is one response made by the skin to regulate body temperature.



- (a) A **decrease** in body temperature leads to a response by the skin blood vessels.

- (i) State the response of the skin blood vessels.

1

- (ii) Explain how this response helps to regulate body temperature.

1

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

An increase in blood temperature is detected in the {hypothalamus / medulla} and then

{hormone / nerve} messages are sent to the sweat glands to {decrease / increase} sweating.

2

[Turn over for Section C on Page twenty-four

SECTION C

Marks

Both questions in this section should be attempted.

Note that each question contains a choice.

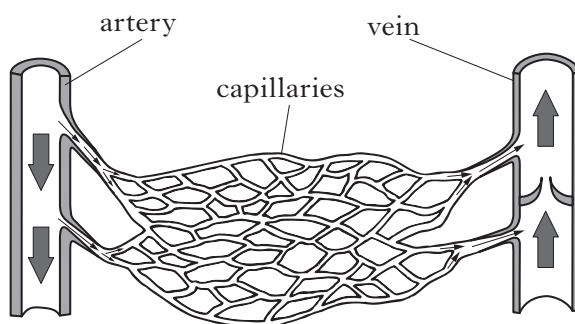
Questions 1 and 2 should be attempted on the blank pages which follow.

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 diagram below shows three types of blood vessel in the human body.



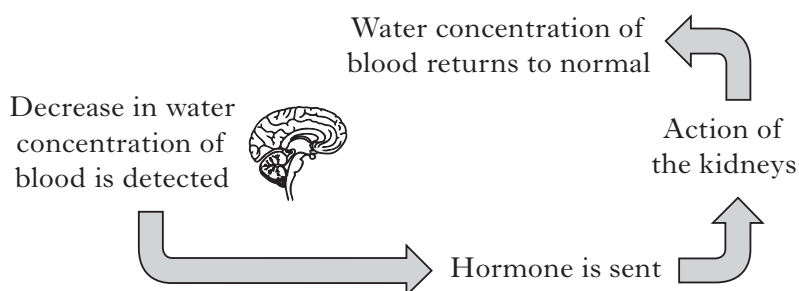
For each of the three types of blood vessel shown, describe their

- (a) structure;
(b) function.

5

OR

B. The diagram below shows how negative feedback is used to control the water concentration of blood in the human body.



Describe how the following organs respond to a **decrease** in the water concentration of the blood:

- (a) the brain;
(b) the kidney.

5

Question 2 is on Page twenty-six

Marks

SPACE FOR ANSWER TO QUESTION 1

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

Marks

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

Labelled diagrams may be included where appropriate.

A. Explain why numbers of the **light form** of peppered moth (*Biston betularia*) changed over a number of generations when air pollution in their environment was reduced.

5

OR

B. Bacteria can be used in genetic engineering. Describe the stages involved in this process. State **one** advantage and **one** disadvantage of genetic engineering.

5

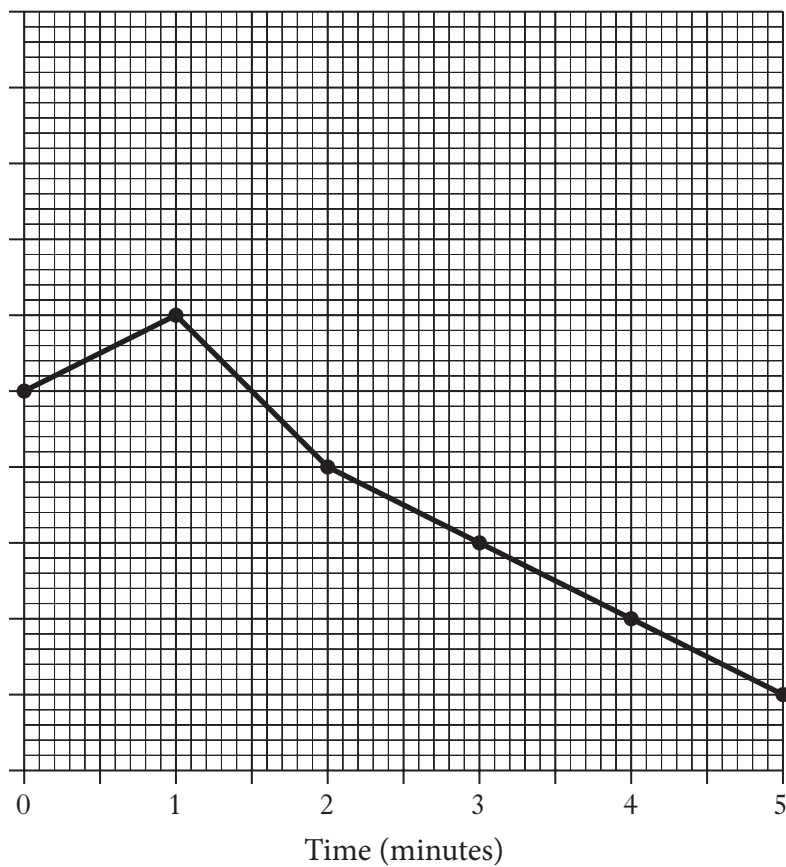
[END OF QUESTION PAPER]

SPACE FOR ANSWER TO QUESTION 2

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ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 7(b)



In light

ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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