

FOR OFFICIAL USE

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X007/201

Total for
Sections B and C

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NATIONAL
QUALIFICATIONS
2008

TUESDAY, 27 MAY
9.00 AM – 11.00 AM

BIOLOGY
INTERMEDIATE 2

Fill in these boxes and read what is printed below.

Full name of centre

--

Town

--

Forename(s)

--

Surname

--

Date of birth

Day Month Year

--	--	--	--	--	--	--	--

Scottish candidate number

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Number of seat

--

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

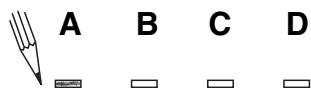
- 1 Check that the answer sheet provided is for **Biology Intermediate 2 (Section A)**.
- 2 For this section of the examination you must use an **HB pencil** and, where necessary, an eraser.
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate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



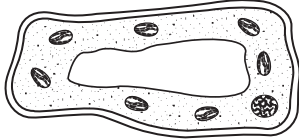
SECTION A

All questions in this Section should be attempted.

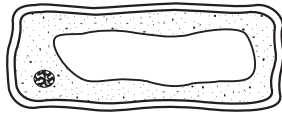
1. The diagrams below show four cells.

Which cell is a leaf mesophyll cell?

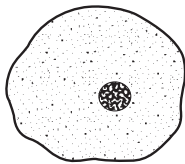
A



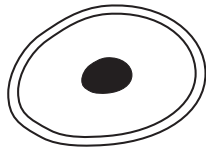
B



C



D



2. Which line in the table below identifies correctly the importance of diffusion to an animal cell?

	<i>Raw material gained</i>	<i>Waste product removed</i>
A	oxygen	glucose
B	carbon dioxide	oxygen
C	oxygen	carbon dioxide
D	glucose	oxygen

3. Which of the following molecules can both diffuse through a cell membrane?

- A Amino acids and starch
- B Amino acids and water
- C Starch and protein
- D Protein and water

4. Red blood cells burst when they are placed in water because

- A the cell contents are hypotonic to the water
- B the cell contents are isotonic to the water
- C the water is hypotonic to the cell contents
- D the water is hypertonic to the cell contents.

5. The energy yield per glucose molecule during aerobic respiration is

- A 2 molecules of ATP
- B 18 molecules of ATP
- C 36 molecules of ATP
- D 38 molecules of ATP.

6. The following are statements about respiration.

- 1 ATP is produced
- 2 Lactic acid is produced
- 3 Carbon dioxide is produced
- 4 Ethanol is produced

Which of the statements are true of anaerobic respiration in human muscle tissue?

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

7. The role of chlorophyll in photosynthesis is to trap

- A light energy for ATP production
- B chemical energy for ATP production
- C light energy for ADP production
- D chemical energy for ADP production.

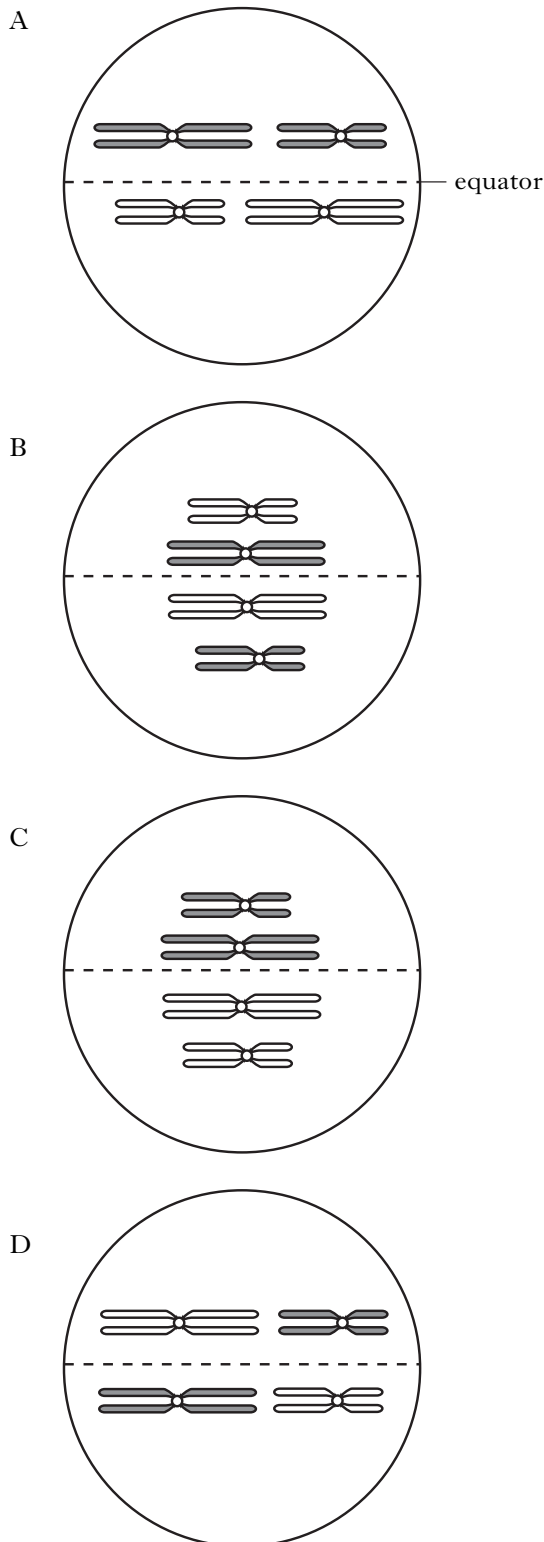
8. The raw materials for photosynthesis are

- A carbon dioxide and water
- B oxygen and water
- C carbon dioxide and glucose
- D oxygen and glucose.

9. All proteins are composed of

- A genes
- B DNA
- C amino acids
- D bases.

10. Which of the following diagrams best represents the arrangement of chromosomes in a cell undergoing meiosis?



11. Which line in the table describes correctly the possible chromosome content of human gametes?

	<i>Sperm</i>		<i>Ovum (egg)</i>	
	<i>Total number of chromosomes</i>	<i>Type of sex chromosome</i>	<i>Total number of chromosomes</i>	<i>Type of sex chromosome</i>
A	23	X	23	Y
B	23	Y	23	X
C	46	X	46	Y
D	46	Y	46	X

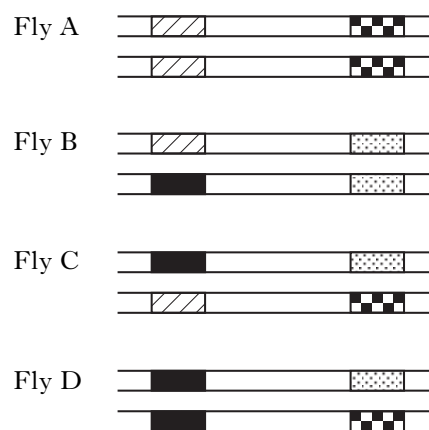
12. In the fruit fly *Drosophila*, the allele for normal wings is dominant to the allele for short wings.

A normal winged fly was crossed with a short winged fly and all the F_1 offspring had normal wings.

If these F_1 offspring were to mate with each other, what percentage of the F_2 offspring would be expected to have normal wings?

- A 25%
- B 50%
- C 75%
- D 100%

13. 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**
- dominant gene for striped body
 - recessive gene for unstriped body
 - dominant gene for normal antennae
 - recessive gene for abnormal antennae

Which fly has a striped body and abnormal antennae?

14. In a breed of dog, the alleles for white coat colour and black coat colour are **co-dominant**.

A cross was performed between two heterozygous dogs.

Which line in the table below shows the numbers of different phenotypes and genotypes which are possible in the offspring?

	<i>Number of phenotypes</i>	<i>Number of genotypes</i>
A	1	3
B	2	3
C	3	2
D	3	3

15. Which of the following is an example of natural selection?

- A Increased milk yield in dairy cattle
- B Industrial melanism in Peppered Moths
- C Insulin production by bacteria
- D Insertion of DNA into a chromosome

16. The Peppered Moth is found in two distinct forms. One form is dark coloured and the other is light coloured. The moths rest on the trunks of trees.

Pale coloured tree-trunks in an area were darkened by pollution. What would happen to the numbers of the two forms of the Peppered Moth in that area?

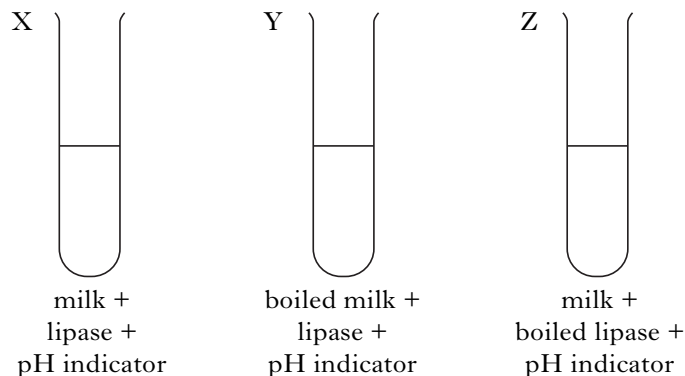
- A The numbers of each form would increase.
- B The dark form would increase and the light form decrease.
- C The numbers of each form would decrease.
- D The light form would increase and the dark form decrease.

17. Which of the following is **not** a benefit of selective breeding in crop plants?

- A Higher yields can be produced.
- B Undesirable features can be eliminated.
- C Seed quality can be improved.
- D Higher yields can always be guaranteed.

18. Lipase is an enzyme found in the small intestine. Lipase speeds up the breakdown of fat. Full cream milk contains a high proportion of fat.

Three test tubes were set up as shown in the diagram below.



The pH of the contents of each test tube was recorded at the start and again 15 minutes later.

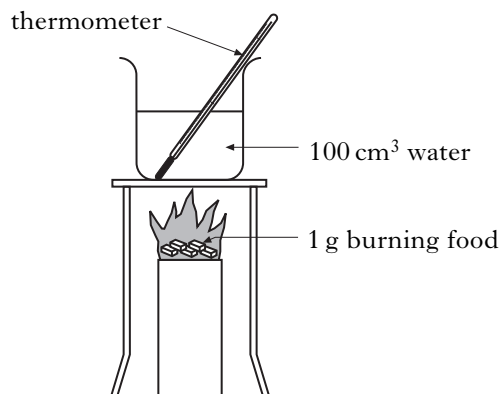
What changes in pH took place?

- A The pH decreased in each test tube.
- B The pH increased in each test tube.
- C The pH decreased in tubes X and Y and did not change in tube Z.
- D The pH increased in tubes Y and Z and did not change in tube X.

[Turn over

19. The diagram below shows the apparatus used to investigate the energy contents of different foods.

1 g of each food was burned under a beaker containing 100 cm³ of water. The rise in water temperature was measured using a thermometer.



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

Food	Temperature rise (°C)
potato	15
margarine	40
egg	20

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

Energy value = 0.42 × temperature rise (°C)
(kJ per gram)

Using this equation, the energy value of egg is

- A 0.42
- B 8.4
- C 84
- D 840.

20. The energy values of different food groups are shown in the table.

Food group	Energy value (kJ per gram)
Carbohydrate	19
Fat	38
Protein	19

What is the simple whole number ratio of the energy value in fat to protein to carbohydrate?

- A 1 : 2 : 1
- B 2 : 1 : 1
- C 19 : 38 : 19
- D 38 : 19 : 19

21. The following statements refer to the state of muscles in the gut.

Statement	State of muscles
1	contracted in front of food
2	relaxed in front of food
3	contracted behind food
4	relaxed behind food

Which statements describe peristalsis?

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

22. Tests were carried out on a sample of food. The result of each test is shown in the table below.

Food test	Iodine solution	Benedict's solution	Biuret solution	Translucent spot
Result	negative	negative	positive	negative

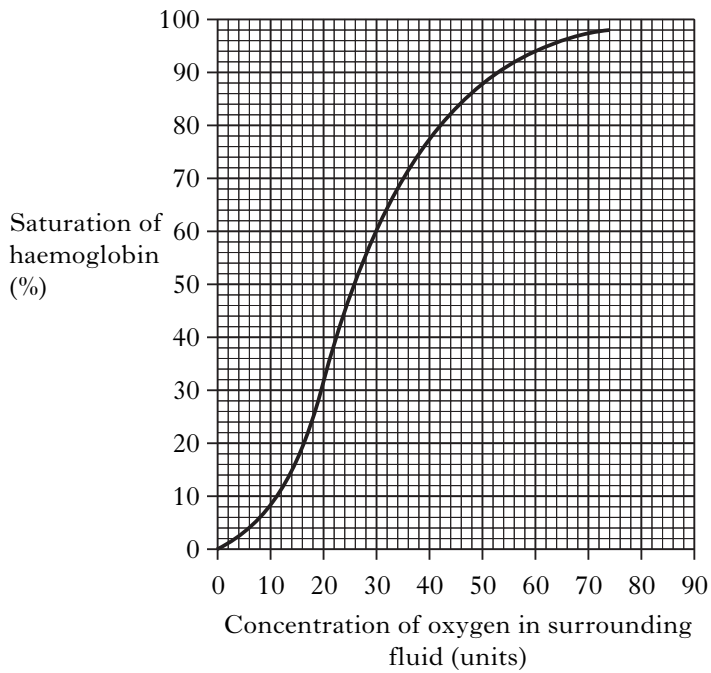
The sample of food contained

- A glucose
- B protein
- C starch
- D fat.

23. Carbon dioxide is removed from the body through the lungs. The correct pathway taken by a molecule of carbon dioxide out of the lungs is

- A alveoli → bronchioles → bronchi → trachea
- B trachea → bronchi → bronchioles → alveoli
- C alveoli → bronchi → bronchioles → trachea
- D trachea → bronchioles → bronchi → alveoli.

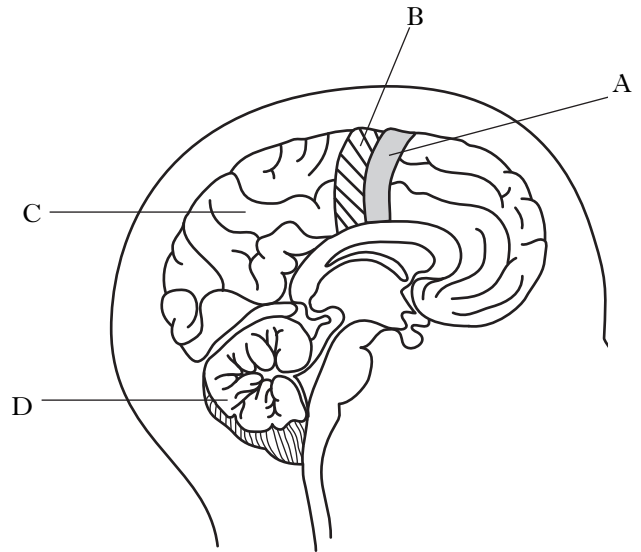
24. The graph shows the percentage saturation of haemoglobin at different oxygen concentrations.



What is the percentage saturation of haemoglobin with oxygen when the oxygen concentration of the surroundings is 60 units?

- A 30
- B 90
- C 92
- D 94

25. The diagram below shows a side view of the human brain.



Which label identifies correctly the part of the brain which controls balance?

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

[Turn over

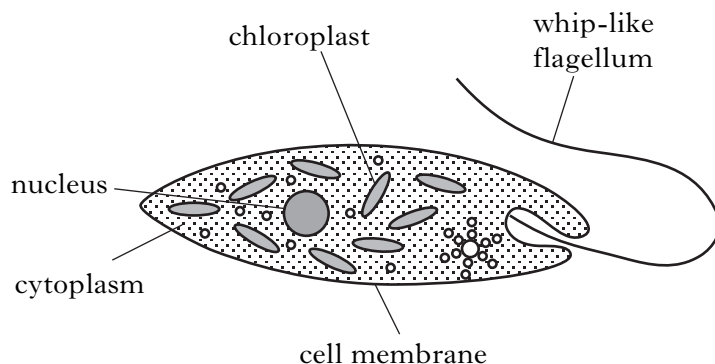
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SECTION B

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

Marks

1. (a) *Euglena* is a single celled organism.
The diagram below shows some of the structures within *Euglena*.



- (i) *Euglena* has structures found in most cells.

Complete the table below to show the names of these structures and their functions.

<i>Structure</i>	<i>Function</i>
	controls the entry and exit of materials
Cytoplasm	
Nucleus	

2

- (ii) Name the structure that identifies *Euglena* as a plant cell.

1

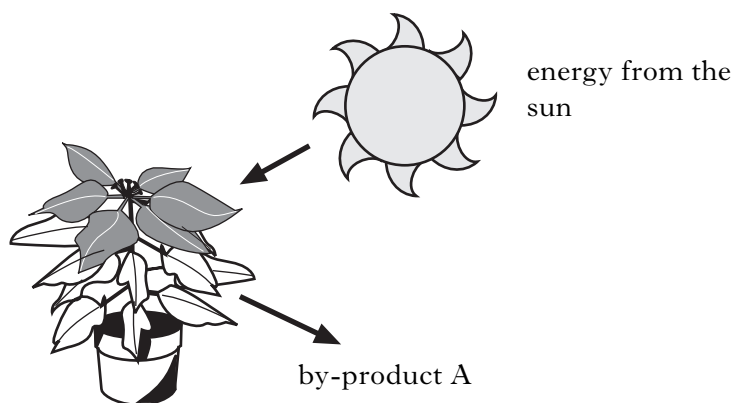
- (b) Most plant cells have a cell wall.
Name the structural carbohydrate in the cell wall.

1

[Turn over

Marks

2. Photosynthesis is the process by which green plants make glucose using energy from the sun.



- (a) Name the by-product A released during photosynthesis.

1

- (b) Hydrogen and a high energy molecule are produced during photolysis.

- (i) Name the high energy molecule.

1

- (ii) Describe the use of hydrogen in carbon fixation.

1

- (c) (i) Explain why an increase in temperature can lead to an increase in the rate of photosynthesis.

2

- (ii) Other than temperature, state **two** limiting factors of photosynthesis.

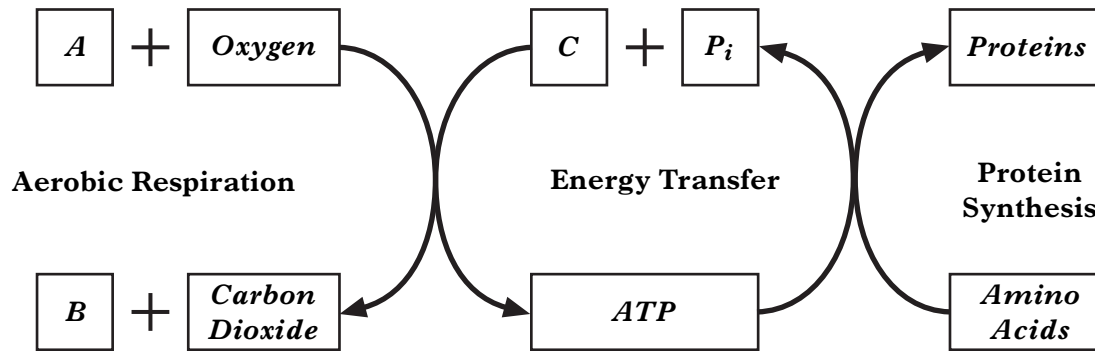
1. _____

2. _____

1

Marks

3. (a) The diagram below shows the link between aerobic respiration and protein synthesis.



- (i) Name substances A, B and C.

A _____

B _____

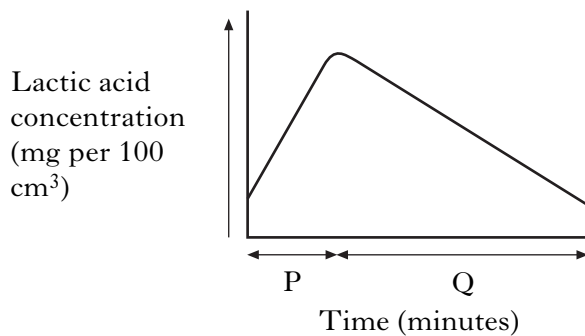
C _____

2

- (ii) Some energy released in respiration can be used for protein synthesis. State one other cellular activity that uses energy.

1

- (b) The graph below shows lactic acid concentration in blood during a period of vigorous exercise (P) and of complete rest (Q).



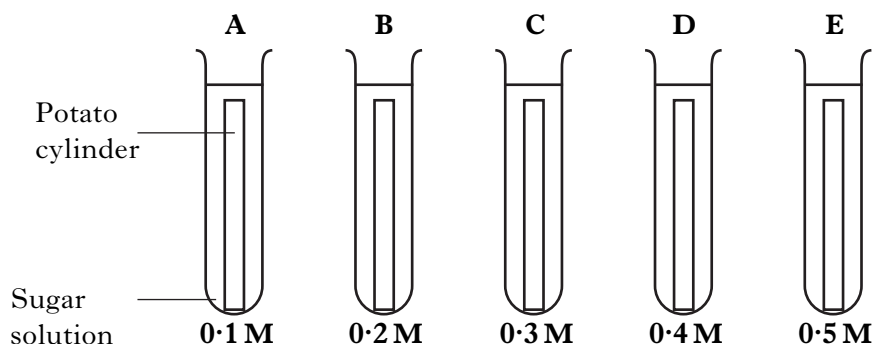
Explain why the lactic acid concentration changes during period Q.

1

Marks

4. A student cut five similar cylinders from the same potato, dried them with a paper towel and weighed them.

Each cylinder was placed in a different concentration of sugar solution as shown in the diagram below:



After three hours, the student removed the cylinders from the solutions, dried and weighed them as before.

The results are shown in the table below.

<i>Test tube</i>	<i>Concentration of sugar solution (M)</i>	<i>Initial mass of potato cylinder (g)</i>	<i>Final mass of potato cylinder (g)</i>	<i>Change in mass of potato cylinder (g)</i>	<i>Percentage change in mass of potato</i>
A	0.1	2.0	2.2	+0.2	+10
B	0.2	2.0	2.1	+0.1	+5
C	0.3	2.0	1.8	-0.2	-10
D	0.4	2.0	1.7	-0.3	
E	0.5	2.0	1.5	-0.5	-25

- (a) Complete the table by calculating the **percentage change in mass** of the potato cylinder in 0.4 M sugar solution.

Space for calculation

1

- (b) (i) Name the variable altered in this investigation.

1

- (ii) Suggest one way in which the reliability of the results could be improved.

1

Marks

4. (b) (continued)

(iii) Would the results be valid if the cylinders were **not** dried before being weighed? Tick (✓) the correct box.

Valid

Not valid

Explain your answer.

Explanation _____

1

(c) (i) State the letter of one test tube containing a potato cylinder in a **hypertonic** solution.

Letter _____

1

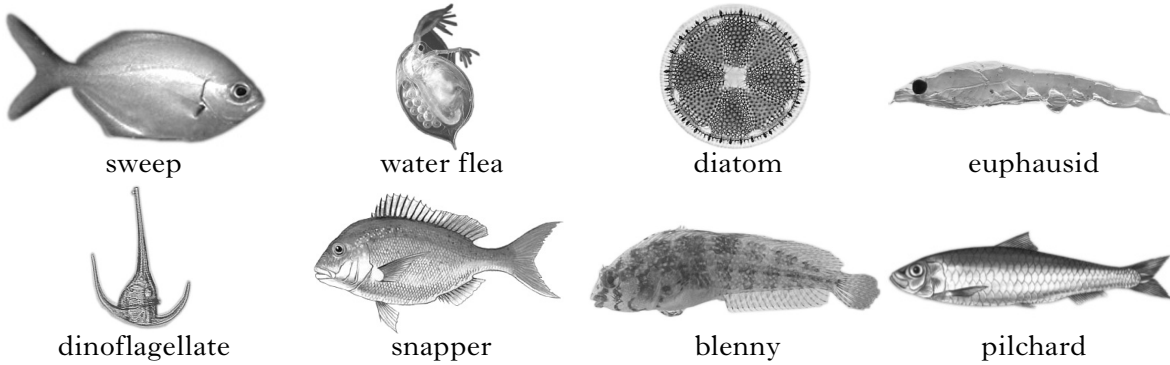
(ii) Predict the appearance of the potato cylinder in test tube E after three hours.

1

[Turn over

Marks

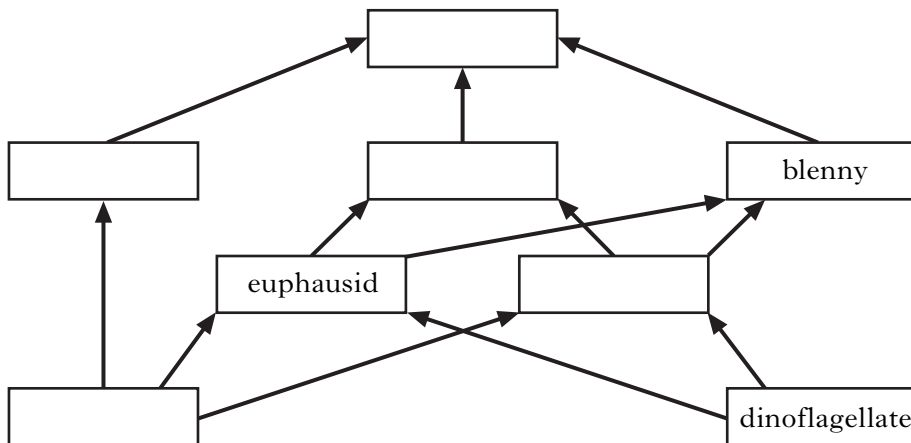
5. The pictures show some organisms from a marine ecosystem.
The pictures are not to scale.



The table below shows information about the feeding relationships in the marine ecosystem.

Organism	Food eaten
euphausiid	dinoflagellate, diatom
dinoflagellate	none
sweep	diatom
snapper	sweep, pilchard, blenny
pilchard	water flea, euphausiid
blenny	water flea, euphausiid
diatom	none
water flea	diatom, dinoflagellate

- (a) (i) Use the information in the table to complete the food web below.



2

- (ii) What term is used to describe the snapper in this ecosystem?

1

Marks

5. (continued)

(b) A pod of dolphins arrived in the area. Dolphins feed on snappers.

Describe the effect of the dolphins on the size of the euphausiid population.
Explain your answer.

Effect _____

1

Explanation _____

1

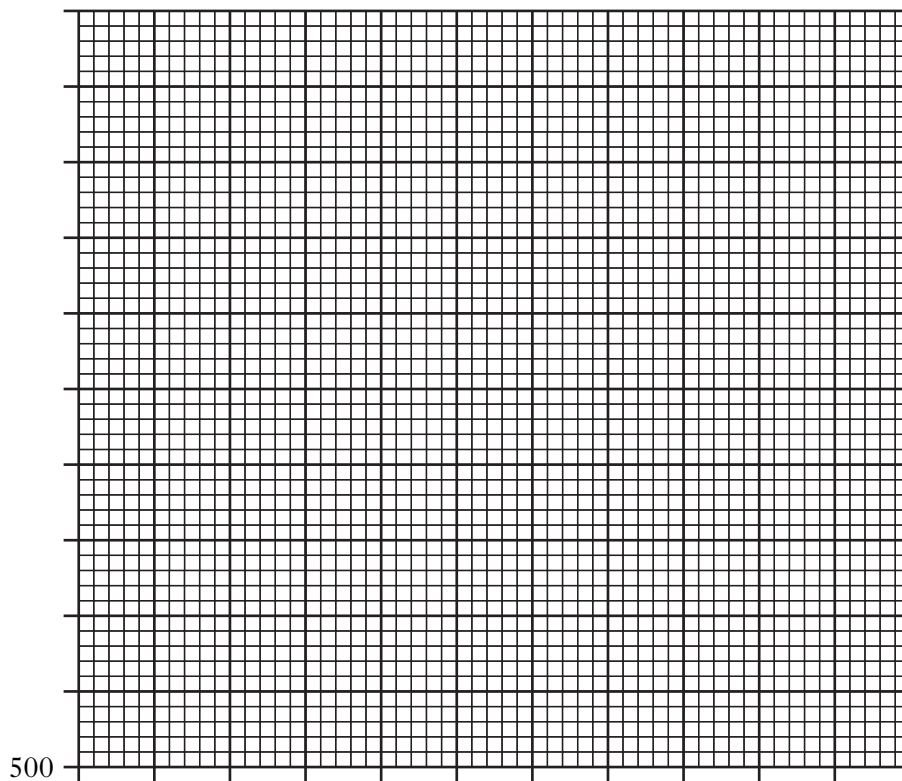
[Turn over

Marks

6. The table shows the number of pilot whales caught in the Faroe islands between 1994 and 2000.

<i>Year</i>	<i>Number of pilot whales caught</i>
1994	1200
1995	228
1996	1500
1997	1170
1998	820
1999	610
2000	580

- (a) (i) Construct a **bar graph** of the results given from **1996 to 2000**.
(Additional graph paper, if required, will be found on page 32)



3

Marks

6. (a) (continued)

(ii) Describe the trend shown by the results in the table from **1996** to **2000**.

1

(iii) What is the average yearly pilot whale catch from **1996** to **2000**?

Space for calculation

average _____

1

(b) How many times greater was the pilot whale catch in 1996 than in 1994?

Space for calculation

_____ times

1

[Turn over

Marks

7. Feather colour in parrots is controlled by a single gene. Blue feather colour (B) is dominant to yellow feather colour (b).



- (a) A homozygous blue parrot is crossed with a homozygous yellow parrot.

- (i) Complete the genotypes of the P generation.

P phenotype blue X yellow

P genotype _____ _____

1

- (ii) State the genotype of the F₁ parrots.

F₁ genotype _____

1

- (iii) State the phenotype of the F₁ parrots.

F₁ phenotype _____

1

- (b) An F₁ individual is crossed with a true breeding yellow parrot.

Complete the punnet square to show the expected results of this cross.

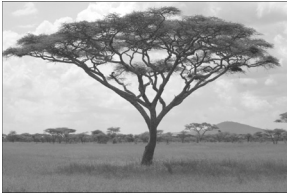
	Genotype of gametes from F ₁ parent	
Genotype of gametes from yellow parent		

2

Marks

8. (a) In African grasslands impala, giraffe and zebra feed on *Acacia* trees. Impala and zebra also graze on grasses.

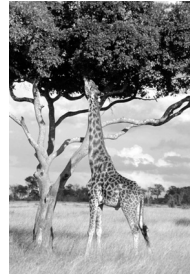
Acacia



impala



giraffe



zebra



- (i) State one way that competition for food is reduced between zebras and giraffes.

_____ 1

- (ii) The *Acacia* tree is adapted to withstand long periods of drought.

Suggest an adaptation the *Acacia* tree may show that allows it to survive long, dry periods.

_____ 1

- (b) In Scottish grasslands, sheep are often found as grazers. A very large flock of sheep was introduced into an area of ungrazed grassland.

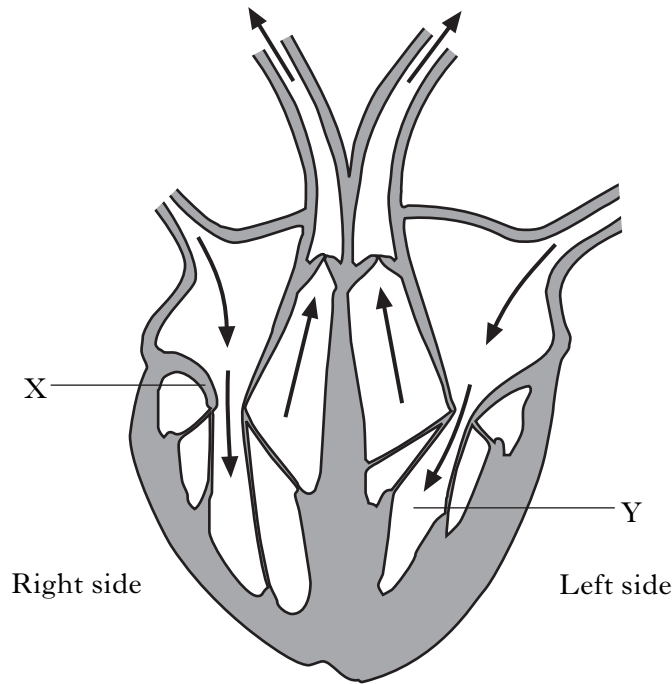
Explain why this would decrease biodiversity within this area.

_____ 2

[Turn over

Marks

9. The diagram below shows a section through a human heart.



(a) Name valve X and chamber Y shown in the diagram.

X _____

Y _____

1

(b) Decide if each of the following statements about blood vessels 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>
<u>Capillaries</u> contain valves.			
<u>Veins</u> allow gas exchange.			
Blood leaves the heart in <u>arteries</u> .			

3

Marks

9. (continued)

- (c) The sentences below describe some of the functions of blood cells.
Underline one option in each set of brackets to make the sentences correct.

Oxygen is transported by $\left\{ \begin{array}{l} \text{red} \\ \text{white} \end{array} \right\}$ blood cells.

It combines with haemoglobin to form oxyhaemoglobin at $\left\{ \begin{array}{l} \text{low} \\ \text{high} \end{array} \right\}$ oxygen levels.

Antibodies are produced by $\left\{ \begin{array}{l} \text{macrophages} \\ \text{lymphocytes} \end{array} \right\}$

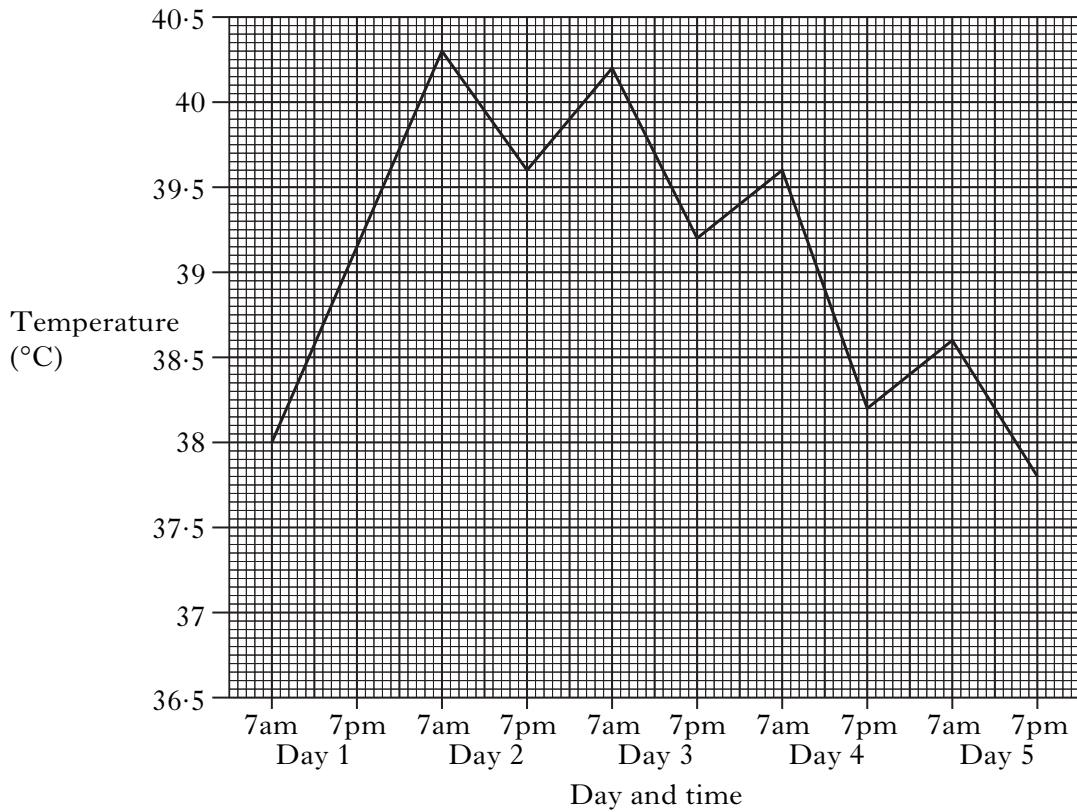
1

1

[Turn over

Marks

10. The chart below shows the temperature of a patient over a 5 day period. Readings were taken daily at 7am and 7pm.



- (a) (i) Calculate the temperature increase from 7am on Day 1 to 7am on Day 2.

Space for working

_____ °C **1**

- (ii) State **two** responses made by the body to cause the change in temperature observed on Day 2 from 7am to 7pm.

1. _____

2. _____

2

10. (continued)

Marks

- (b) (i) Name the area of the brain containing the temperature regulating centre.

1

- (ii) What term is used to describe the type of control mechanism which returns the body temperature to normal?

1

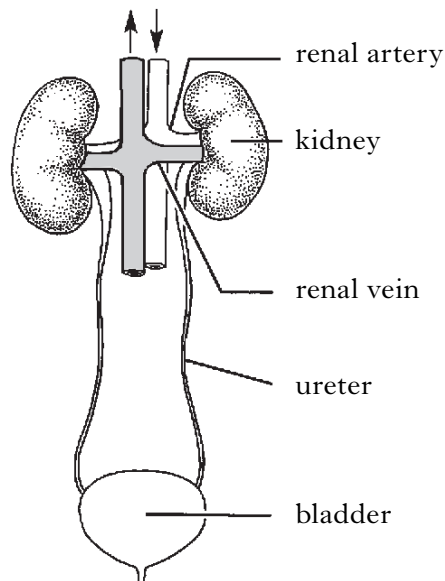
- (iii) Describe how information is carried from temperature receptors in the skin to the brain.

1

[Turn over

Marks

11. The diagram below shows the human urinary system with its blood supply.
blood flow



- (a) An investigation was carried out to measure the concentration of three substances in samples of blood and urine.

The table below shows the results of this investigation.

<i>Sample site</i>	<i>Concentration (grams per litre)</i>		
	<i>Glucose</i>	<i>Urea</i>	<i>Salts</i>
Renal artery	1.0	0.3	8.0
Renal vein	0.8	0.0	6.0
Ureter	0.0	20.0	15.0

- (i) Calculate the percentage of glucose remaining in the blood after it passes through the kidney.

Space for calculation

_____ % **1**

- (ii) Explain how the data in the table supports the statement that urea is a waste product.

_____ **1**

- (iii) Name one substance, not shown in the table, which is present in urine.

_____ **1**

Marks

11. (continued)

(b) Name the two processes in the kidney which cause the differences in salt concentration between blood and urine.

Process 1 _____

1

Process 2 _____

1

(c) Freshwater bony fish use their kidneys to overcome a water balance problem. Describe this problem and **one** method used by the kidneys to overcome it.

Problem _____

1

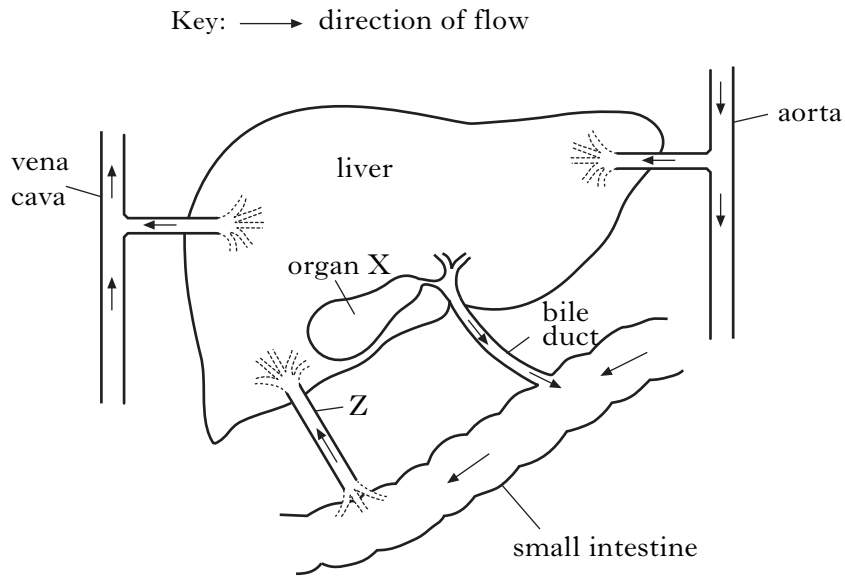
Method _____

1

[Turn over

Marks

12. (a) The diagram below shows the small intestine with associated organs and blood vessels.



- (i) Blood vessel Z carries amino acids to the liver.

(A) Name blood vessel Z.

1

(B) Describe what happens to excess amino acids in the liver.

1

- (ii) (A) Name organ X.

1

(B) Describe the function of the bile that is released from organ X.

1

- (b) Complete the table below which shows the substrate and product of two enzymes found in the small intestine.

<i>Enzyme</i>	<i>Substrate</i>	<i>Product</i>
	protein	
amylase		maltose

2

[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.

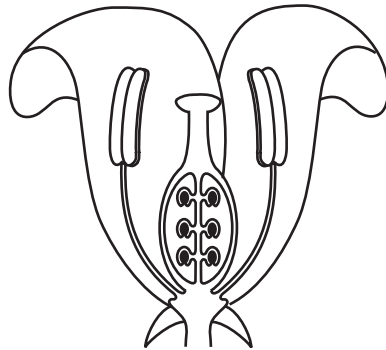
**Questions 1 and 2 should be attempted on the blank pages which follow.
All answers must be written clearly and legibly in ink.**

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

Marks

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

A. The diagram below shows a section through a flower.

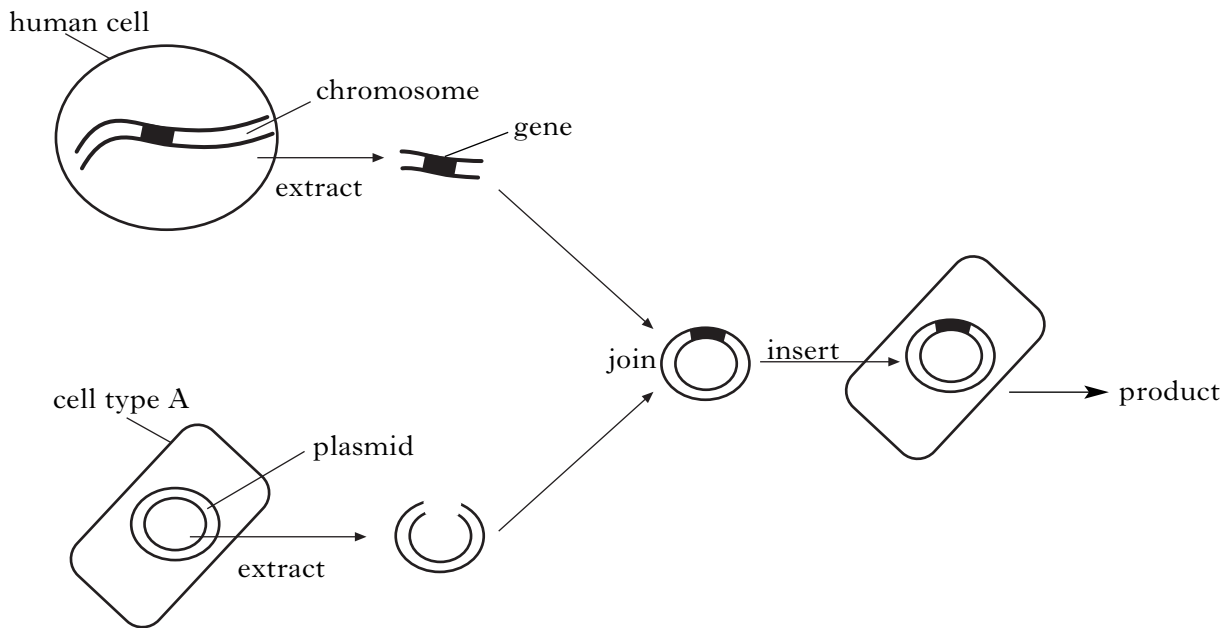


Name the sites of production of pollen grains and ovules in a flower.
Describe how these gametes are formed and describe the process of fertilisation.

5

OR

B. The diagram below summarises a form of genetic engineering.



Identify cell type A and name a product of genetic engineering.
Describe the advantages and disadvantages of this process.

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. Describe the function of yeast in bread making and the anaerobic pathway of respiration involved in this process.

5

OR

B. Describe the properties of enzymes and the function of the enzyme phosphorylase in a synthesis reaction.

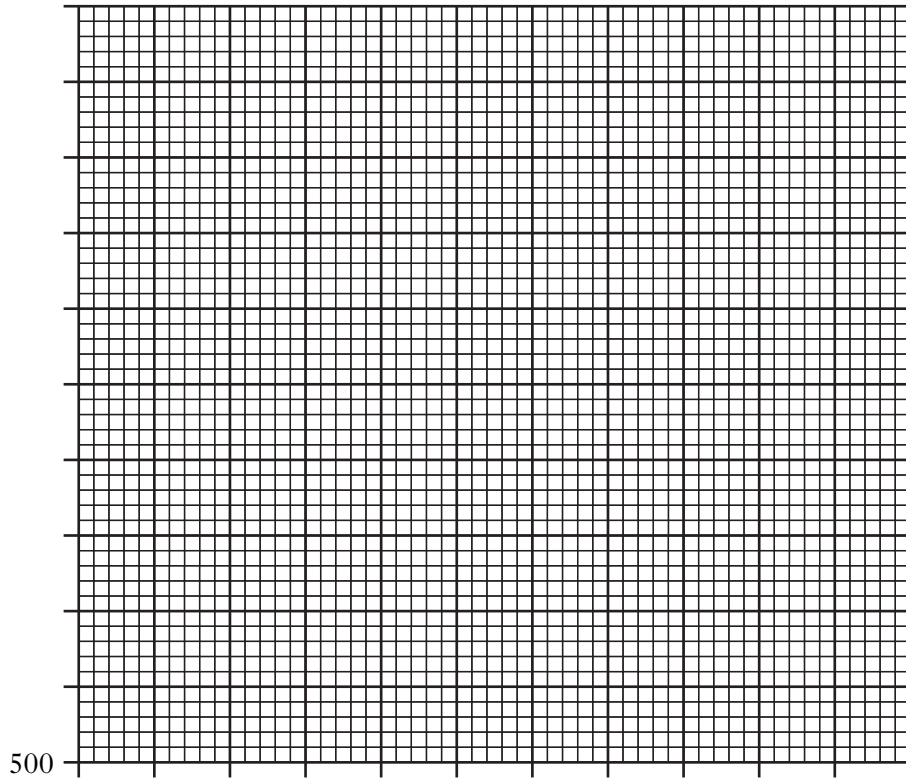
5

[END OF QUESTION PAPER]

SPACE FOR ANSWER TO QUESTION 2

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 6(a)(i)



ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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