

FOR OFFICIAL USE

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Total for
Sections B and C

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X007/201

NATIONAL WEDNESDAY, 1 JUNE
QUALIFICATIONS 9.00 AM – 11.00 AM
2011

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

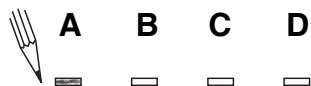
- 1 Check that the answer sheet provided is for **Biology Intermediate 2 (Section A)**.
- 2 For this section of the examination you must use an **HB pencil** and, where necessary, an eraser.
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate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

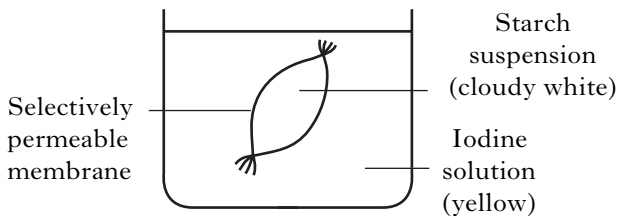
All questions in this Section should be attempted.

1. Which substance enters animal cells by diffusion and is used to produce ATP?

- A Carbon dioxide
- B Starch
- C Water
- D Glucose

2. The diagram below shows a model cell that was set up to investigate diffusion through a selectively permeable membrane.

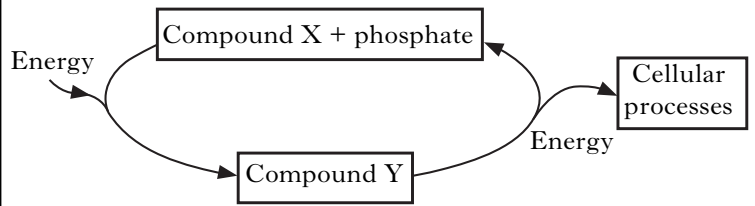
Iodine is a small, soluble molecule.



Predict the colour changes which would be observed after one hour.

<i>Colour change after one hour</i>		
	<i>Starch suspension</i>	<i>Iodine solution</i>
A	remained cloudy white	yellow to blue/black
B	cloudy white to blue/black	remained yellow
C	remained cloudy white	remained yellow
D	cloudy white to blue/black	yellow to blue/black

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



Which line in the table identifies correctly compounds X and Y?

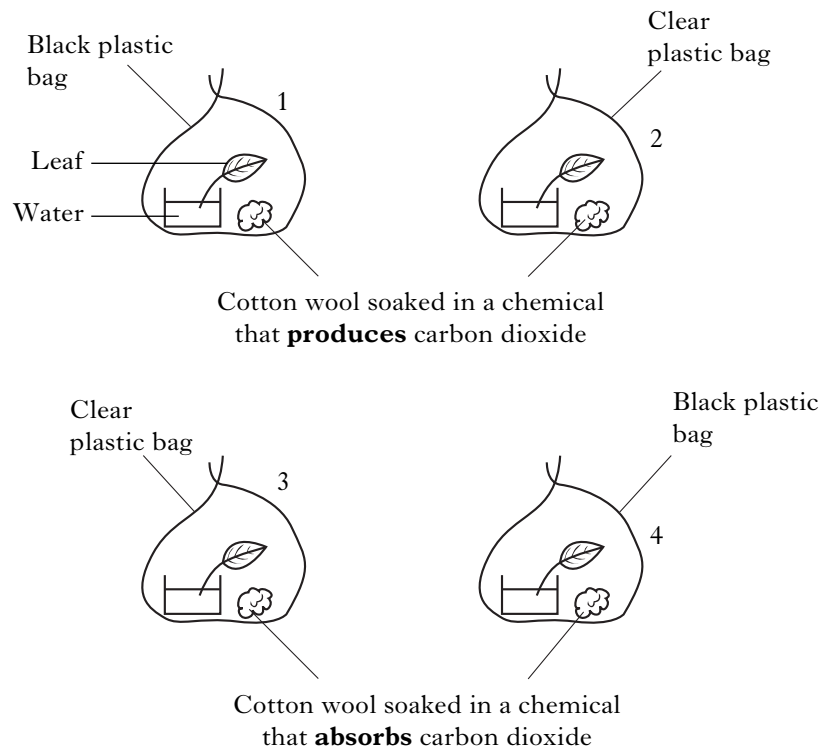
	X	Y
A	glucose	CO ₂
B	CO ₂	ADP
C	ADP	ATP
D	ATP	glucose

4. Which of the following stages in respiration would result in the production of 38 molecules of ATP?

- A Glucose to pyruvic acid
- B Pyruvic acid to lactic acid
- C Pyruvic acid to carbon dioxide and water
- D Glucose to carbon dioxide and water

[Turn over

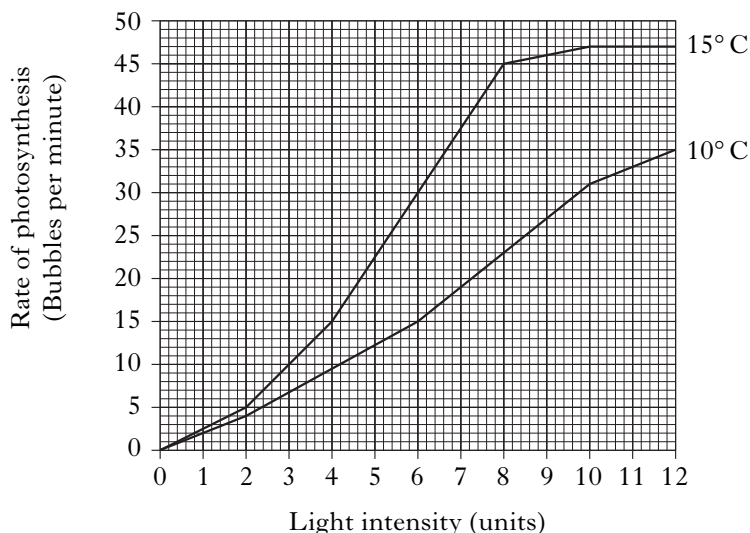
5. The diagrams below show four experiments used in an investigation into the conditions needed for photosynthesis.



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

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

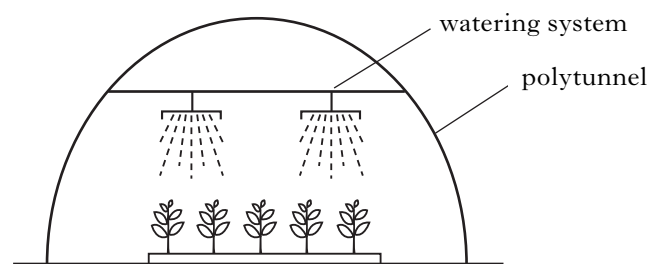
6. The graph below shows the rate of photosynthesis, as light intensity increases, at two different temperatures.



At a light intensity of 6 units, what is the simplest whole number ratio of the rate of photosynthesis at 10°C compared to 15°C?

- A 15 : 30
- B 10 : 15
- C 3 : 6
- D 1 : 2

7. A crop of tomatoes was grown in a polytunnel.

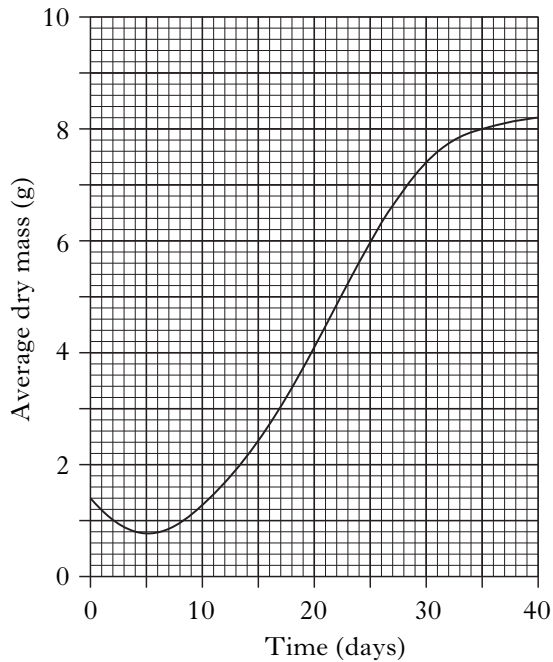


Which of the following changes would **not** produce an earlier crop of tomatoes?

- A Increasing the heating during the day.
- B Increasing the CO₂ concentration at night.
- C Increasing the light intensity at night.
- D Increasing the CO₂ concentration during the day.

8. An experiment was carried out to investigate the growth of plants for 40 days after germination.

The graph below shows the average dry mass of the plants.



During which 5 day period is there the greatest increase in average dry mass?

- A Days 5 – 10
- B Days 10 – 15
- C Days 20 – 25
- D Days 25 – 30

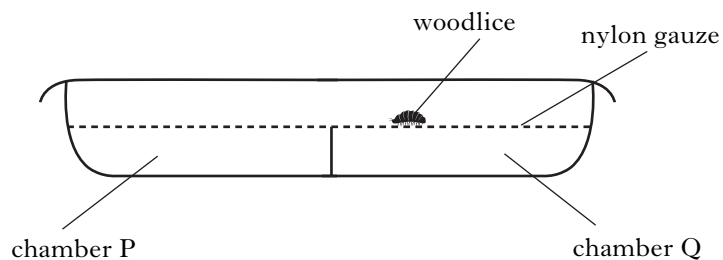
9. The table below shows the results of an investigation into the effect of temperature on the number of eggs laid by female red spider mites.

	Temperature (°C)	
	20°C	30°C
Average number of eggs laid per female	90	60

The percentage decrease in the average number of eggs laid per female when the temperature is increased from 20°C to 30°C is

- A 30%
- B 33%
- C 50%
- D 67%

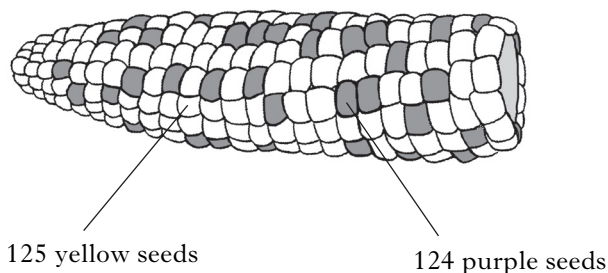
10. A choice chamber was used to investigate the effect of humidity on the behaviour of woodlice, as shown below.



Which line in the table below describes the most appropriate set up for this investigation?

	Number of woodlice	Contents of chamber P	Contents of chamber Q	Modification to choice chamber
A	2	Drying agent	Wet cotton wool	Half covered in black paper
B	2	Wet cotton wool	Drying agent	Totally covered in black paper
C	10	Drying agent	Wet cotton wool	Half covered in black paper
D	10	Wet cotton wool	Drying agent	Totally covered in black paper

11. In corn on the cob, yellow seed (G) is dominant to purple seed (g). The cob shown below shows some yellow and some purple seeds. The seeds have been counted.



The genotypes of the parents that produced this cob were

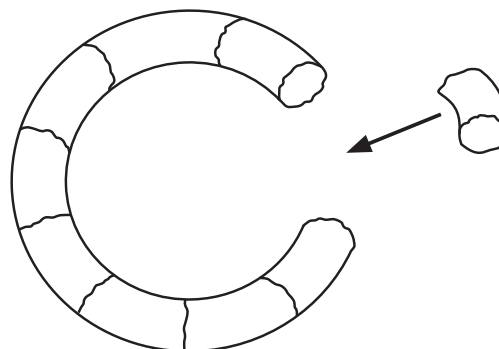
- A $GG \times gg$
 B $Gg \times gg$
 C $gg \times gg$
 D $Gg \times Gg$.
12. The table below shows the relationship between planting density and the mass of seed harvested for a trial cereal crop.

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

The reason a low mass of seed was harvested when the planting density was 128 plants per square metre was

- A less disease at high planting densities
 B more nutrients available
 C more competition for light and nutrients
 D less space for weeds.

13. Which stage in the production of human insulin by genetic engineering is represented in the diagram below?



- A Human gene is inserted into a plasmid.
 B Human gene is inserted into a bacterium.
 C Plasmid is inserted into a human chromosome.
 D Bacterial gene is inserted into a human chromosome.
14. A hairy stemmed pea plant is crossed with a smooth stemmed pea plant. All the F_1 plants had hairy stems.
 The genotype of the F_1 plants was
- A heterozygous
 B homozygous
 C dominant
 D recessive.
15. Differences in the mass of sunflower seeds are due to the interaction of the alleles of several genes.
 This type of inheritance is called
- A dominant
 B monohybrid
 C polygenic
 D co-dominant.

16. Two groups of the seeds of genetically tall plants were grown under different conditions.

Group I seeds were grown in high light intensity and high nutrient levels.

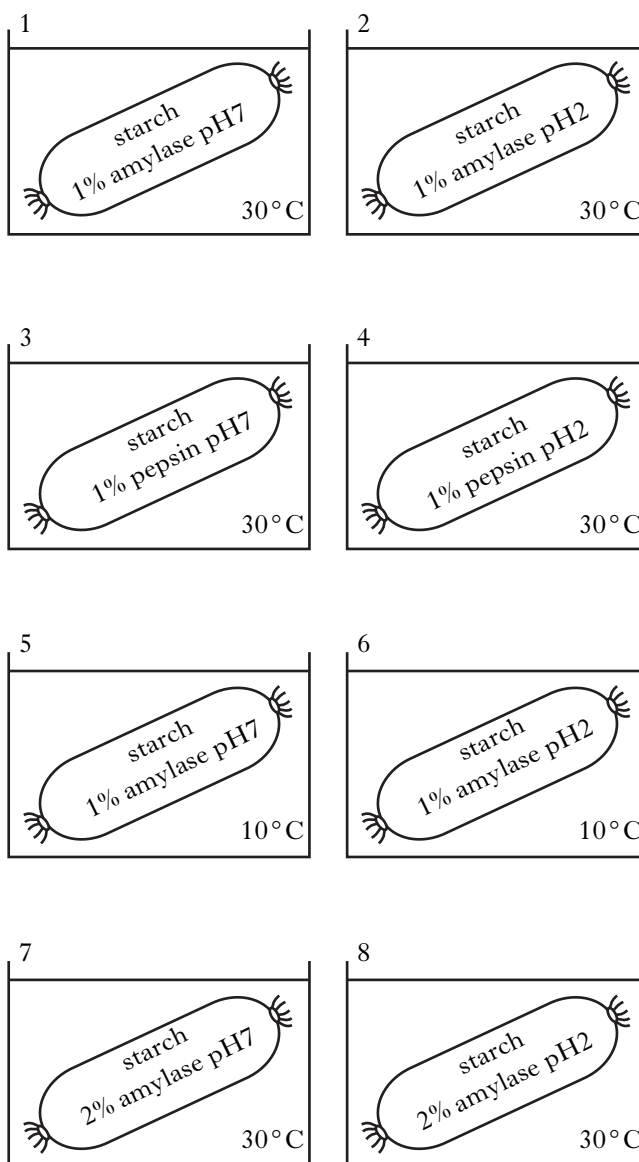
Group II seeds were grown in low light intensity and low nutrient levels.

All plants in group I were taller than those in group II.

The effect of the different conditions on the phenotype is due to

- A natural selection
 - B biodiversity
 - C environmental impact
 - D polygenic inheritance.
17. Which of the following is an example of selective breeding?
- A Increasing milk yield in dairy cattle
 - B Industrial melanism in Peppered moths
 - C Insulin production by bacteria
 - D Insertion of DNA into a bacterium

18. Eight visking tubing (model gut) bags, as shown below, were placed into water baths.

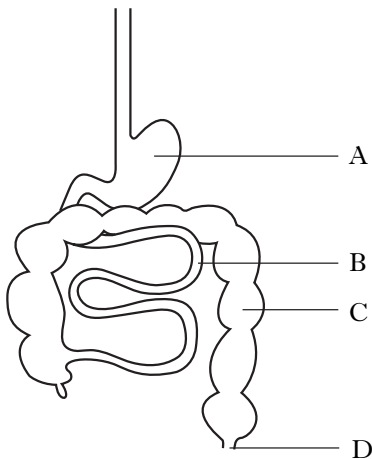


Which two bags could be compared to investigate the effect of pH on the digestion of starch?

- A 1 and 4
- B 2 and 5
- C 2 and 7
- D 7 and 8

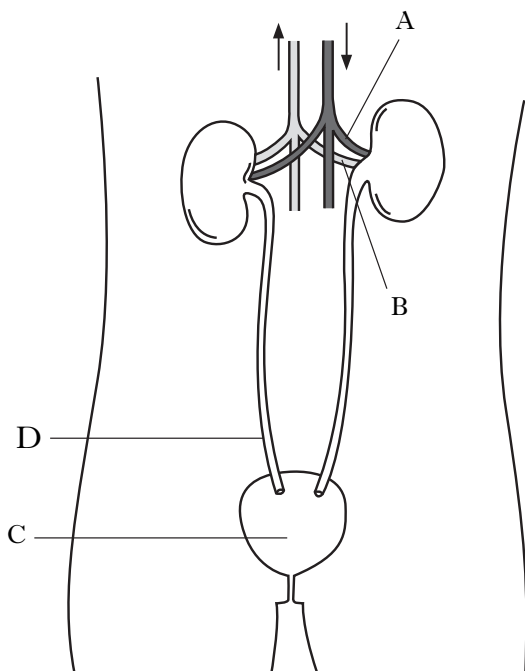
[Turn over

19. The diagram below shows the human alimentary canal.



Which structure contains villi?

20. The diagram below shows the human urinary system.



Which labelled part has the lowest concentration of urea?

21. A student has a heart rate of 80 beats per minute and a cardiac output of 4 litres per minute.

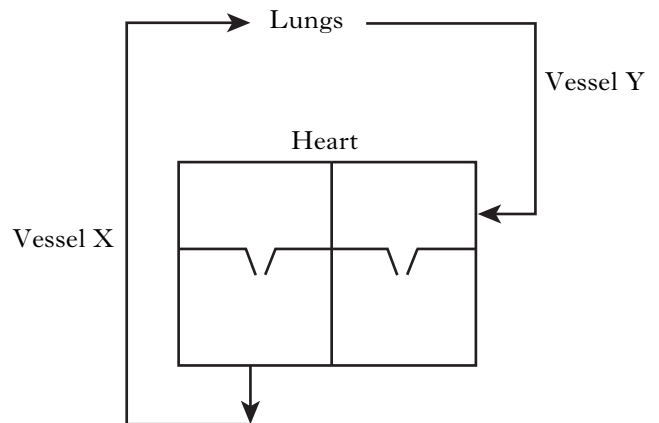
Cardiac output is calculated using the following equation:

$$\text{Cardiac output} = \text{volume of blood} \times \text{heart rate per beat}$$

What is the volume of blood pumped per beat?

- A 5 cm³
- B 20 cm³
- C 50 cm³
- D 320 cm³

22. The diagram below shows the heart and circulation.



Which line in the table describes correctly the types of blood in vessels X and Y?

	<i>Vessel X</i>	<i>Vessel Y</i>
A	deoxygenated	deoxygenated
B	oxygenated	deoxygenated
C	oxygenated	oxygenated
D	deoxygenated	oxygenated

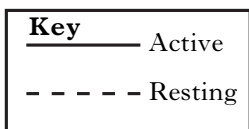
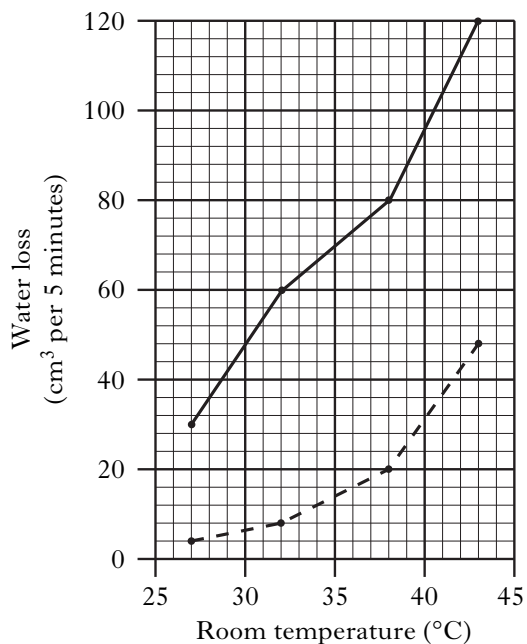
23. The list below refers to stages in the response of the nervous system to a stimulus.

- 1 Central nervous system sorts information.
- 2 Nerve impulses sent to muscles.
- 3 Nerve impulses sent to central nervous system.
- 4 Senses detect the stimulus.
- 5 Response is produced.

The correct order of the stages is

- A 4 → 3 → 1 → 2 → 5
- B 3 → 4 → 2 → 1 → 5
- C 4 → 3 → 2 → 1 → 5
- D 3 → 4 → 1 → 2 → 5.

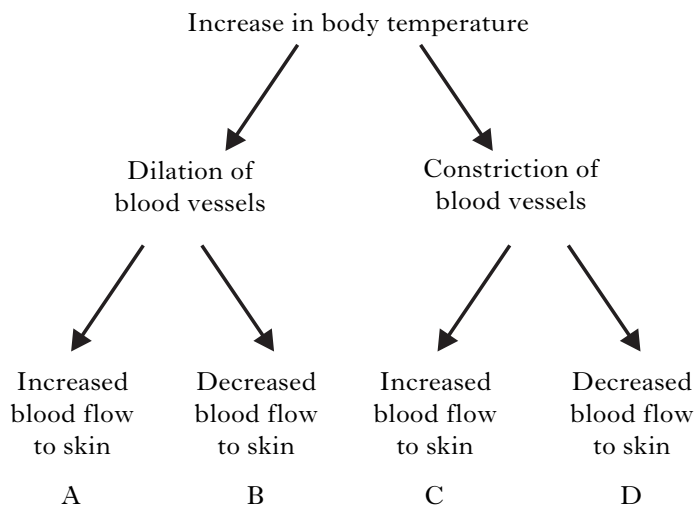
24. The graph below shows the rates of water loss from an athlete when active and resting at different room temperatures.



What is the difference in water loss per 5 minutes between active and resting at 43 °C?

- A 70 cm³
- B 72 cm³
- C 76 cm³
- D 78 cm³

25. Which of the following pathways shows the correct response in blood vessels of the skin to an increase in body temperature?



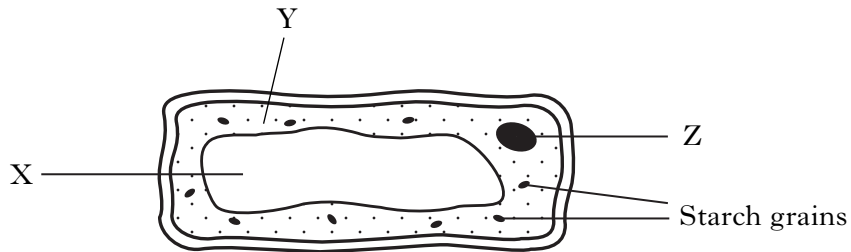
Candidates are reminded that the answer sheet for Section A MUST be placed INSIDE the front cover of this answer book.

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 represents a potato cell.



(i) Name the parts of the cell labelled X and Y.

X _____

Y _____

1

(ii) Give the function of structure Z.

1

(b) Name the enzyme involved in the synthesis of starch in potato cells.

1

(c) Give **one** difference and **one** similarity in the structure of plant and animal cells.

Difference _____

1

Similarity _____

1

Marks

2. (a) Yeast cells have many industrial and commercial uses.

The sentences below describe some of the uses of yeast cells.

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

Yeast cells are $\left\{ \begin{array}{l} \text{bacteria} \\ \text{fungi} \end{array} \right\}$ that produce $\left\{ \begin{array}{l} \text{carbon dioxide} \\ \text{oxygen} \end{array} \right\}$ which makes bread rise. Yeast cells are also used in the production of $\left\{ \begin{array}{l} \text{biogas} \\ \text{gasohol} \end{array} \right\}$.

2

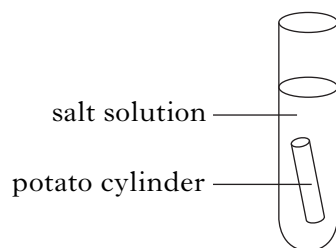
- (b) Explain how milk is converted into yoghurt by bacteria.

2

[Turn over

Marks

3. An investigation was carried out to find the effect of salt solutions of different concentrations on the mass of potato tissue. Five test tubes were set up as shown below, each containing a different concentration of salt solution.

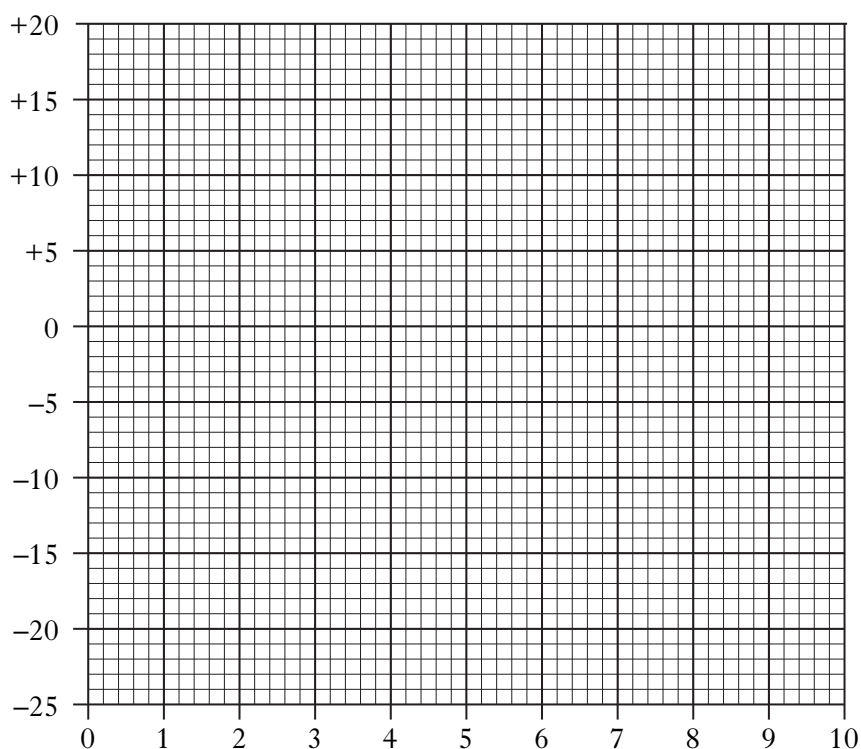


Each potato cylinder was weighed, placed in the solution and left for an hour. Each cylinder was then reweighed and the percentage (%) change in mass was calculated.

The table below shows the results of the investigation.

<i>Salt concentration</i> (g/100 cm ³)	<i>Change in mass (%)</i>
1	+15
3	+10
6	-5
8	-15
10	-20

- (a) (i) Add the appropriate label to each axis. 1
- (ii) Construct a **line graph** using the results given in the table. 1
- (Additional graph paper, if required, will be found on *Page thirty*.)



Marks

3. (continued)

(b) Time was kept constant in this investigation.

Name **two** other variables which must be kept constant.

1 _____

2 _____

1

(c) Using the results given, state the salt concentration which is isotonic to the potato tissue. Explain your answer.

Isotonic concentration _____ g/100 cm³

1

Explanation _____

1

(d) Predict the salt concentration that would produce a 10% decrease in mass.

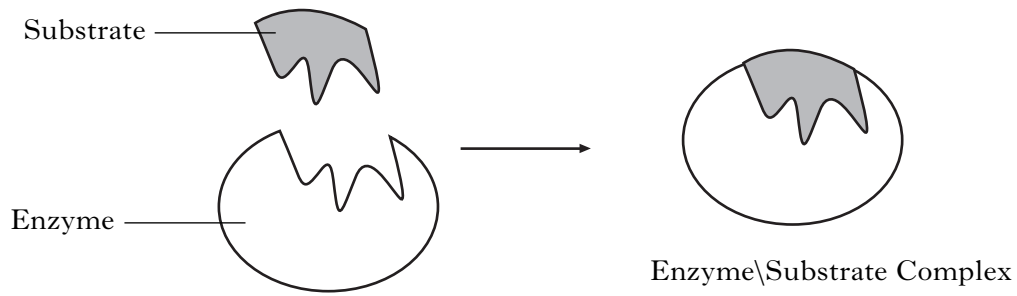
_____ g/100 cm³

1

[Turn over

Marks

4. Enzymes are biological catalysts. The diagram below shows part of an enzyme controlled reaction.



- (a) Describe the features of an enzyme which allow it to combine with only one substrate.

2

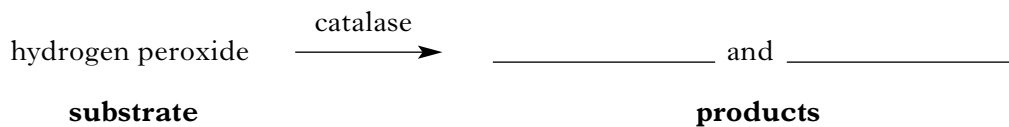
- (b) What happens to an enzyme when it is boiled?

1

- (c) Name a factor, other than temperature, which affects enzyme activity.

1

- (d) Complete the following word equation for the enzyme catalase.



1

Marks

5. A study has shown that Scotland's river otter population is increasing after falling sharply over the last 40 years.



Otters live along the banks of rivers, usually in reeds and gaps between tree roots. Fish are their main food.

- (a) What term is used for the place where otters live?

1

- (b) What disadvantage might otters have if reeds are removed from riverbanks?

1

- (c) Mink are North American animals introduced into Scotland. They feed on fish and live in riverbanks.

What effect would the mink have on otter numbers? Explain your answer.

Effect _____

Explanation _____

2

- (d) An ecosystem such as the otters' has several components.

Complete the table below to identify the terms used and their definitions.

<i>Term</i>	<i>Definition</i>
	A green plant that makes its own food.
Carnivore	
Community	

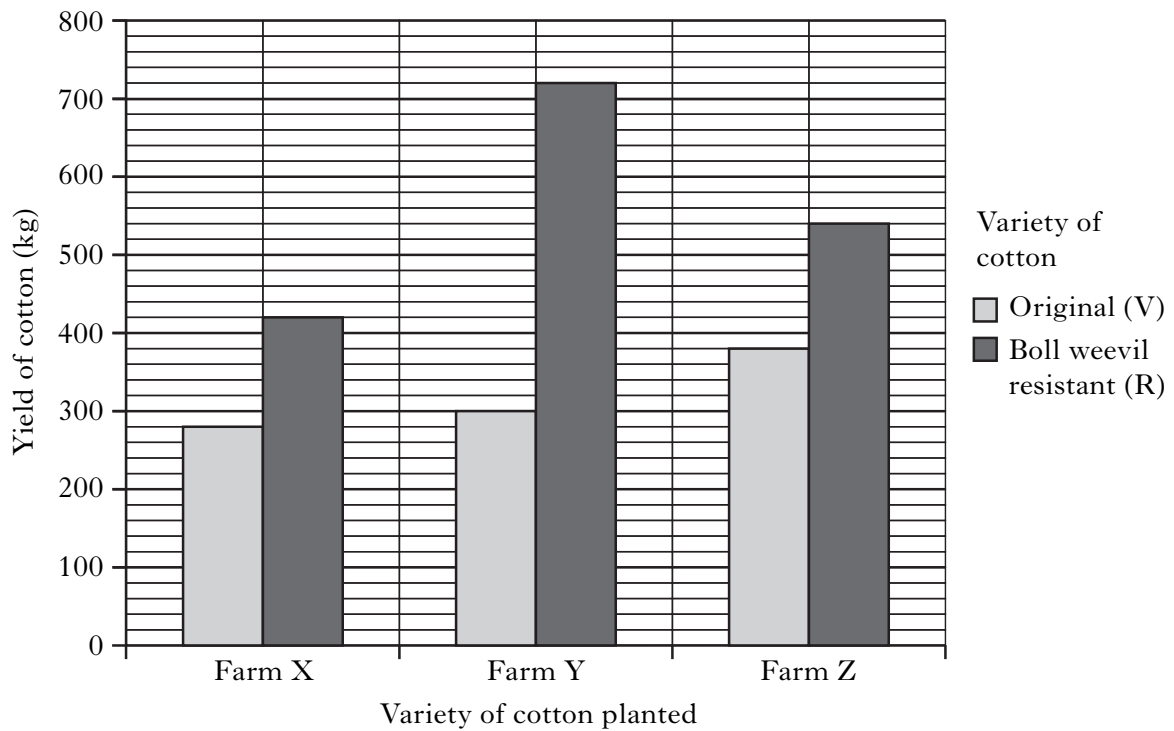
2

Marks

6. Boll weevil insects, shown in the picture below, feed on cotton plants. There are two varieties of cotton plant, original variety (V) and boll weevil resistant variety (R).



Three farms were used to compare the yield of the two varieties. Each farmer planted two fields, one of each variety. All fields were treated identically. The yield of cotton from each field was weighed. The results are shown in the bar graph below.



- (a) Calculate the average yield of V cotton.

Space for calculation

_____ kg **1**

Marks

6. (continued)

- (b) Calculate the percentage difference in yield between the two varieties of cotton grown at Farm X.

Space for calculation

_____ %

1

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

1

- (ii) The fields planted with V cotton were used as a control.
Give a reason for using this control.

1

- (iii) Explain why using ten farms instead of three would have improved this investigation.

1

- (d) What conclusion can be drawn from these results?

1

- (e) The farmers use pesticides to kill insects which damage their crops.

- (i) Explain why less pesticide is needed when growing R cotton.

1

- (ii) Explain why growing R cotton is less likely to affect insect biodiversity.

1

[Turn over

Marks

7. (a) Hair appearance in mice is controlled by a single gene.

Wavy hair (H) is dominant to straight hair (h).

Two homozygous mice were crossed, one had wavy hair and one had straight hair.

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

	Wavy haired	×	Straight haired	
P genotypes	_____	×	_____	1

- (ii) State the phenotype of the F₁ mice.

F₁ phenotype _____ **1**

- (iii) An F₁ mouse was crossed with a straight haired mouse.

State the genotype of the wavy haired offspring.

Space for working

Genotype _____ **1**

- (b) What term is used to describe alleles which are neither dominant nor recessive?

_____ **1**

- (c) The sentence below describes the function of DNA.

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

The $\left\{ \begin{array}{l} \text{number} \\ \text{order} \end{array} \right\}$ of DNA $\left\{ \begin{array}{l} \text{bases} \\ \text{genes} \end{array} \right\}$ in a chromosome encodes information

for the structure of a $\left\{ \begin{array}{l} \text{carbohydrate} \\ \text{protein} \end{array} \right\}$. **2**

Marks

8. (a) Name **two** places in the alimentary canal where protein is digested.

1 _____

2 _____

2

(b) The nutrition information panel below is from a chocolate bar.

Each bar contains . . .			
Calories	Sugars	Fat	Saturates
170	17.7 g	9.9 g	6.6 g
8.5%	19.6%	14.1%	10.4%
of your guideline daily amount			

(i) According to this information, how many calories make up your guideline daily amount?

Space for calculation

_____ calories

1

(ii) Saturates are a type of fat which form part of the total fat (9.9 g) in this chocolate bar.

What percentage of the total fat is saturates?

Space for calculation

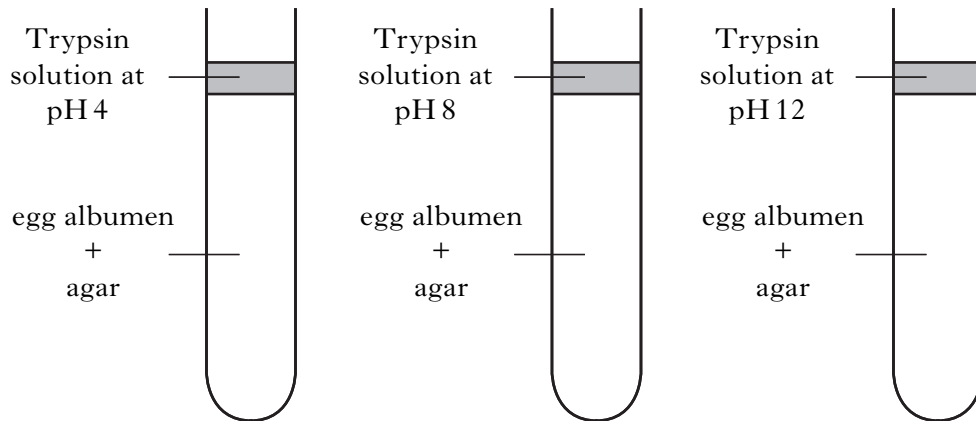
_____ %

1

[Turn over

Marks

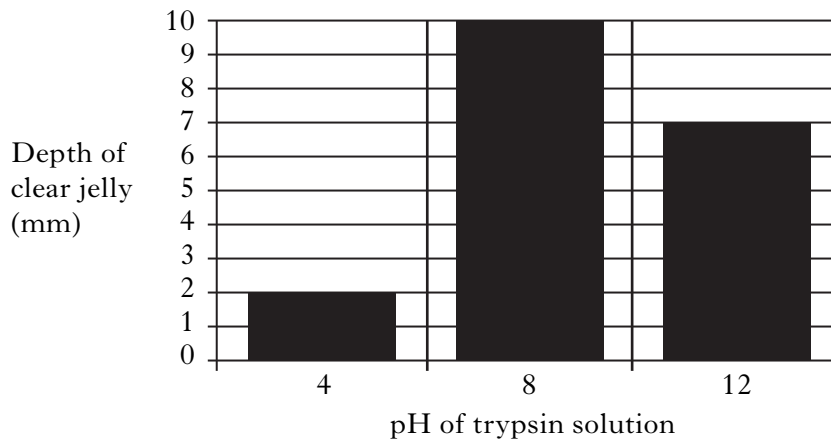
9. The diagram below shows an investigation into the effect of pH on the digestion of protein by trypsin.



Egg albumen is the source of protein. It is added to agar to give a cloudy, white jelly. When the egg albumen is digested the jelly turns clear.

The test tubes were left in a warm place for 24 hours. At the end of this time the depth of the clear jelly was measured.

The graph below shows results from this investigation.



- (a) Describe trypsin activity as pH increases as shown in the graph.

2

Marks

9. (continued)

(b) Predict the depth of clear jelly with trypsin at pH 2.

_____ mm

1

(c) Trypsin is produced by the pancreas. Name **two** other enzymes produced by the pancreas.

1 _____

1

2 _____

1

[Turn over

Marks

10. (a) Marine bony fish are found in the North Sea.



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

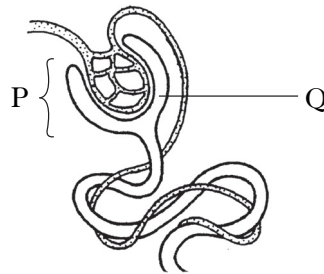
Marine bony fish have tissues that are { hypertonic }
{ hypotonic } to sea water.

They overcome osmotic problems by { absorbing }
{ excreting } salts and producing

{ concentrated }
{ dilute } urine.

2

- (b) The diagram below shows part of a nephron from a human kidney.



- (i) Name structure Q.

1

- (ii) Name the process carried out at P.

1

- (c) The hormone ADH affects water reabsorption from the nephron.

- (i) Which part of the brain releases ADH?

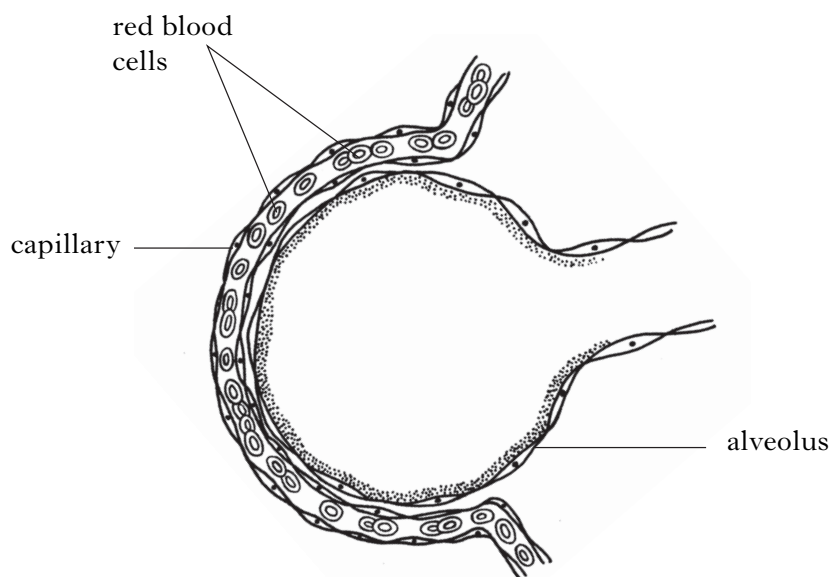
1

- (ii) Name a part of a nephron where water is reabsorbed.

1

Marks

11. The diagram below shows an alveolus and a capillary in the lungs where gas exchange occurs.



- (a) Decide if each of the following statements about gas exchange 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 underlined in the statement.

Statement	True	False	Correction
Lungs have a <u>large</u> surface area for efficient gas exchange.			
The thin walls of alveoli <u>slow down</u> gas exchange.			
There is a lower <u>oxygen</u> concentration in the alveoli than in the blood.			

3

- (b) How is oxygen carried in the red blood cells?

1

- (c) Blood plasma transports the blood cells.

Name **two** other substances carried by the blood plasma.

_____ and _____

1

[Turn over

Marks

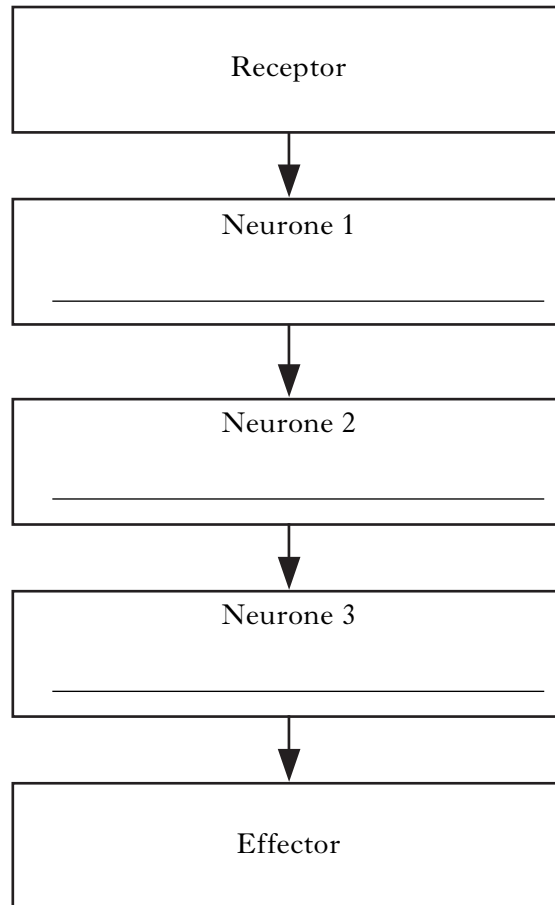
12. (a) Different parts of the brain have different functions.

Draw **one** line to link each part of the brain with its correct function.
(One example has been completed for you.)

<i>Part of the brain</i>	<i>Function</i>
Cerebrum	regulation of temperature
Medulla	control of breathing rate
Cerebellum	conscious responses
Hypothalamus	co-ordination of movement

2

(b) (i) The flow chart below shows the structures in a reflex arc.
Complete the chart by inserting the names of the missing neurones.



2

(ii) Describe a function of a reflex response.

1

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

SECTION C

Marks

Both questions in this section should be attempted.

Note that each question contains a choice.

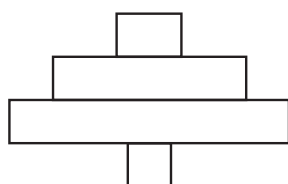
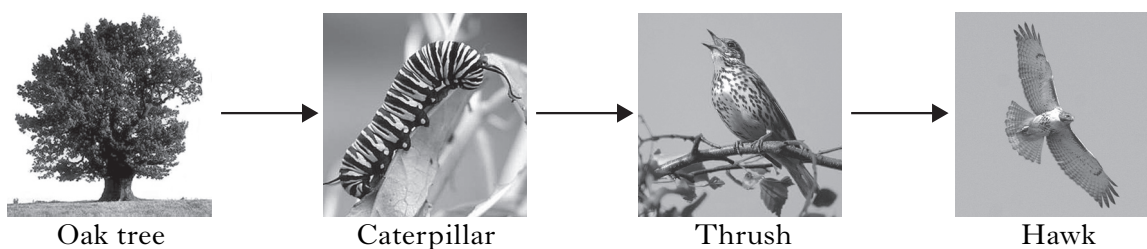
Questions 1 and 2 should be attempted on the blank pages which follow.

All answers must be written clearly and legibly in ink.

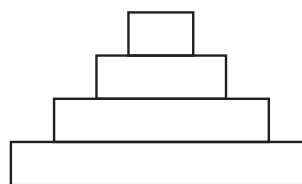
Supplementary sheets, if required, may be obtained from the Invigilator.

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

A. The pictures below show a food chain which is also represented by two types of pyramid.



Pyramid X



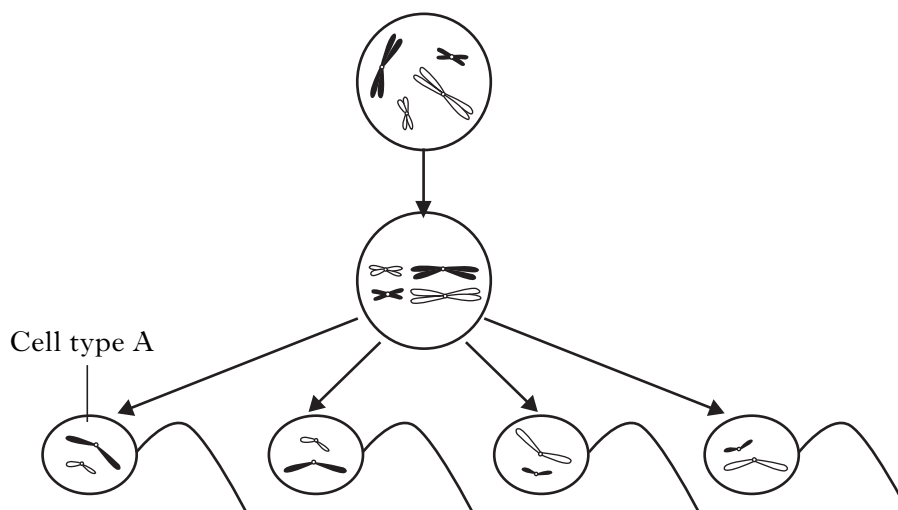
Pyramid of energy

Name the type of pyramid X. Explain why **both** pyramids are correct for this food chain.

5

OR

B. The diagram below represents some of the stages of meiosis in the testes.



Name cell type A **and** describe the role of **both** meiosis and fertilisation in producing offspring.

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 the **two** stages of aerobic respiration **including** the names of the raw materials and products for **each** stage.

5

OR

B. Describe the **two** stages of photosynthesis **including** the names of the raw materials and products for **each** stage.

5

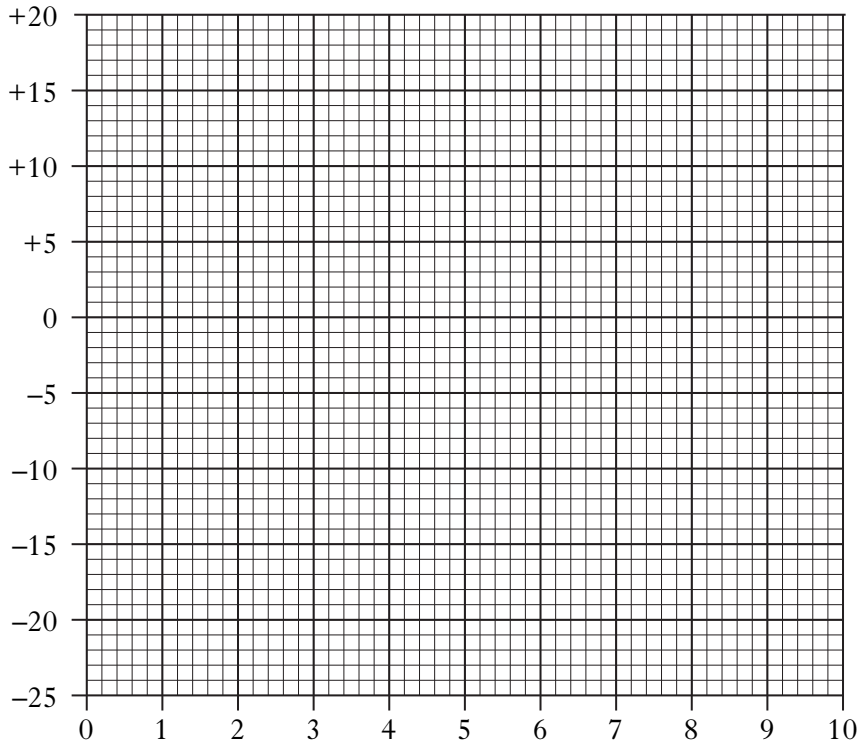
[END OF QUESTION PAPER]

SPACE FOR ANSWER TO QUESTION 2

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ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 3(a)



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ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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