

FOR OFFICIAL USE

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X007/201

Total for
Sections B and C

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NATIONAL
QUALIFICATIONS
2007

MONDAY, 21 MAY
9.00 AM – 11.00 AM

BIOLOGY
INTERMEDIATE 2

Fill in these boxes and read what is printed below.

Full name of centre

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Town

--

Forename(s)

--

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

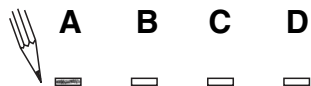
- 1 Check that the answer sheet provided is for **Biology Intermediate 2 (Section A)**.
- 2 For this section of the examination you must use an **HB pencil** and, where necessary, an eraser.
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate 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

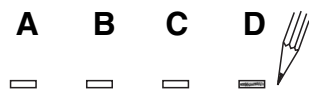
- A water, light and soil nutrients
- B water, food and soil nutrients
- C light, water and food
- D light, food and soil nutrients.

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. Which structural feature is common to both plant and animal cells?
- A Cell wall
 - B Chloroplast
 - C Nucleus
 - D Large central vacuole

2. Which line in the table below correctly matches the plant cell structure to its function?

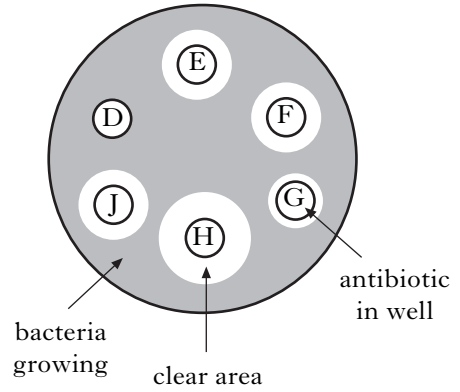
	<i>Plant cell structure</i>	<i>Function</i>
A	Cytoplasm	Controls all the chemical activities
B	Cell wall	Keeps the cells turgid
C	Vacuole	Prevents the cell from bursting in a hypotonic solution
D	Cell membrane	Controls which molecules enter or leave the cell

3. Once yoghurt has been produced it is stored in a fridge.

This is because

- A bacterial growth is slowed down
- B it makes the yoghurt more creamy
- C it causes lactose to change to lactic acid
- D the taste of the yoghurt is improved.

4. The diagram below shows the results of an investigation into the effect of different antibiotics on a type of bacterium.



Which of the following conclusions can be drawn from these results?

- A These bacteria are resistant to antibiotic H.
 - B Antibiotic D is the most effective antibiotic against this type of bacterium.
 - C These bacteria are resistant to antibiotic D.
 - D This type of bacterium is resistant to all of the antibiotics.
5. The animals present in a sample of leaf litter were counted.

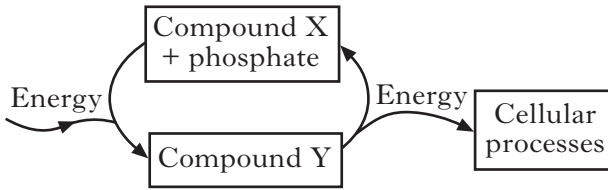
<i>Animals</i>	<i>Number in sample</i>
ground beetles	10
woodlice	35
slugs	5
centipedes	10
others	10

What is the percentage of woodlice in the sample?

- A 35%
- B 50%
- C 65%
- D 70%

[Turn over

6. The diagram below shows energy transfer within a cell.



Which line of the table below identifies correctly compounds X and Y?

	X	Y
A	glucose	ATP
B	glucose	ADP
C	ADP	ATP
D	ATP	glucose

7. After running a race an athlete experienced muscle fatigue.

Which of the following had increased in the muscles?

- A Glucose
- B Oxygen
- C ATP
- D Lactic acid

8. Fermentation of sugar cane produces alcohol. What is produced when this alcohol is mixed with petrol?

- A Biogas
- B Gasohol
- C Methane
- D Carbon dioxide

9. Four cylinders of potato tissue were weighed and each was placed into a salt solution of different concentration.

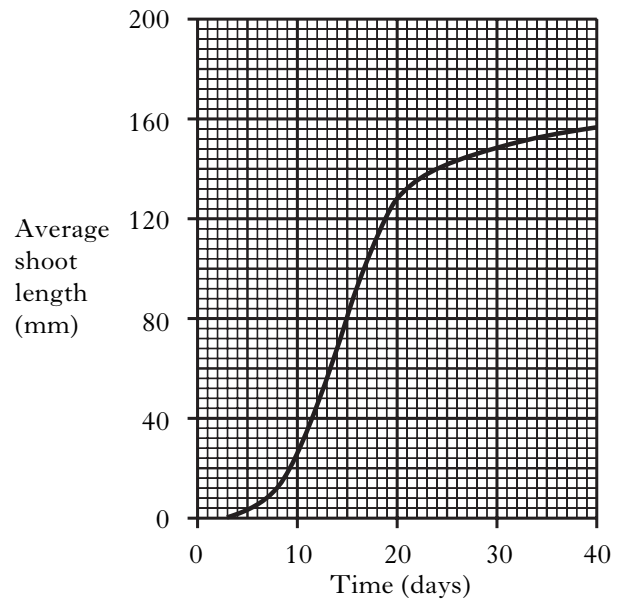
The cylinders were reweighed after one hour. The results are shown in the following table.

Salt solution	Mass of potato cylinder (g)	
	Initial mass	Final mass
A	10.0	12.6
B	10.0	11.2
C	10.0	9.4
D	10.0	7.0

In which salt solution would most potato cells be plasmolysed?

10. An experiment was carried out to investigate the growth of pea plants kept in a high light intensity following germination.

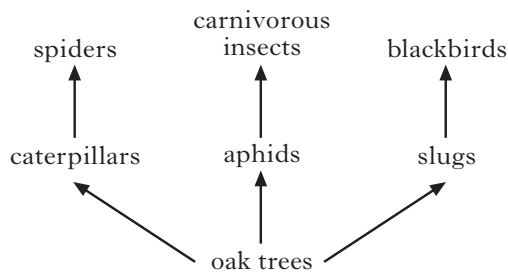
The graph shows the average shoot length of the pea plants.



During which 5 day period is there the greatest increase in average shoot length?

- A Day 10 – 15
- B Day 15 – 20
- C Day 20 – 25
- D Day 25 – 30

11. The diagram below shows part of a food web in an oak woodland.

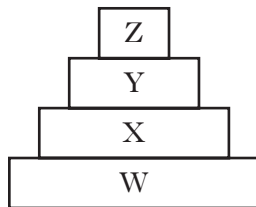


The use of insecticides in a nearby field resulted in the deaths of most aphids and caterpillars.

Which line in the table identifies correctly the effects on the numbers of slugs and carnivorous insects?

	<i>Number of slugs</i>	<i>Number of carnivorous insects</i>
A	increases	decreases
B	decreases	stays the same
C	decreases	increases
D	increases	stays the same

12. The diagram below shows a pyramid of biomass.



X represents the total mass of

- A producers
 - B primary consumers
 - C predators
 - D secondary consumers.
13. Which of the following describes correctly a niche?
- A The place where an organism lives
 - B Organisms and their environments
 - C A population of organisms in an ecosystem
 - D The role of an organism in an ecosystem

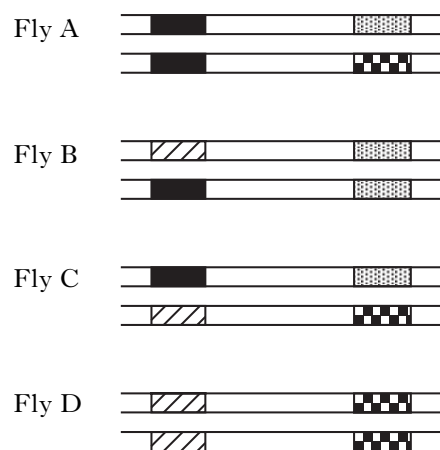
14. The table below shows the relationship between planting density and the mass of seed harvested for a cereal crop trial.

<i>Planting density</i> (number of plants per square metre)	<i>Mass of seed harvested</i> (grams per square metre)
4	60
8	86
15	105
32	77
128	21

What is the percentage increase in mass of seed harvested as planting density increases from 4 to 15 plants per square metre?

- A 45%
 - B 75%
 - C 90%
 - D 105%
15. In humans, which of the following gametes are **not** normally formed?
- A An egg with an X chromosome
 - B An egg with a Y chromosome
 - C A sperm with an X chromosome
 - D A sperm with a Y chromosome

16. The diagram below shows the same sections of matching chromosomes found in four fruit flies, A, B, C and D.

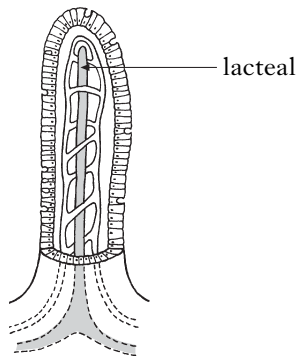


The genes shown on the chromosomes can be identified using the following key.

- Key**
- gene for striped body
 - gene for unstriped body
 - gene for normal antennae
 - gene for abnormal antennae

Which fly is homozygous for both genes?

17. The diagram below shows a single villus from the small intestine.

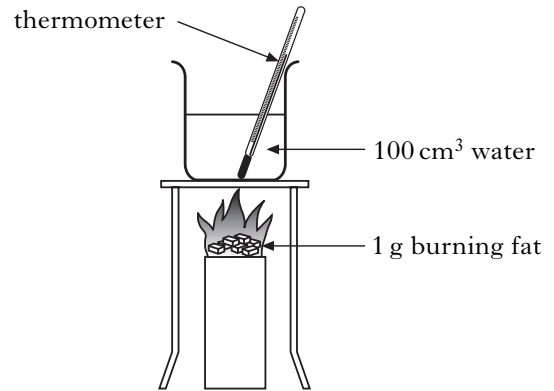


Which food molecules are absorbed into the lacteal?

- A Amino acids and glycerol
 B Glucose and amino acids
 C Fatty acids and glycerol
 D Amino acids and fatty acids
18. Which line in the table below describes correctly the changes in food due to digestion?

<i>Changes in food</i>		
	<i>Molecule size</i>	<i>Solubility</i>
A	decreases	increases
B	decreases	decreases
C	increases	decreases
D	increases	increases

19. The diagram shows the apparatus used to investigate the energy content of fat.



Which of the experiments shown below allows a valid comparison to be made between the energy content of fat and protein?

- A B
- C D

20. Bile is produced in the

- A liver
 B gall bladder
 C stomach
 D small intestine.

21. 100 g of baked beans contains 4.5 g of protein.
How many grams of beans would provide a daily protein requirement of 81 g?

- A 5.5 g
- B 18 g
- C 364.5 g
- D 1800 g

22. One way that marine bony fish cope with dehydration is

- A producing dilute urine
- B drinking seawater
- C producing large volumes of urine
- D absorbing salts.

23. The table below shows some features of blood vessels.

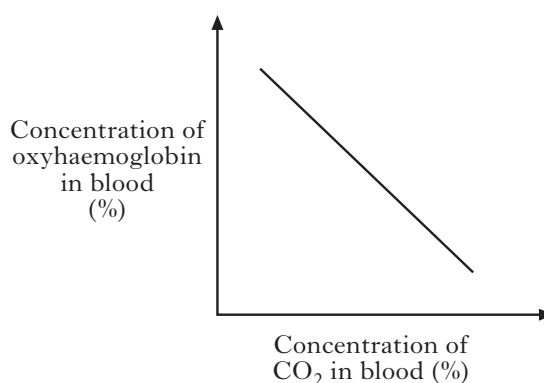
Which line describes features of veins?

	<i>Direction of blood flow</i>	<i>Detection of pulse</i>	<i>Presence of valves</i>
A	towards the heart	yes	no
B	away from the heart	no	yes
C	towards the heart	no	yes
D	away from the heart	yes	no

24. Which line in the table below identifies correctly how lymphocytes destroy bacteria?

	<i>Phagocytosis</i>	<i>Antibody production</i>
A	yes	yes
B	yes	no
C	no	yes
D	no	no

25. The graph below shows the relationship between the concentration of carbon dioxide and oxyhaemoglobin in the blood.



Which of the following describes this relationship?

- A As the carbon dioxide concentration decreases, the concentration of oxyhaemoglobin decreases.
- B As the carbon dioxide concentration increases, the concentration of oxyhaemoglobin decreases.
- C As the carbon dioxide concentration increases, the concentration of oxyhaemoglobin increases.
- D As the carbon dioxide concentration increases, it has no effect upon the concentration of oxyhaemoglobin.

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

[Turn over

SECTION B

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

Marks

1. (a) The sentences below describe how oxygen enters the bloodstream for use in respiration.

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

Air entering the lungs passes down the { bronchioles }
trachea } to the bronchi.

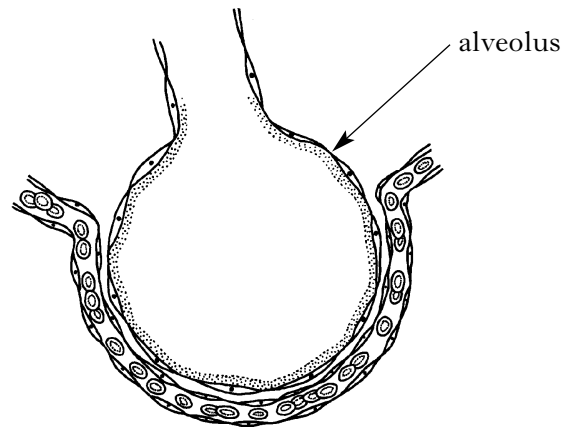
1

To collect oxygen, blood enters the lungs through the pulmonary { artery }
vein }

and returns to the { left }
right } atrium of the heart.

1

- (b) The diagram below shows an alveolus in the lungs.



State **two** features of the alveolus that allow efficient gas exchange.

Feature 1 _____ 1

Feature 2 _____ 1

Marks

1. (continued)

- (c) (i) Oxygen diffuses into muscle cells for respiration. Name **one** other raw material needed for respiration that enters by diffusion.

1

- (ii) Name a waste product of respiration that diffuses out of muscle cells.

1

- (d) Osmosis occurs in plant cells.

- (i) Name the substance that enters or leaves cells by osmosis.

1

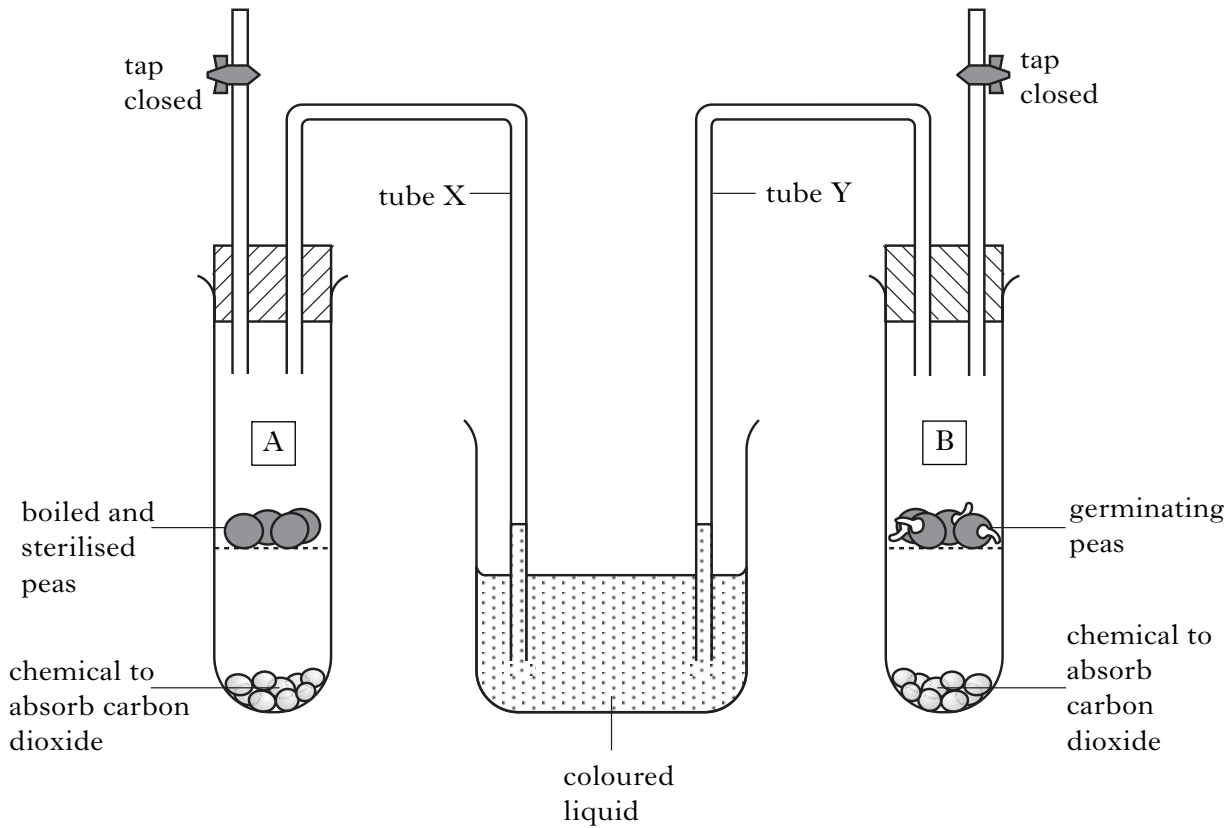
- (ii) What term describes the condition of plant cells after being placed in distilled water?

1

[Turn over

Marks

2. (a) The experiment shown below was set up to demonstrate aerobic respiration in peas that are germinating (starting to grow).



After two days, the level of liquid had risen in tube Y but had not risen in tube X.

- (i) Explain the purpose of A as a control in this experiment.

1

- (ii) Predict the effect on the level of the liquid in tube Y if a greater mass of peas is used.

1

Marks

2. (continued)

- (b) The following list contains some features of aerobic and anaerobic respiration in germinating peas.

List

- W Does not use oxygen
- X Produces carbon dioxide
- Y Yields 38 molecules of ATP per glucose molecule
- Z Produces ethanol

Complete the table below by writing the letters from the list in the correct columns.

Each letter may be used once or more than once.

<i>Aerobic respiration in germinating peas</i>	<i>Anaerobic respiration in germinating peas</i>

2

[Turn over

Marks

3. (a) A food sample was tested to find which food groups were present.
Both the Benedict's test and the Biuret test were positive.

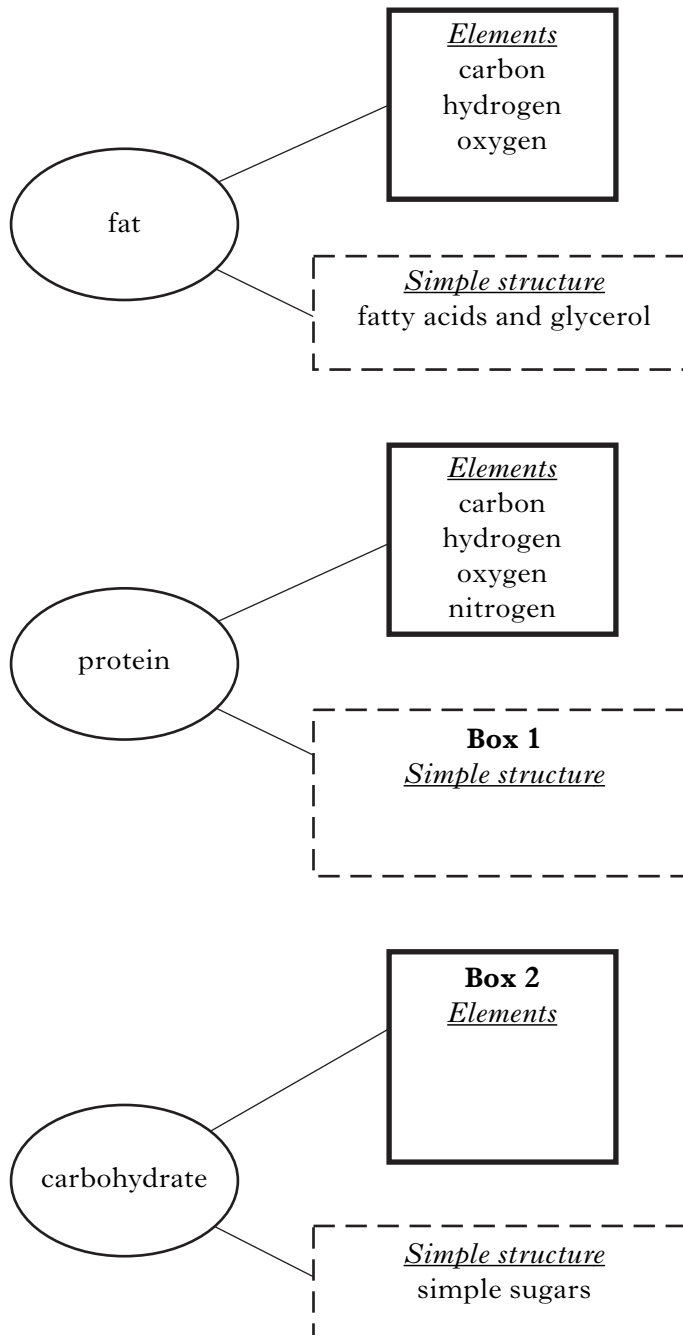
(i) What colour indicates a positive result with the Benedict's test?

1

(ii) Which food group was indicated by the Biuret test result?

1

(b) Complete boxes 1 and 2 in the following diagram which shows information about the structures of three food groups.

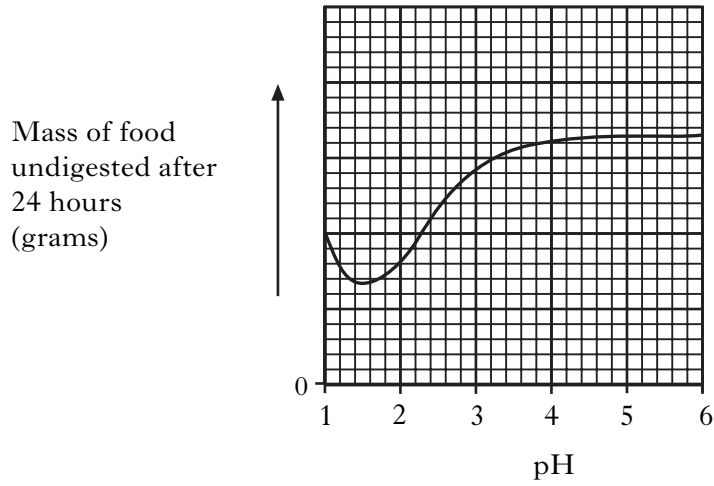


2

Marks

3. (continued)

- (c) The graph below shows the results of an experiment into the activity of a stomach enzyme at various pH levels.



- (i) Name a stomach enzyme.

1

- (ii) From the graph, what is the optimum pH of this enzyme?

pH _____

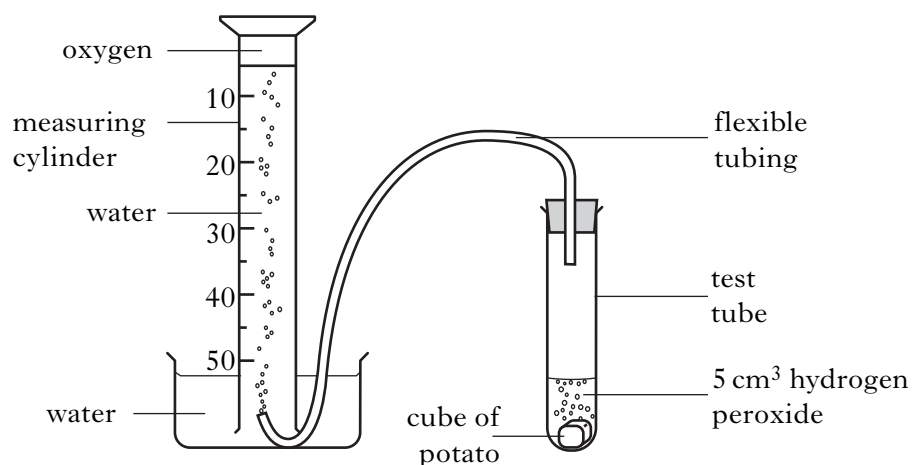
1

[Turn over

Marks

4. (a) Four groups of students investigated the catalase concentration of different tissues.

Each group set up a test-tube containing 5 cm³ of hydrogen peroxide and a cube of potato. The oxygen was collected over a 3 minute period and the volume was measured as shown in the diagram below.



This procedure was repeated by each group using cubes of liver, apple and carrot. The results from the four groups are given in the table below.

Tissue	Volume of oxygen collected in 3 minutes (cm ³)				
	Group 1	Group 2	Group 3	Group 4	Average
Potato	5.5	5.0	5.5	6.0	
Liver	39.5	37.0	42.5	35.5	38.5
Apple	1.0	1.5	1.0	0.5	1.0
Carrot	3.5	3.0	3.5	2.0	3.0

- (i) Complete the table to show the average volume of oxygen collected for potato tissue.

Space for calculation

1

- (ii) The volume of hydrogen peroxide and time taken to collect the oxygen were kept constant in this investigation.

State **two** other variables that must be kept constant.

1 _____

1

2 _____

1

Marks

4. (a) (continued)

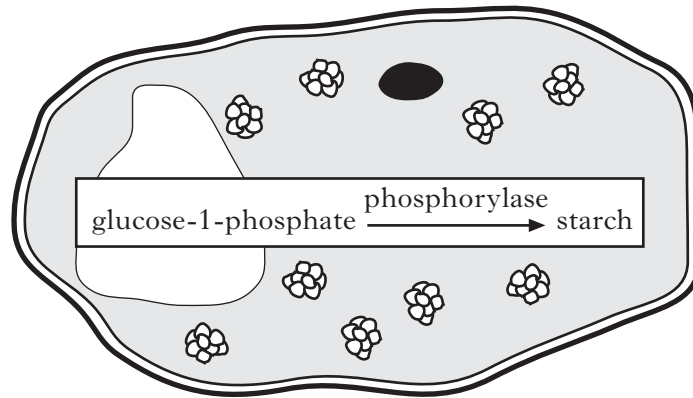
(iii) What was done in this investigation to make the results reliable?

1

(iv) What conclusion can be drawn from these results?

1

(b) The diagram below shows the action of the enzyme phosphorylase in a potato cell.



(i) Underline the option in the bracket to make the sentence correct.

The action of the enzyme phosphorylase catalyses the $\left\{ \begin{array}{l} \text{synthesis} \\ \text{degradation} \end{array} \right\}$ of starch.

1

(ii) State the effect of phosphorylase on the rate of this reaction.

1

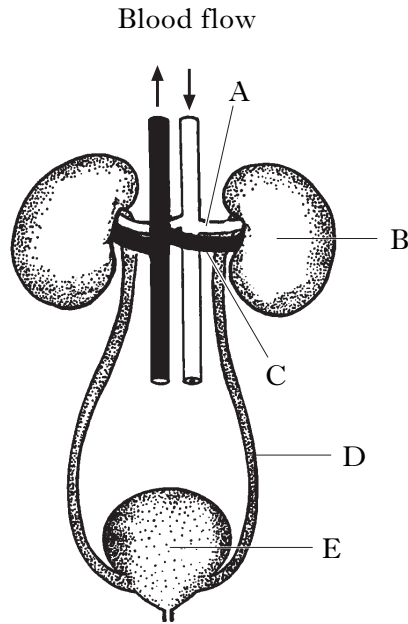
(iii) Explain why lipase could not produce starch in this reaction.

1

[Turn over

Marks

5. (a) The diagram below shows the structure of the human urinary system.

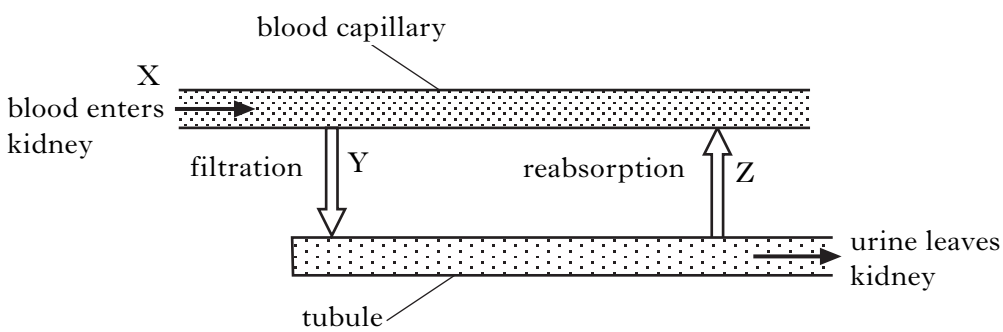


Complete the table to identify the structures and their functions.

Structure	Letter	Function
Bladder	E	
	A	Carries blood into the kidney
Ureter		Carries urine away from the kidney

2

(b) The diagram below represents filtration and reabsorption in the kidney.



A hormone controls the volume of water reabsorbed at Z.

(i) Name this hormone.

1

(ii) If there is a decrease in the level of this hormone, what will happen to the volume of water reabsorbed at Z?

1

Marks

5. (b) (continued)

- (iii) Tick (✓) the boxes in the table below to indicate which two blood components are filtered out of the blood at Y.

<i>Blood components</i>	<i>Filtered out at Y</i>
glucose	
salts	
blood cells	

1

- (iv) The rate of flow at X, Y and Z is measured.

Rates of flow:

X = 1200 cm³ per minute

Y = 125 cm³ per minute

Z = 124 cm³ per minute

How much urine will be produced in one hour?

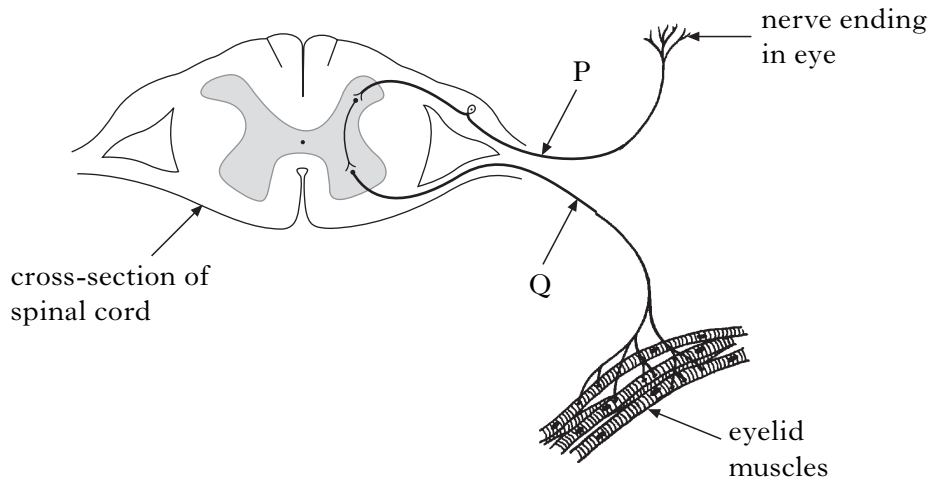
Space for calculation

Volume of urine produced in one hour _____ cm³ 1

[Turn over

Marks

6. The three types of neurone involved in the reflex arc for blinking are shown in the diagram below.



- (a) Name neurones P and Q.

P _____

Q _____

2

- (b) Which labelled structure is the effector in this response?

1

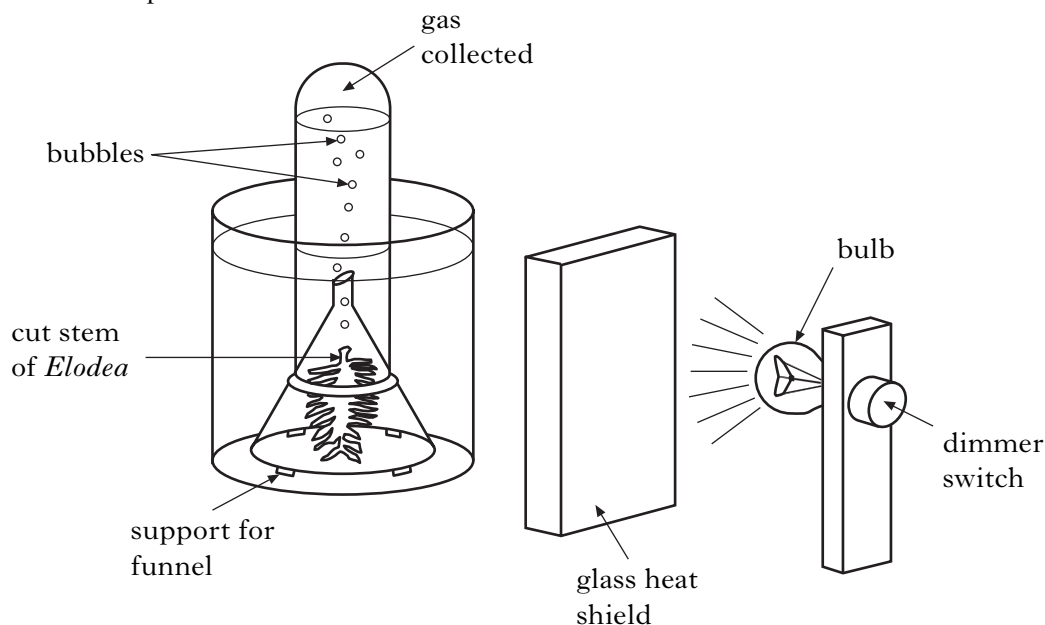
- (c) What is the function of a reflex action?

1

[Turn over for Question 7 on *Page twenty*

Marks

7. (a) An experiment was set up to measure the effect of light intensity on the rate of photosynthesis in the water plant, *Elodea*.
The light intensity was varied using a dimmer switch on the bulb.
The rate of photosynthesis was measured by counting the number of bubbles released per minute.



- (i) Name the gas collected.

1

- (ii) The results of the experiment are shown in the table below.

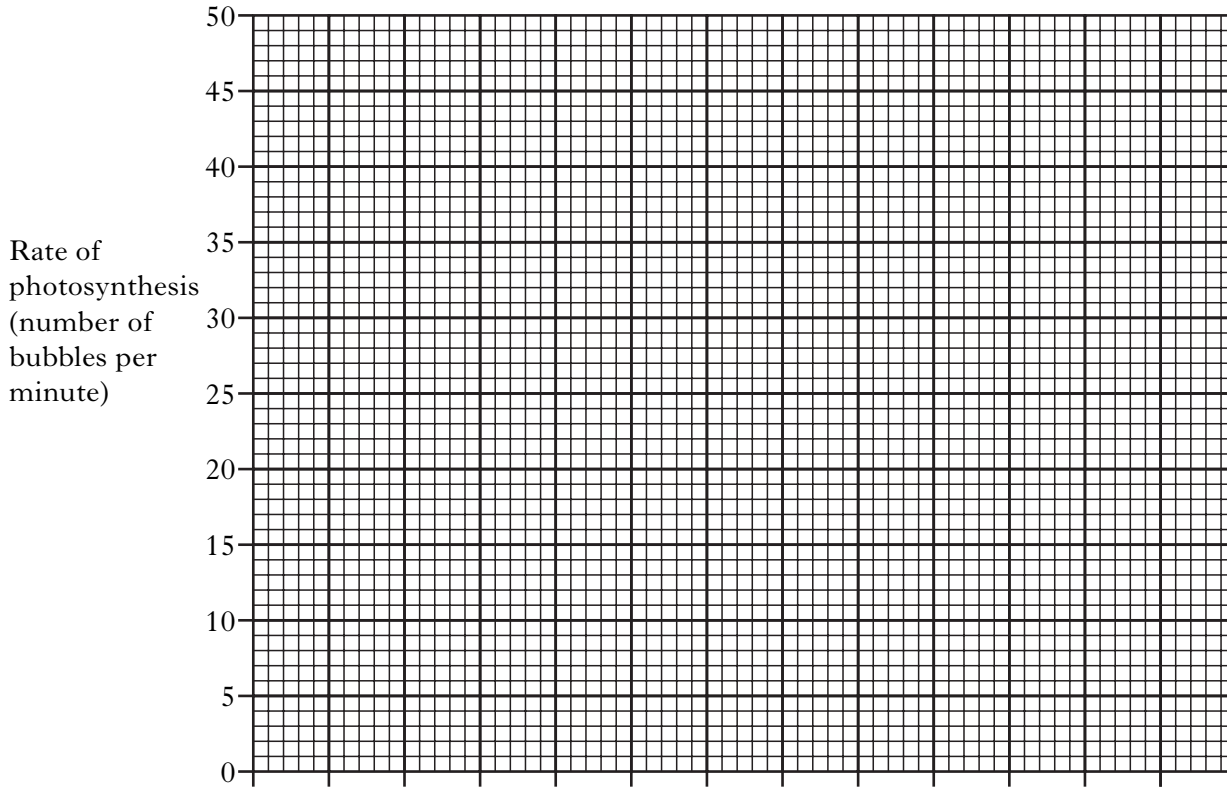
<i>Light intensity</i> (units)	<i>Rate of photosynthesis</i> (number of bubbles per minute)
1	2
3	10
5	23
8	45
10	45
12	45

Marks

7. (a) (ii) (continued)

(A) On the grid below, plot a line graph to show rate of photosynthesis against light intensity.

(Additional graph paper, if required, will be found on page 32.)



2

(B) Using the data in the table, explain the results obtained at light intensities greater than 8 units.

1

(b) There are **two** reactions in photosynthesis. The first reaction is photolysis.

(i) Name the two substances produced by photolysis that are required for the second reaction.

Substance 1 _____

Substance 2 _____

2

(ii) Name the second reaction.

1

*Marks***7. (continued)**

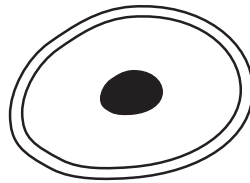
(c) Plant cells convert glucose into other carbohydrates.

Complete the table below by naming two of these carbohydrates.

<i>Role of carbohydrate in plant cells</i>	<i>Name of carbohydrate</i>
Storage as an insoluble material	
Forms cell walls	

2

8. (a) The diagram below shows a yeast cell.



Marks

(i) Name the structure shown in the yeast cell which contains the genetic information.

1

(ii) A molecule consisting of chains of bases is contained in chromosomes.

(A) Name this molecule.

1

(B) Explain how this molecule controls cell activities.

2

(b) Gamete production is essential to sexual reproduction.

(i) Name the division of the nucleus that occurs during gamete production.

1

(ii) Name the process occurring during this division that increases variation.

1

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

The number of chromosomes in gametes is $\left\{ \begin{array}{l} \text{half} \\ \text{twice} \end{array} \right\}$ the number found in body cells.

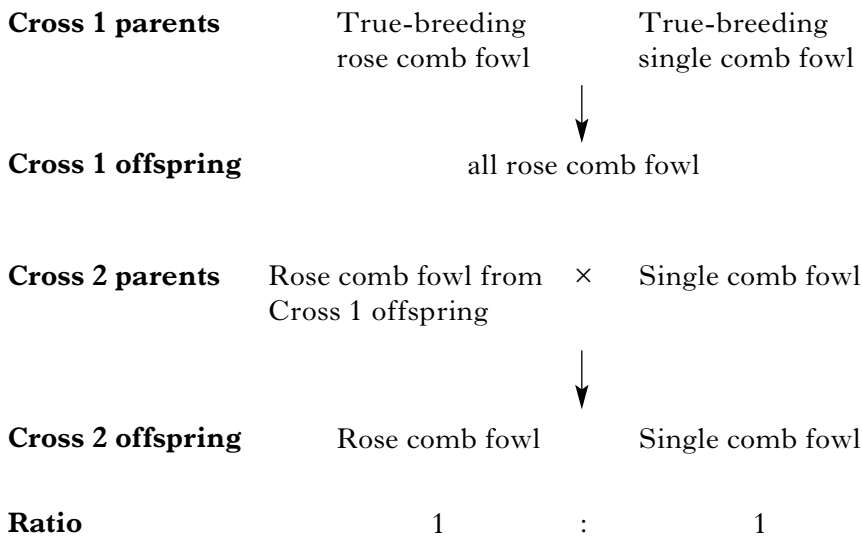
The zygote is formed by $\left\{ \begin{array}{l} \text{fusion} \\ \text{division} \end{array} \right\}$ and contains $\left\{ \begin{array}{l} \text{half} \\ \text{twice} \end{array} \right\}$ the number of chromosomes in a gamete.

2

Marks

9. In fowl, the dominant form (R) of one gene determines rose comb shape; single comb shape results from the recessive form (r) of the gene.

The diagram below shows the results of two crosses.



- (a) (i) Which offspring contains only one phenotype?

1

- (ii) Complete the Punnet square below to show the genotypes of the gametes of the Cross 2 single comb parent and the genotypes of the offspring produced.

		Genotypes of gametes of Cross 2 single comb parent	
Genotypes of gametes of Cross 2 rose comb parent	R		
	r		

2

Marks

9. (continued)

(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 underlined in the statement.

<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
A characteristic controlled by many genes is called <u>co-dominant</u> .			
The <u>gene</u> for comb shape has two different alleles.			
True breeding is another way of describing a <u>homozygous</u> individual.			

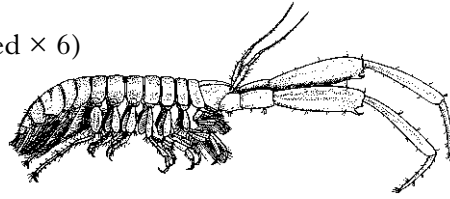
3

[Turn over

Marks

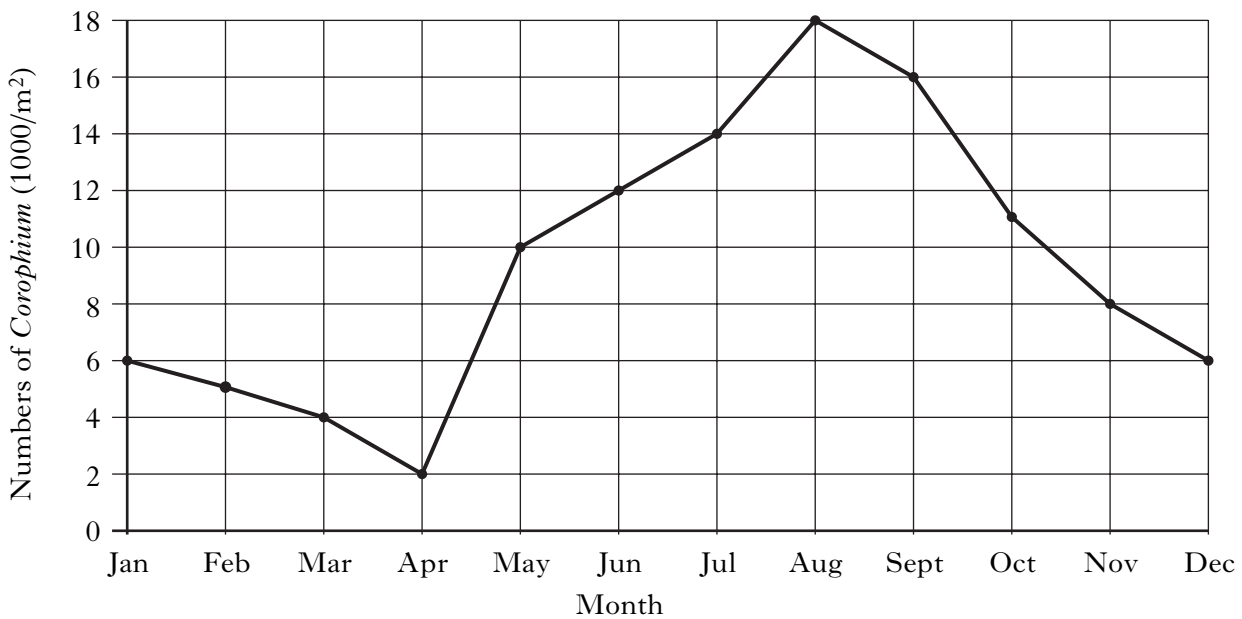
10. The small burrowing invertebrate, *Corophium*, is found in the mud of Scottish estuaries.

Corophium (magnified $\times 6$)



Corophium is the major prey of many species of migratory wading birds. These birds are present in large numbers from August to April.

The graph below shows the results of a one year survey on the numbers of *Corophium* taken on the first day of each month.



- (a) Describe the changes in the numbers of *Corophium* from January to December.

2

- (b) How many times greater are the numbers of *Corophium* on 1st June compared to 1st April?

Space for calculation

_____ times 1

Marks

10. (continued)

- (c) Using all the information given, explain why there are high numbers of *Corophium* on 1st August.

1

- (d) Predict what would happen to the biodiversity of this estuary if the wading birds stayed all year. Explain your answer.

Prediction _____

1

Explanation _____

1

[Turn over for Section C on page twenty-eight]

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.

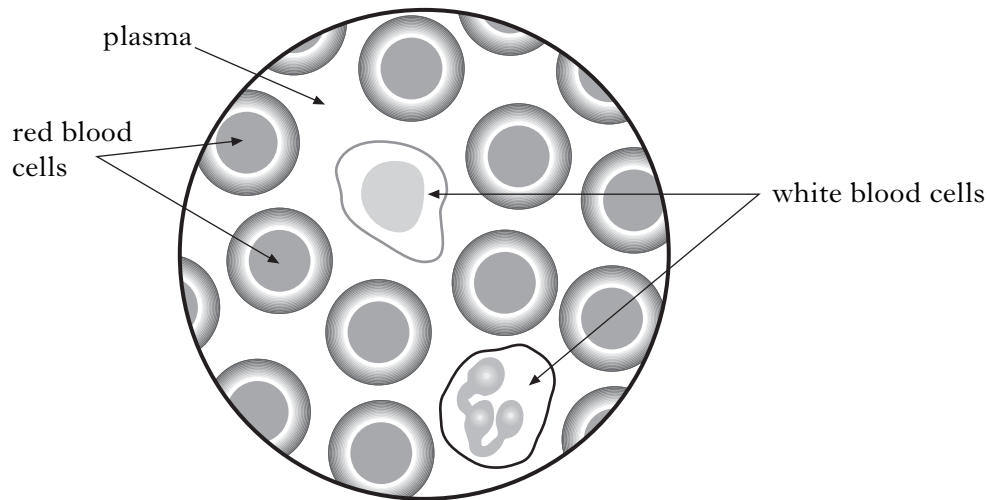
All answers must be written clearly and legibly in ink.

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

Marks

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

A. The diagram below shows human blood as seen through a microscope.



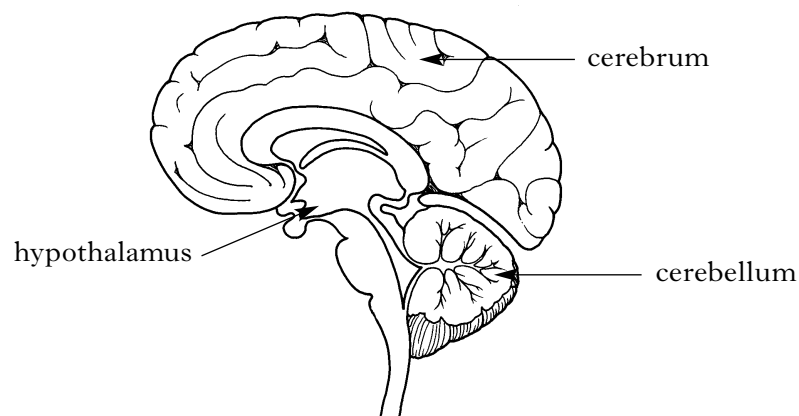
(a) Name the **two** parts of the blood involved in the transport of substances around the body.

(b) Describe how named substances are transported by each part of the blood.

5

OR

B. The diagram below shows a section through the brain.



(a) Name the part of the brain that regulates body temperature.

(b) State its response to a **decrease** in body temperature by describing the changes which will occur in the skin, blood vessels and muscles.

5

Question 2 is on Page thirty.

SPACE FOR ANSWER TO QUESTION 1

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[Turn over for Question 2 on *Page thirty*

Marks

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

Labelled diagrams may be included where appropriate.

A. Genetic engineering uses bacteria to produce human insulin. Describe the stages involved in this process.

5

OR

B. Describe the process of natural selection as illustrated by the peppered moth *Biston betularia*.

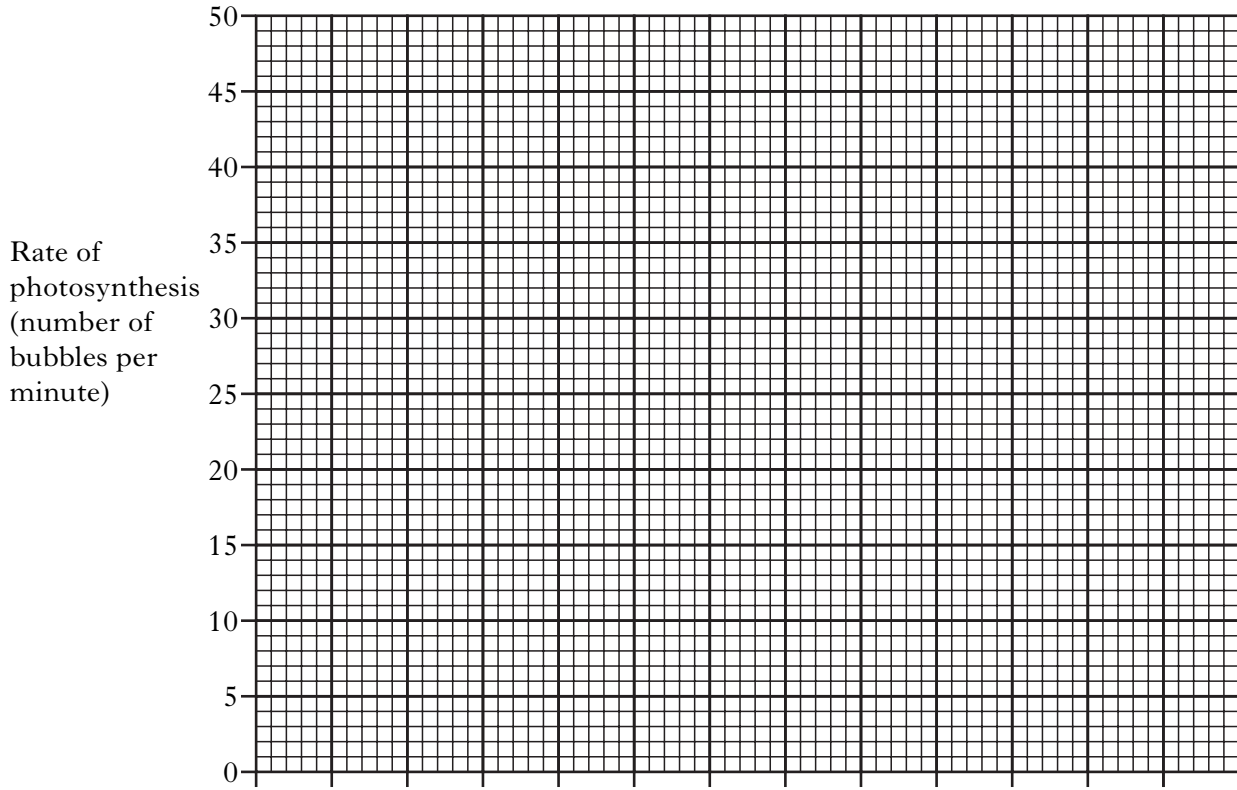
5

[END OF QUESTION PAPER]

SPACE FOR ANSWER TO QUESTION 2

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 7(a)(ii)A



ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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