

FOR OFFICIAL USE

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KU	PS

Total Marks

**0300/401**

NATIONAL  
QUALIFICATIONS  
2007

MONDAY, 21 MAY  
9.00 AM – 10.30 AM

**BIOLOGY**  
**STANDARD GRADE**  
General Level

**Fill in these boxes and read what is printed below.**

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

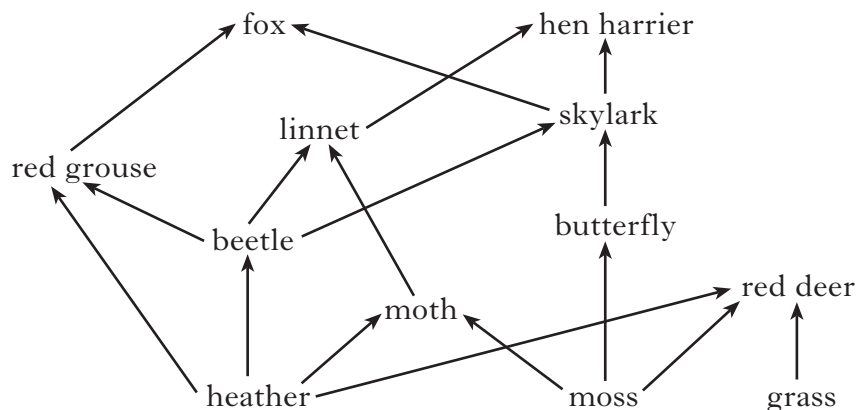
- 1 All questions should be attempted.
- 2 The questions may be answered in any order but all answers are to be written in the spaces provided in this answer book, and must be written clearly and legibly in ink.
- 3 Rough work, if any should be necessary, as well as the fair copy, is to be written in this book. Additional spaces for answers and for rough work will be found at the end of the book. Rough work should be scored through when the fair copy has been written.
- 4 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.



Marks

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1	
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1	
	2

1. The diagram shows a food web from a moorland ecosystem.



(a) The following statements refer to the food web.

Complete the table by entering “**T**” when the statement is true, and “**F**” when the statement is false.

<i>Statement</i>	<i>T or F</i>
Linnets are eaten by beetles and moths.	
Foxes and hen harriers are not eaten by anything.	
Butterflies are eaten by skylarks which are eaten by foxes.	

(b) Give an example of a producer and a consumer from the food web.

Producer \_\_\_\_\_

Consumer \_\_\_\_\_

(c) Which plant provides energy for the greatest number of different species in this food web?

\_\_\_\_\_

(d) Give **two** ways in which energy can be lost from this food web.

1 \_\_\_\_\_

2 \_\_\_\_\_

Marks

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<b>1</b>	
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<b>1</b>	

2. (a) The phrases below refer to man's influence on natural resources.

- 1 Overgrazing by too many animals in one area
- 2 Air pollution by sulphur dioxide released by burning fossil fuels
- 3 Overfishing by modern fishing boats

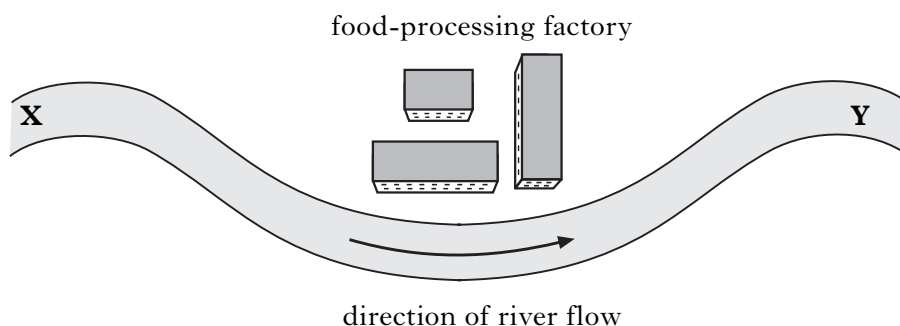
Choose **one** of the phrases and describe a problem which may result from it.

Phrase number \_\_\_\_\_

Problem \_\_\_\_\_

\_\_\_\_\_

(b) The diagram shows the position of a food-processing factory beside a river.



The factory accidentally released organic waste into the river.

Water samples were taken from points **X** and **Y** and analysed for the numbers of micro-organisms and oxygen concentration.

(i) Complete the following sentence by underlining the correct word in each bracket.

Water samples from point **X** had  $\left\{ \begin{array}{l} \text{more} \\ \text{fewer} \end{array} \right\}$  micro-organisms and a  $\left\{ \begin{array}{l} \text{higher} \\ \text{lower} \end{array} \right\}$  oxygen concentration than samples from point **Y**.

(ii) What does the organic waste provide for the micro-organisms in the river?

\_\_\_\_\_

**[Turn over**

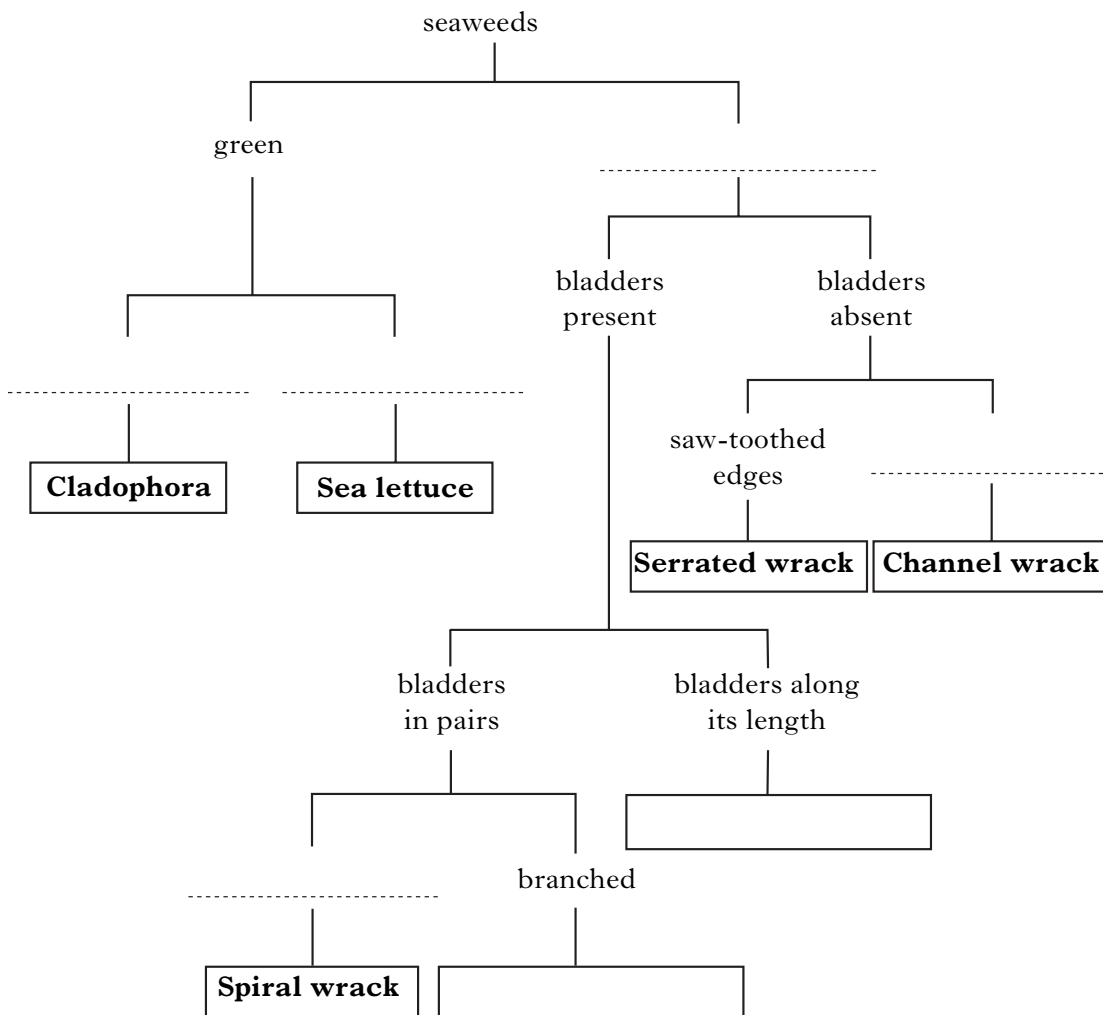
Marks

KU	PS

3. Some features of common seaweeds are shown in the table below.

<i>Seaweed</i>	<i>Colour</i>	<i>Shape</i>	<i>Bladders</i>
Bladder wrack	brown	branched	in pairs
Channel wrack	brown	grooved	absent
Cladophora	green	long and thin	absent
Egg wrack	brown	branched	along its length
Sea lettuce	green	flat	absent
Serrated wrack	brown	saw-toothed edges	absent
Spiral wrack	brown	twisted	in pairs

(a) (i) Use the information in the table to complete the key below by writing the correct feature on each dotted line and the correct seaweed names in the empty boxes.



3


Marks	KU	PS
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1		

3. (a) (continued)

(ii) Describe **two** differences between Sea lettuce and Spiral wrack.

1 \_\_\_\_\_

2 \_\_\_\_\_

(iii) Describe the features which Bladder wrack and Spiral wrack have in common.

\_\_\_\_\_

(b) Abiotic factors can affect the community of seaweeds that grow on a rocky shore.

Identify **two** abiotic factors from the list below.

*Tick (✓) the correct boxes*

temperature

competition

light intensity

grazing by limpets

disease

**[Turn over**

Marks

4. There are four major groups of plants. Features used to identify members of each group include the presence of a transport system, the shape of their leaves and their method of reproduction.

Flowering plants and the conifers reproduce using seeds. They both have transport systems but they differ in the shape of their leaves. Conifers have needle-like leaves whereas the leaves of flowering plants are either narrow or broad. Mosses don't have any true leaves or transport systems. Ferns have transport systems and feathery leaves but they reproduce using spores, as do the mosses.

- (a) Use the information above to complete the table about the plant groups.

<i>Plant group</i>	<i>Transport system</i>	<i>Leaves</i>	<i>Structures used in reproduction</i>
	absent	no true leaves	
Ferns			spores
Conifers			seeds
	present	narrow or broad	

- (b) One type of transport system in plants carries water from the roots to the leaves.

- (i) Name the type of tissue involved in this transport system.

\_\_\_\_\_

- (ii) Describe a function of a different transport system in plants.

\_\_\_\_\_

\_\_\_\_\_

- (c) Some plants are useful to humans.

State a use by humans of a named plant.

Plant \_\_\_\_\_

Use \_\_\_\_\_

3

1

1

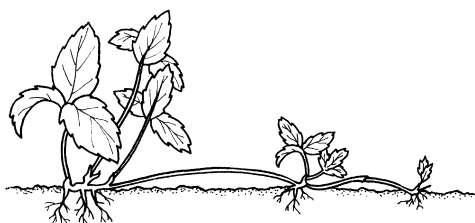
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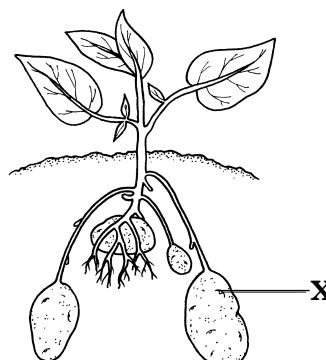
5. The diagrams show two natural methods of asexual reproduction in flowering plants.

Method A



Strawberry plant

Method B



Potato plant

(a) Name the two methods of asexual reproduction.

Method A \_\_\_\_\_

Method B \_\_\_\_\_

(b) What does structure **X** contribute to the growth of a new potato plant?

\_\_\_\_\_

\_\_\_\_\_

(c) Name an artificial method of propagating flowering plants.

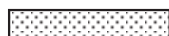
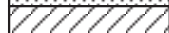
\_\_\_\_\_

**[Turn over**

Marks

KU	PS
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6. The chart shows the times when different vegetable crops can be sown and harvested.

 sowing times  
 harvesting times

Vegetable	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beetroot			Sowing				Harvesting					
Carrot	Harvesting		Sowing					Harvesting				
Cauliflower		Harvesting		Sowing								
Leek	Harvesting		Sowing					Harvesting				
Onion			Sowing			Harvesting						
Parsnip			Sowing								Harvesting	

- (a) Parsnip seeds can be sown throughout March and April. The parsnip crop can be harvested from the beginning of November to the end of February.

Add this information to the chart.

(An additional chart will be found, if needed, on page 28.)

- (b) During which month is it possible to sow seeds for all the vegetables?

\_\_\_\_\_

- (c) Which crop can be harvested over the longest period of time?

\_\_\_\_\_

- (d) Name **all** the crops which could be harvested in the same month as seeds of the same species are being sown.

\_\_\_\_\_

2

1

1

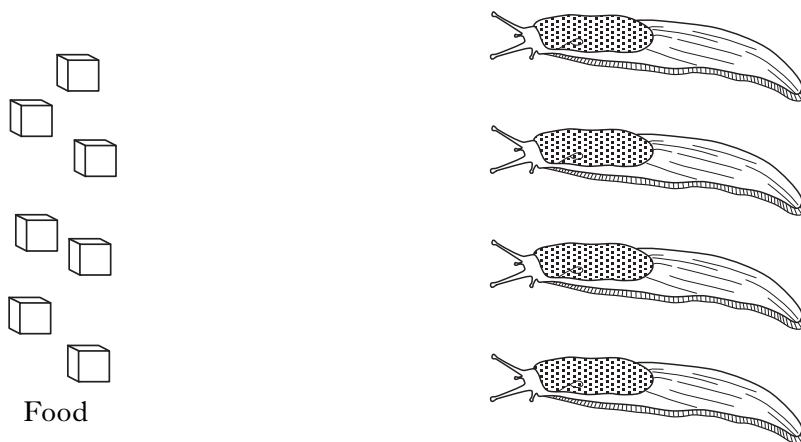
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1	

7. (a) An investigation was set up to examine the behaviour of slugs.



During the investigation the slugs moved towards the food.

(i) Two possible hypotheses for the movement of the slugs are:

- 1 The slugs saw the food and moved towards it.
- 2 The slugs smelled the food and moved towards it.

How could the investigation be improved to show which hypothesis was correct?

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1

(ii) Why was it good experimental practice to use several slugs rather than just one?

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1

(b) Give **one** example of an abiotic factor which can affect the behaviour of a named animal and describe the response of the animal to that factor.

Animal \_\_\_\_\_ Abiotic factor \_\_\_\_\_

1

Response \_\_\_\_\_

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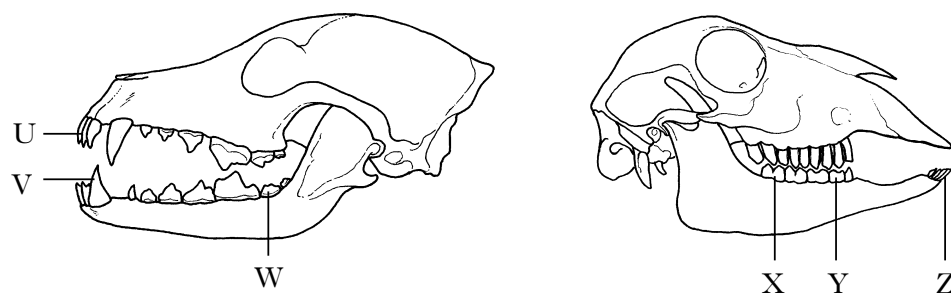
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Marks

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2	

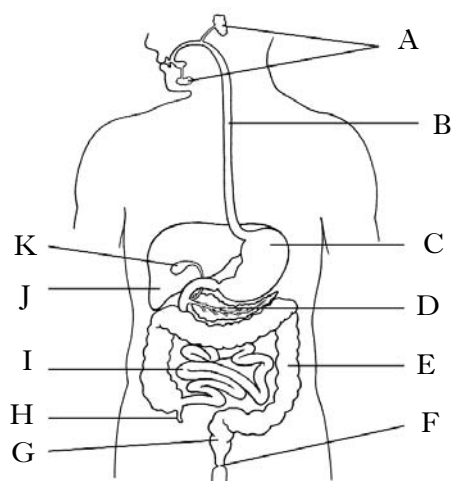
8. (a) The diagram shows the skulls of two mammals.



Use letters from the diagram to identify the following teeth.

- (i) Incisors \_\_\_\_\_ and \_\_\_\_\_
- (ii) A tooth used for piercing and holding prey \_\_\_\_\_
- (iii) A tooth used for crushing and grinding plant material \_\_\_\_\_

(b) The diagram below shows the human digestive system.



(i) Complete the table to identify the following parts of the digestive system.

Part of digestive system	Letter
oesophagus	
pancreas	
	K
	C

2

Marks	KU	PS
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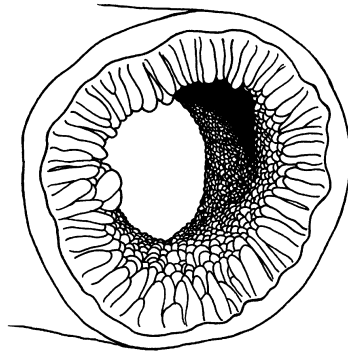
8. (b) (continued)

(ii) What is the main function of part E of the diagram?

\_\_\_\_\_

1

(c) The diagram shows a cross section of the small intestine.



Describe **one** feature of the small intestine shown on the diagram and explain how it helps in the absorption of food.

Feature \_\_\_\_\_

Explanation \_\_\_\_\_

\_\_\_\_\_

1

[Turn over

Marks	KU	PS
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9. Read the following passage and answer the questions based on it.

**Alexis St. Martin – Human Guinea Pig**

In 1822, a 20 year old Canadian fur trapper called Alexis St. Martin was accidentally injured by a shotgun. His abdomen and stomach were blasted open. He survived thanks to prompt treatment by a local doctor. His stomach did not fully heal and Alexis was left with an opening to his stomach which the doctor covered with a leather flap.

The doctor was a keen scientist and carried out more than 60 experiments on his patient. In one experiment he tied lumps of food to a silk thread and pushed them into Alexis’ stomach. Each hour he pulled them out to see what the stomach juices had done to the food, carefully recording the results. A piece of boiled beef was half the original size after 1 hour and completely gone after 2 hours. A piece of raw beef was digested in exactly the same manner.

In another experiment, the doctor removed some of the digestive juices from Alexis’ stomach and put them into a glass tube. A piece of boiled beef was put into the tube and kept at body temperature. It showed little change after 1 hour, was only half gone in 2 hours and disappeared after 4 hours.

Despite his injuries Alexis led a long and healthy life. He married and had six children. He survived to the age of 86, outliving the doctor by many years.

(a) What was the purpose of the silk thread?

\_\_\_\_\_

\_\_\_\_\_

1

(b) Why did the doctor keep the experiment in the glass tube at body temperature?

\_\_\_\_\_

\_\_\_\_\_

1

(c) How long did Alexis live after the shotgun accident?

*Space for calculation*

\_\_\_\_\_ years

1

Marks

KU	PS

9. (continued)

(d) Use information from the passage to complete the table of results.

		<i>Raw beef in stomach</i>	<i>Boiled beef in stomach</i>	<i>Boiled beef in glass tube</i>
Time (hours)	0	unaffected	unaffected	unaffected
	1			
	2			
	4		digestion complete	digestion complete

2

[Turn over

Marks	KU	PS
1		
1		
1		
1		

10. (a) (i) What effect does cell division have on the number of cells in the human body?

\_\_\_\_\_

(ii) What part of a cell controls cell division?

\_\_\_\_\_

(b) The following phrases describe stages in cell division.

Stage P—Chromosomes line up at the equator of the cell.

Stage Q—Nuclear membranes form and cytoplasm divides.

Stage R—Chromatids separate and move to opposite ends of the cell.

Stage S—Each chromosome doubles itself and appears as coiled threads.

Use the letters to arrange the stages into the correct order.

First stage \_\_\_\_\_

Second stage \_\_\_\_\_

Third stage \_\_\_\_\_

Fourth stage \_\_\_\_\_

(c) A cell divides every 20 minutes. How many cells would be produced from one original cell at the end of two hours?

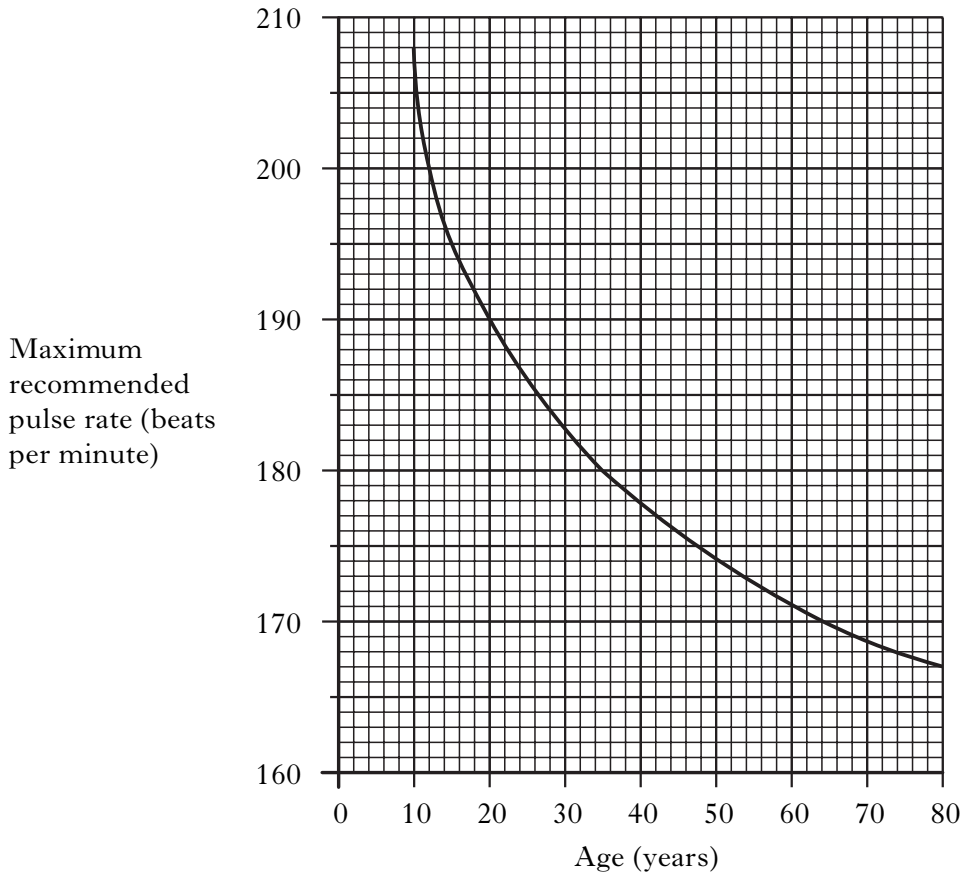
*Space for calculation*

\_\_\_\_\_ cells

*Marks*

KU	PS
<b>1</b>	
<b>1</b>	
<b>1</b>	

11. The graph shows the maximum recommended pulse rate for humans of different ages.



(a) What is the maximum recommended pulse rate for a person aged 15 years?

\_\_\_\_\_ beats per minute

**1**

(b) At what age does the maximum recommended pulse rate fall below 200 beats per minute?

above \_\_\_\_\_ years

**1**

(c) Calculate the percentage decrease in the maximum recommended pulse rate between the ages of 20 and 60 years.

*Space for calculation*

\_\_\_\_\_ %

**1**

Marks	KU	PS
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12. (a) All living cells require enzymes. What would happen to chemical reactions in a cell if enzymes were not present?

\_\_\_\_\_

1

(b) Give **one** example of an enzyme responsible for the synthesis of a substance.

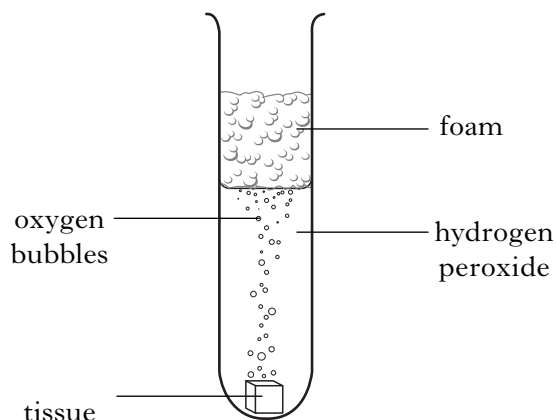
\_\_\_\_\_

1

(c) Catalase enzyme releases oxygen from hydrogen peroxide.

Different tissues were tested for catalase activity by adding equal masses of tissue to hydrogen peroxide at pH 7.

The height of the foam produced was used as a measure of the volume of oxygen released.



The results are shown in the table.

<i>Type of tissue</i>	<i>Height of foam (mm)</i>
apple	24
potato	28
beef	53
carrot	22
fish	48
chicken	50

(i) Give **one** variable, other than pH, which must be kept constant in this investigation.

\_\_\_\_\_

1



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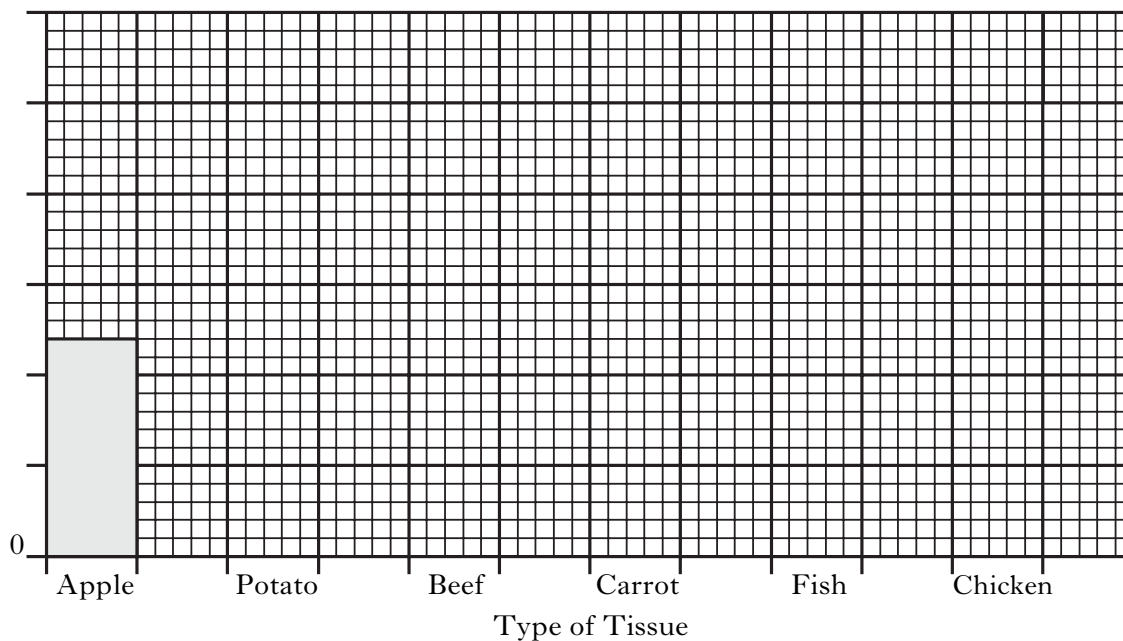
KU	PS

12. (c) (continued)

(ii) Use the information in the table to complete the bar chart by:

- 1 adding a scale to the y-axis; 1
- 2 labelling the y-axis; 1
- 3 drawing the bars. 1

(An additional grid will be found, if needed, on page 28.)



(iii) Beef, fish and chicken tissues produced greater volumes of oxygen than the others.

Suggest a hypothesis which could explain this fact.

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1

(iv) The investigation was carried out at pH7.

Use the words **increase**, **decrease** or **stay the same** to complete the following sentence correctly.

At pH 4 oxygen production would \_\_\_\_\_ and

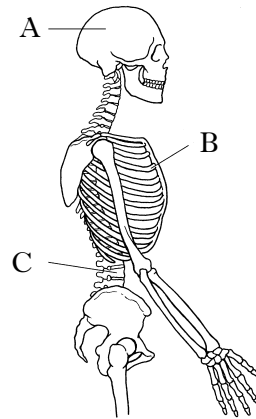
at pH 11 oxygen production would \_\_\_\_\_ .

1

[Turn over

Marks

13. (a) The diagram shows part of a human skeleton.



Complete the table below to name each part of the skeleton labelled on the diagram and name **one** organ protected by that part.

Letter	Part of skeleton	Organ protected
A		
B		
C		

2

(b) Complete the table below by inserting ticks (✓) to say whether each line refers to a hinge joint, a ball and socket joint or both types of joint.

	Hinge	Ball and socket
shoulder joint		
knee joint		
hip joint		
elbow joint		
can move in only one plane		
can move in many planes		
held together by ligaments		
cartilage protects the ends of the bones		

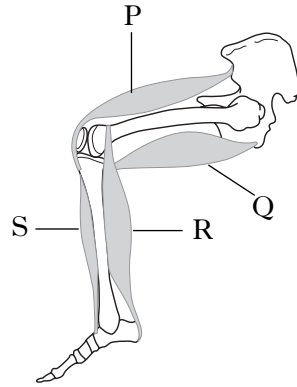
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KU	PS
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13. (continued)

(c) The diagram shows some of the muscles in a human leg.



(i) Which muscle contracts to straighten the leg?

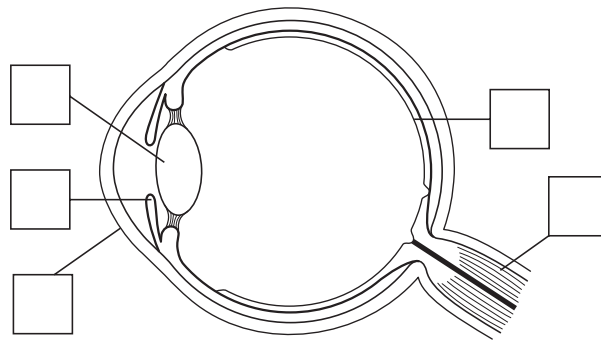
\_\_\_\_\_

(ii) What is the name of the structures which attach the muscles to bones?

\_\_\_\_\_

[Turn over

14. (a) The diagram shows a human eye.

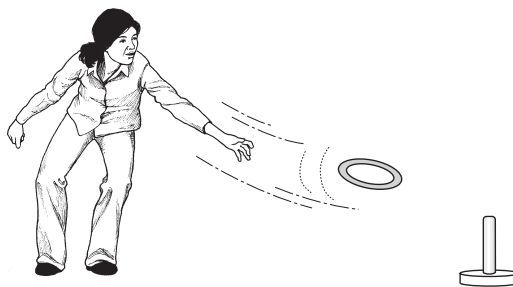


Use the information in the table below to add the correct letters to the diagram.

Letter	Description
A	cornea
B	optic nerve
C	controls the amount of light entering the eye
D	changes shape to adjust focus
E	converts light to electrical impulses

2

(b) The diagram shows an investigation into the judgement of distance.



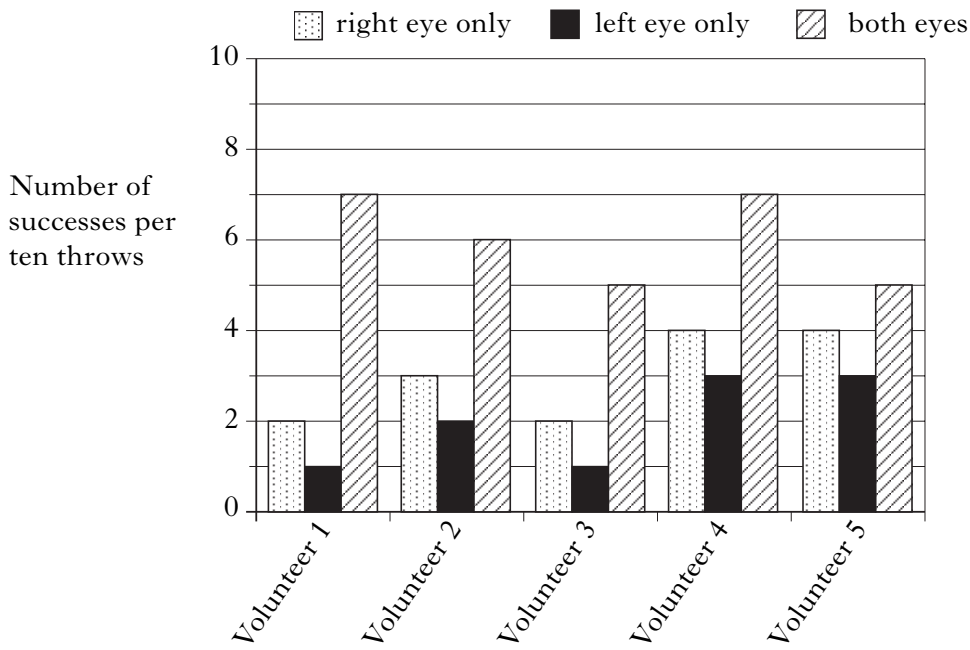
Volunteers each threw 10 hoops at a peg 3 metres away. The number of successful throws was recorded. Each volunteer attempted the test three times, once using the right eye only, once using the left eye only and once using both eyes.

The results are shown in the following chart.

Marks

	KU	PS
2		
2		
1		

14. (b) (continued)



- (i) Calculate the average number of successful throws by the volunteers for each trial.

*Space for calculations*

Average number of successful throws using right eye only \_\_\_\_\_.

Average number of successful throws using left eye only \_\_\_\_\_.

Average number of successful throws using both eyes \_\_\_\_\_.

- (ii) Suggest **two** valid conclusions about the distance judgement of the volunteers which can be drawn from the results.

1 \_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_

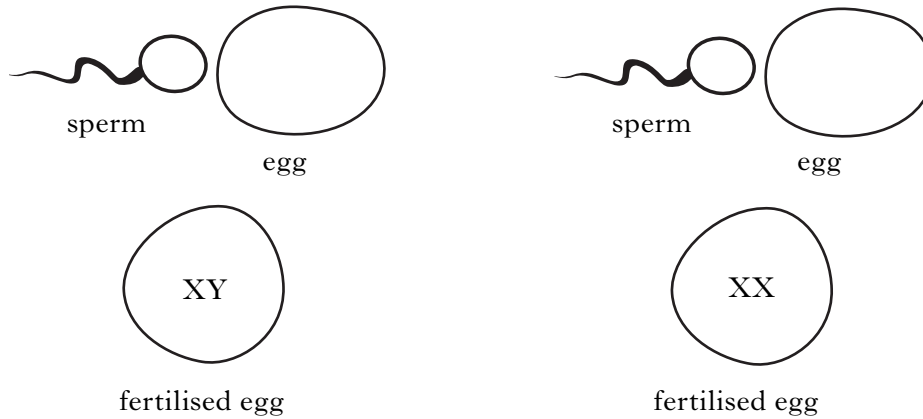
- (iii) The brain, spinal cord and nerves are all involved in such activities. What is the collective name for these parts of the body?

\_\_\_\_\_

Marks

KU	PS

15. (a) The diagrams below show the inheritance of the sex chromosomes **X** and **Y**.



Sex \_\_\_\_\_

Sex \_\_\_\_\_

Complete the diagrams by:

- inserting the missing sex chromosomes into the eggs and sperm;
  - writing the sex of each fertilised egg in the spaces provided.
- (b) Complete the following sentences by underlining the correct word in each bracket.

The name given to a group of interbreeding organisms which produce

fertile young is a  $\left\{ \begin{array}{l} \text{tissue} \\ \text{clone} \\ \text{species} \end{array} \right\}$ .

Characteristics of offspring are controlled by  $\left\{ \begin{array}{l} \text{enzymes} \\ \text{genes} \\ \text{phenotype} \end{array} \right\}$ .

- (c) (i) Down's Syndrome is an example of a condition caused by a change to the chromosomes.

What is the correct term for a change to the chromosomes?

\_\_\_\_\_

- (ii) Down's Syndrome can be detected before birth by the removal of some of the fluid surrounding the baby as it develops. The fluid is removed by a doctor using a syringe inserted into the uterus.

What name is given to this procedure?

\_\_\_\_\_



Marks

KU PS

16. In an investigation into the conditions required for making yoghurt, the following steps were carried out.

- 1 Milk was pasteurised by heating to over  $75^{\circ}\text{C}$ .
- 2 Yoghurt-making bacteria were added to the milk and the mixture was stirred.
- 3 Four samples were taken and kept at different temperatures.
- 4 The pH of each sample was measured every hour.

The results are shown in the following table.

<i>Temperature</i> ( $^{\circ}\text{C}$ )	<i>pH of sample</i>					
	<i>Start</i>	<i>1 hour</i>	<i>2 hours</i>	<i>3 hours</i>	<i>4 hours</i>	<i>5 hours</i>
5	7·0	7·0	7·0	7·0	7·0	7·0
20	7·0	6·8	6·5	6·0	5·4	4·8
35	7·0	6·5	5·9	5·2	4·4	3·5
50	7·0	7·0	7·0	7·0	7·0	7·0

- (a) (i) What precaution was taken to ensure that no harmful bacteria were present in the milk at the start?

\_\_\_\_\_

1

- (ii) From the results, what is the optimum temperature for yoghurt production?

\_\_\_\_\_  $^{\circ}\text{C}$

1

- (iii) Explain why the mixture kept at  $50^{\circ}\text{C}$  did not change in pH.

\_\_\_\_\_

\_\_\_\_\_

1

- (iv) Name the process carried out by the bacteria which causes the milk to change into yoghurt.

\_\_\_\_\_

1



Marks

KU	PS

16. (continued)

(b) The table shows how the fat content of the yoghurt varies according to the type of milk used to make it.

<i>Type of milk used</i>	<i>Fat content of yoghurt (%)</i>
whole	over 3·0
semi-skimmed	0·5–3·0
skimmed	under 0·5

The following table shows the fat and lactose content of three yoghurts.

<i>Yoghurt</i>	<i>Composition</i>	
	<i>fat (%)</i>	<i>lactose (%)</i>
A	2·8	3·9
B	4·0	4·5
C	0·4	3·0

(i) Using information from both tables, identify which yoghurt was made from:

1 semi-skimmed milk yoghurt \_\_\_\_\_

2 whole milk yoghurt \_\_\_\_\_

1

(ii) What is the range of lactose concentrations in the yoghurts?

From \_\_\_\_\_ to \_\_\_\_\_%

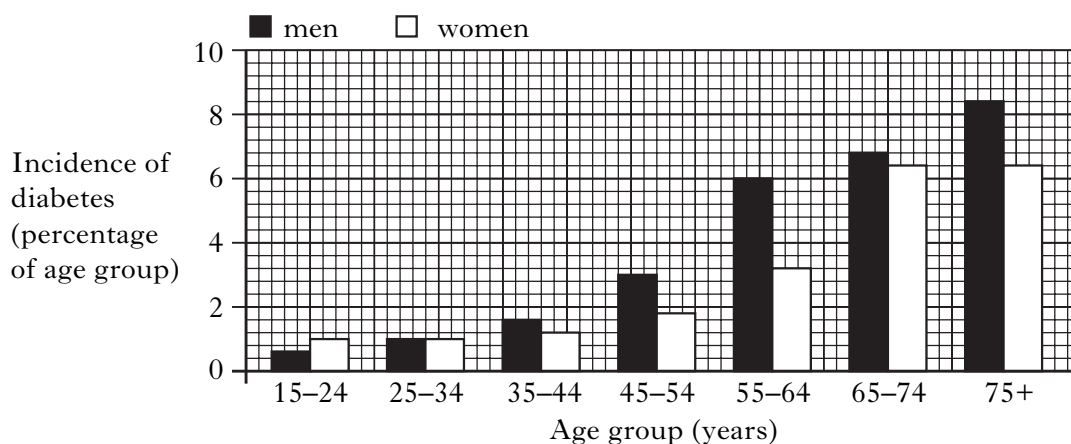
1

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Marks

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1			
1			

**17. (a)** The following bar chart shows the incidence of diabetes in people of different ages.



(i) Which age group has the highest incidence of diabetes?

\_\_\_\_\_ years

(ii) What is the incidence of diabetes in the following groups?

A men aged between 35 and 44 \_\_\_\_\_ %

B women aged between 55 and 64 \_\_\_\_\_ %

(iii) What age group shows no difference in the incidence of diabetes in men and women?

\_\_\_\_\_ years

(b) (i) Diabetes can be treated with a substance produced by genetic engineering. Name this substance.

\_\_\_\_\_

(ii) What type of chemical, used in biological washing powders, can be produced by genetic engineering?

\_\_\_\_\_

(iii) During genetic engineering, what is transferred into bacteria from another organism?

\_\_\_\_\_

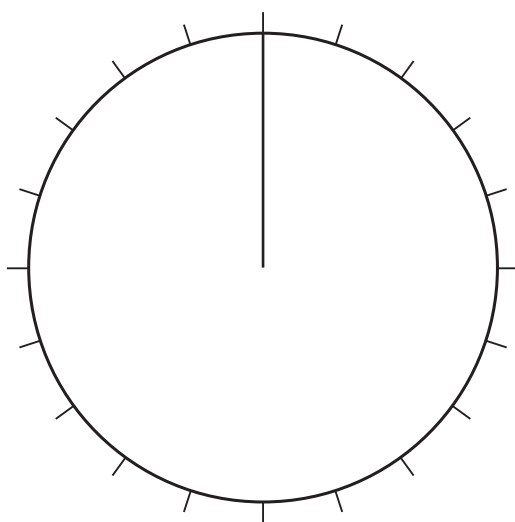
Marks

	KU	PS
2		
1		
1		

18. The eye colours of 160 school pupils are shown in the table below.

<i>Eye colour</i>	<i>Number of school pupils</i>
brown	80
green	24
blue	48
grey	8

- (a) Complete the pie chart to show this information.  
(An additional chart will be found, if needed, on page 29.)



- (b) What type of variation is shown by eye colour?

\_\_\_\_\_

- (c) What percentage of the school pupils had green eyes?

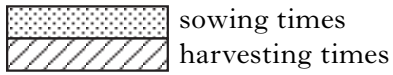
*Space for calculation*

\_\_\_\_\_ %

[END OF QUESTION PAPER]

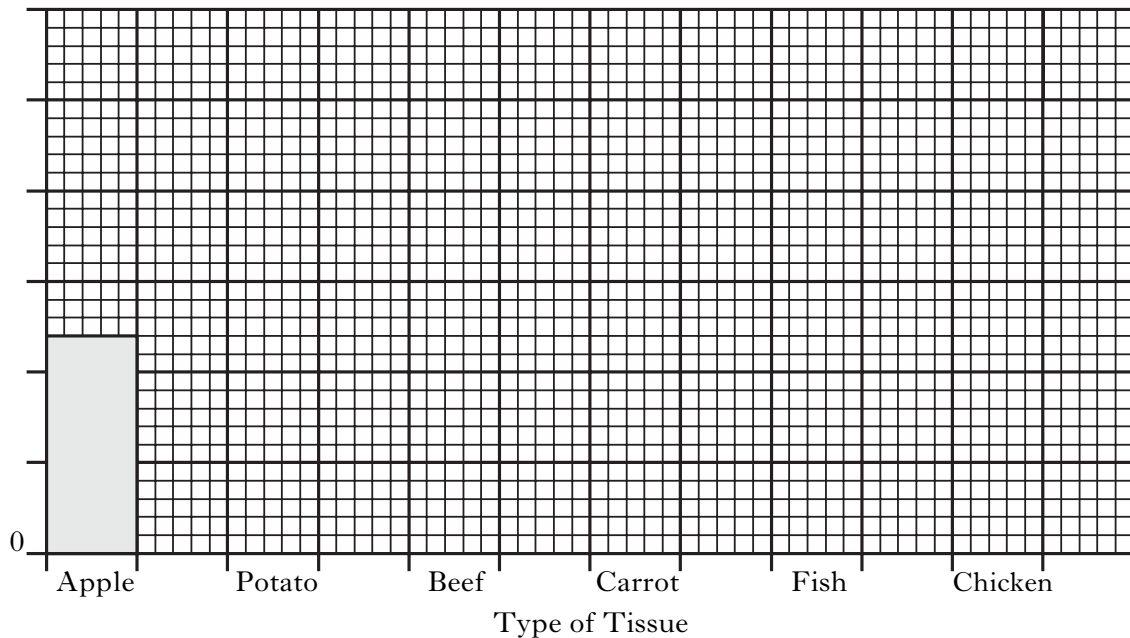
SPACE FOR ANSWERS  
AND FOR ROUGH WORKING

ADDITIONAL CHART FOR QUESTION 6(a)



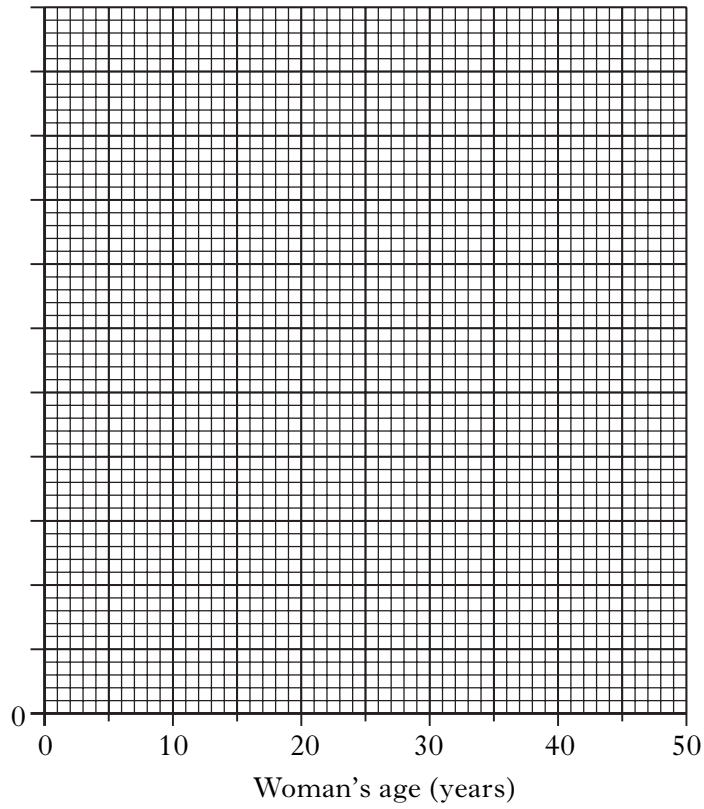
Vegetable	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beetroot			[Sowing]				[Harvesting]					
Carrot	[Harvesting]		[Sowing]					[Harvesting]				
Cauliflower		[Harvesting]			[Sowing]							
Leek	[Harvesting]		[Sowing]				[Harvesting]					
Onion			[Sowing]			[Harvesting]						
Parsnip												

ADDITIONAL GRAPH PAPER FOR QUESTION 12(c)(ii)

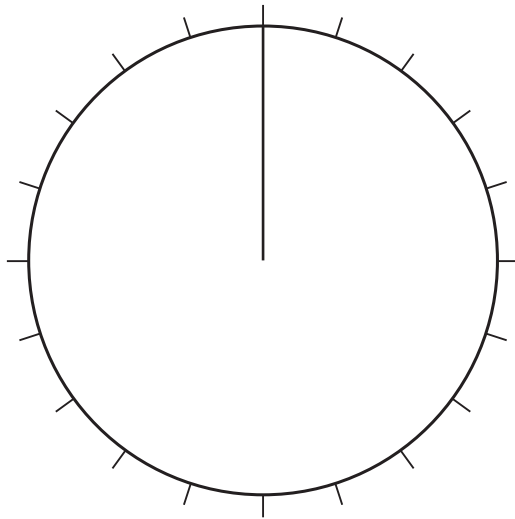


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AND FOR ROUGH WORKING

ADDITIONAL GRAPH PAPER FOR QUESTION 15(d)(ii)



ADDITIONAL CHART PAPER FOR QUESTION 18(a)



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AND FOR ROUGH WORKING

SPACE FOR ANSWERS  
AND FOR ROUGH WORKING

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