FOR OFFICIAL USE

G

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

Scottish candidate number

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.

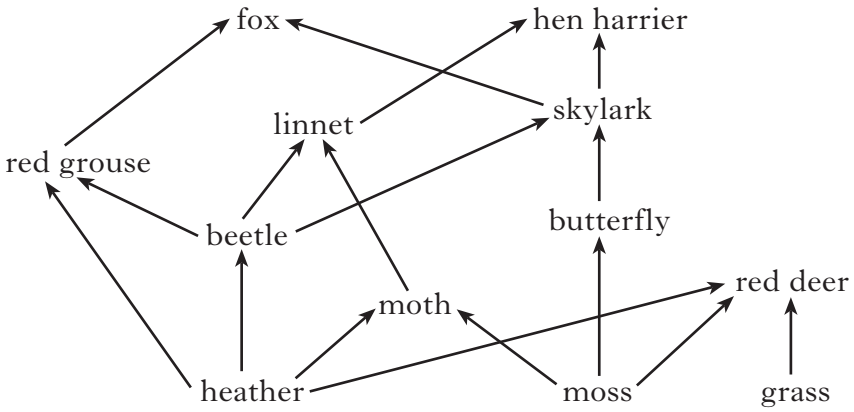
4 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.

LI 0300/401 6/32270

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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.

Statement	***T*** *or* ***F***
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.	

1

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

Producer _____

Consumer _____ **1**

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

_____ **1**

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

1 _____

2 _____ **2**

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

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

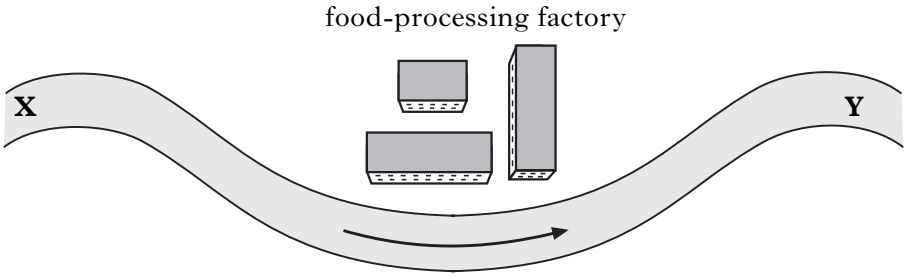
Choose **one** of the phrases and describe a problem which may result from it.

Phrase number _____

Problem _____

_____ **1**

(*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 <u>underlining</u> the correct word in each bracket.

Water samples from point **X** had $\left\{\begin{matrix}\text{more}\\\text{fewer}\end{matrix}\right\}$ micro-organisms and a $\left\{\begin{matrix}\text{higher}\\\text{lower}\end{matrix}\right\}$ oxygen concentration than samples from point **Y**. **1**

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

_____ **1**

[Turn over

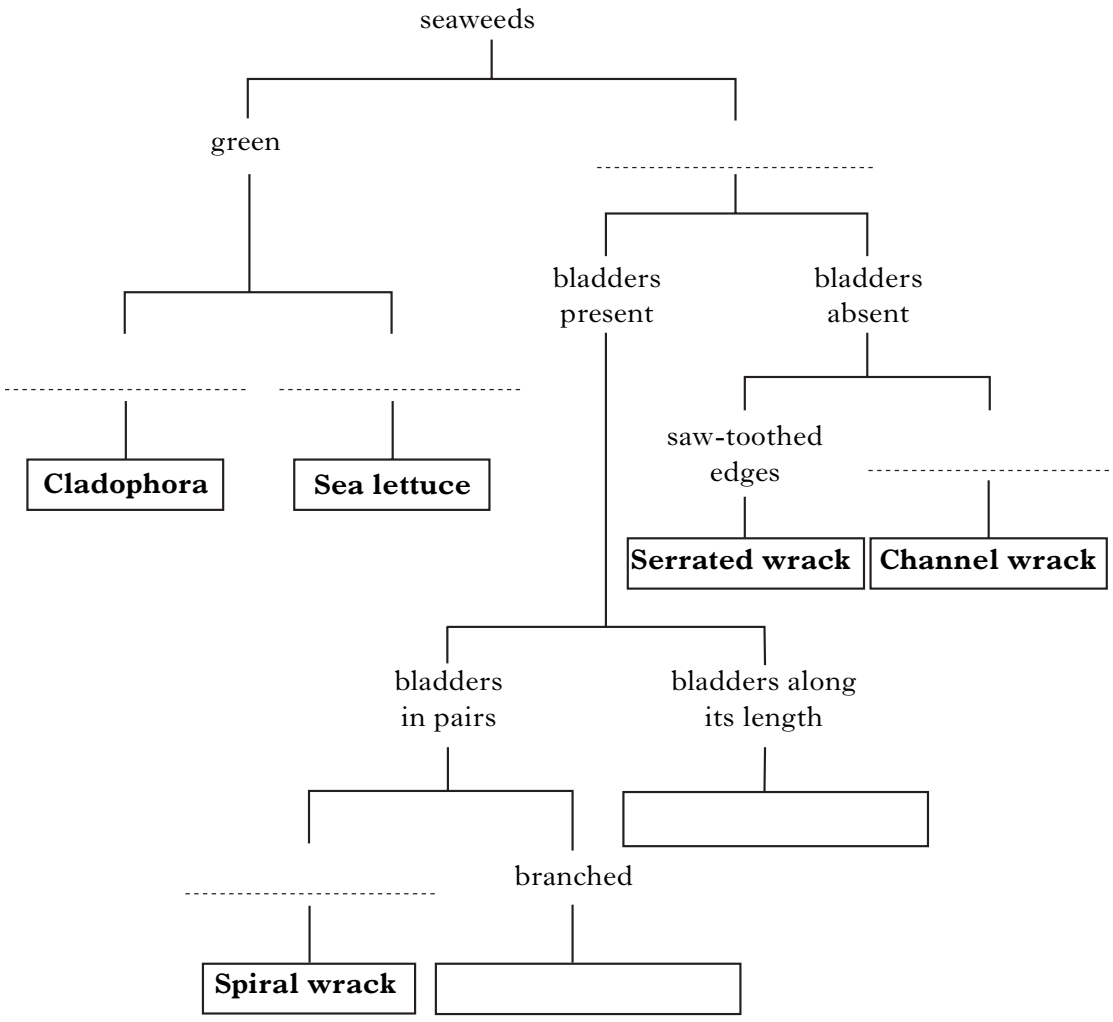
DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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

Seaweed	*Colour*	*Shape*	*Bladders*
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

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

3. (*a*) (continued)

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

1 _____

2 _____ **1**

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

_____ **1**

(*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	☐

1

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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.

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

3

(*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.

_____ **1**

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

_____

_____ **1**

(*c*) Some plants are useful to humans.

State a use by humans of a named plant.

Plant _____

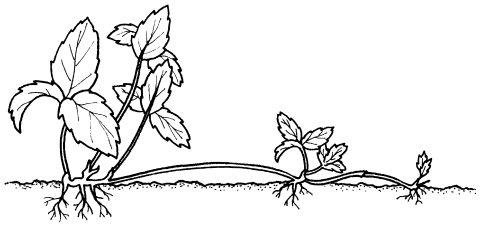
Use _____ **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

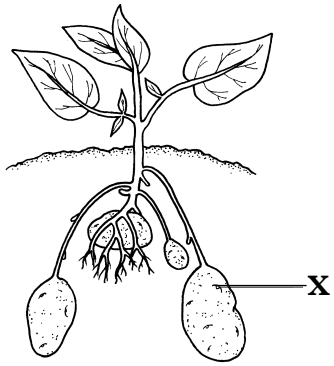
5. The diagrams show two natural methods of asexual reproduction in flowering plants.

Method A



Strawberry plant

Method B



Potato plant

(*a*) Name the two methods of asexual reproduction.

Method A _____

Method B _____ **2**

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

_____

_____ **1**

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

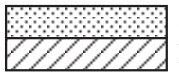
_____ **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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



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

(*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. **2**

(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?

_____ **1**

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

_____ **1**

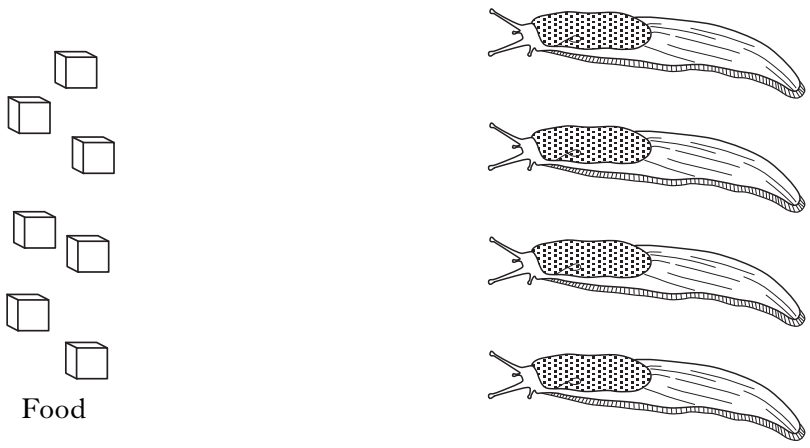
(*d*) Name **all** the crops which could be harvested in the same month as seeds of the same species are being sown.

_____ **1**

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

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?

_____

_____ **1**

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

_____ **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 _____

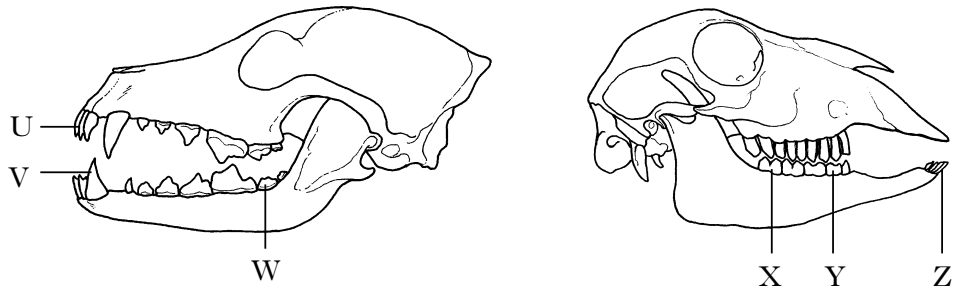
_____ **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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



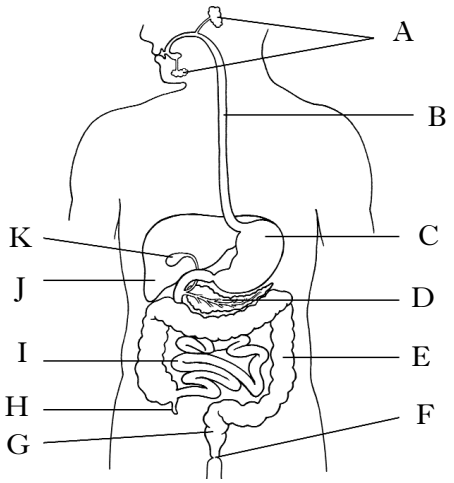
Use letters from the diagram to identify the following teeth.

(i) Incisors _____ and _____ **1**

(ii) A tooth used for piercing and holding prey _____ **1**

(iii) A tooth used for crushing and grinding plant material _____ **1**

(*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

DO NOT WRITE IN THIS MARGIN

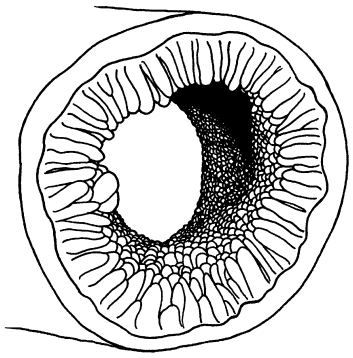
	Marks	KU	PS

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

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

9. (continued)

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

		Raw beef in stomach	*Boiled beef in stomach*	*Boiled beef in glass tube*
Time (hours)	0	unaffected	unaffected	unaffected
	1			
	2			
	4		digestion complete	digestion complete

2

[Turn over

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

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

_____ **1**

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

_____ **1**

(*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 _____ **1**

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

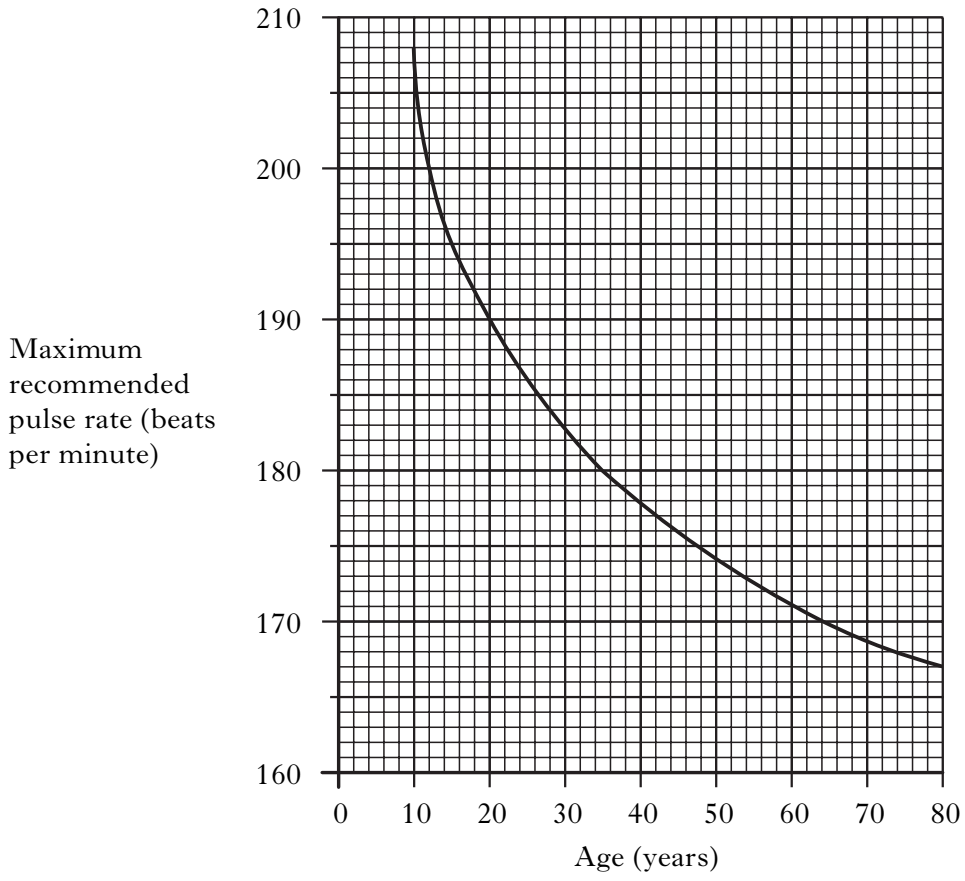
Space for calculation

_____ cells **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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?

1

_____ beats per minute

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

1

above _____ years

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

Space for calculation

1

_____%

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

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

_____ **1**

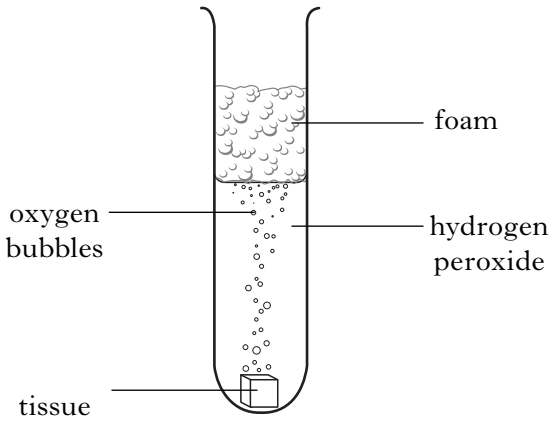
(*b*) Give **one** example of an enzyme responsible for the synthesis of a substance.

_____ **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.

Type of tissue	*Height of foam* (mm)
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**

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

12. (*c*) (continued)

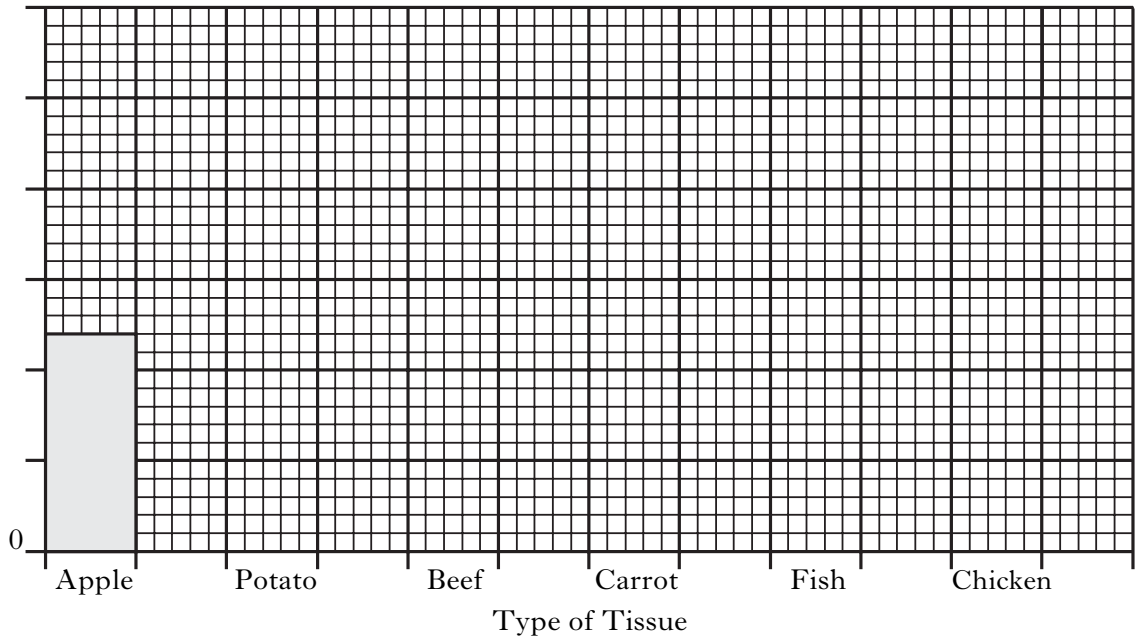
(ii) Use the information in the table to complete the bar chart by:

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.

_____

_____ **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

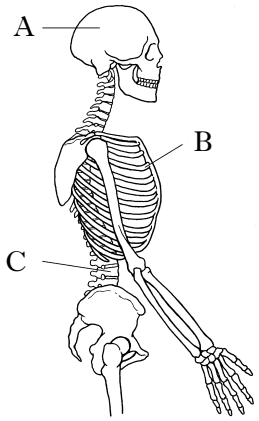
at pH 11 oxygen production would _____ . **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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		

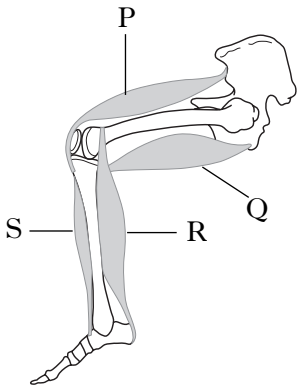
3

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

13. (continued)

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



(i) Which muscle contracts to straighten the leg?

_____ **1**

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

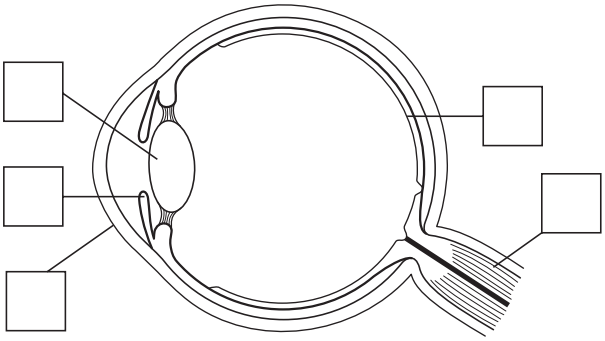
_____ **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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

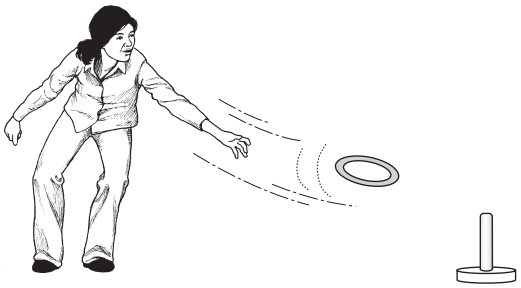


Use the information in the table below to add the correct letters to the diagram.

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.



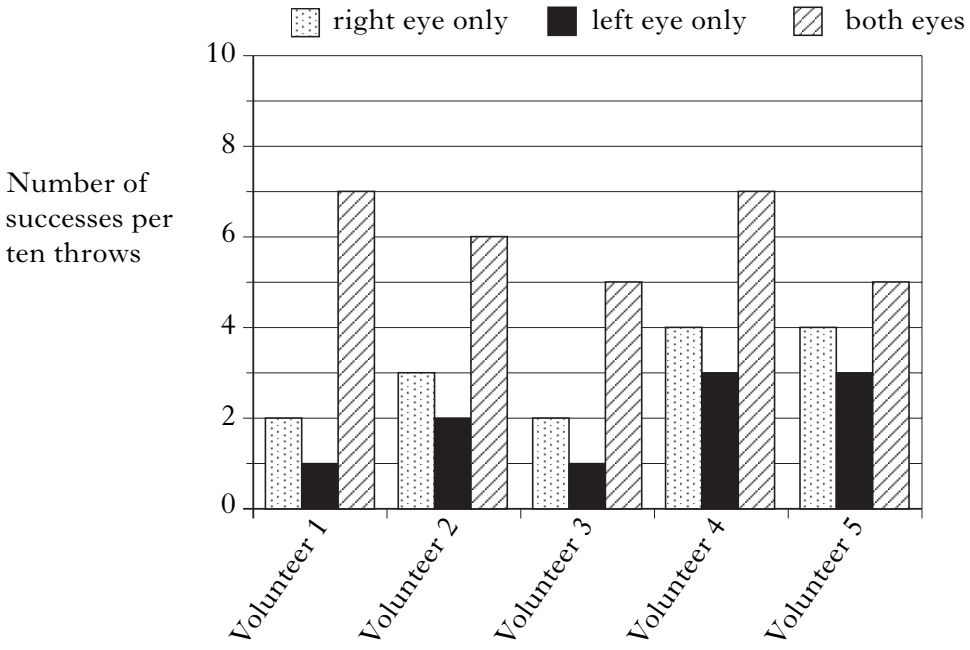
Volunteers each threw 10 hoops at a peg 3 metres away. The number of successful throws was recorded. Each volunteer attempted the test three times, once using the right eye only, once using the left eye only and once using both eyes.

The results are shown in the following chart.

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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 _____. **2**

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

1 _____

_____

2 _____

_____ **2**

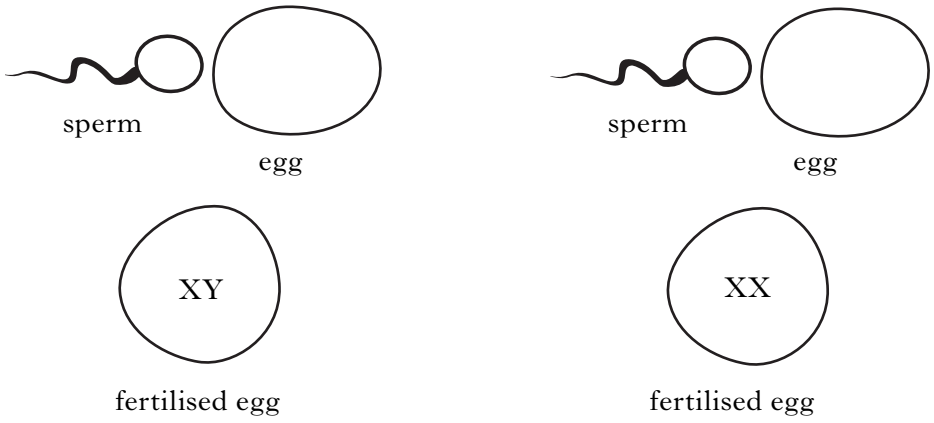
(iii) The brain, spinal cord and nerves are all involved in such activities. What is the collective name for these parts of the body?

_____ **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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



Sex _____ Sex _____

Complete the diagrams by:

(i) inserting the missing sex chromosomes into the eggs and sperm; **1**

(ii) writing the sex of each fertilised egg in the spaces provided. **1**

(*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 { tissue / clone / species }.

Characteristics of offspring are controlled by { enzymes / genes / phenotype }. **2**

(*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?

_____ **1**

(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?

_____ **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

15. (continued)

(*d*) The following table shows the risk to women of different ages of having a baby with Down's Syndrome.

Woman's age (years)	*Risk of Down's Syndrome (per 10 000 births)*
18	4
22	6
28	8
32	12
38	34
42	100

(i) How many times greater is the risk to a 42 year old woman of having a Down's Syndrome baby, compared to an 18 year old woman?

Space for calculation.

_____ times greater **1**

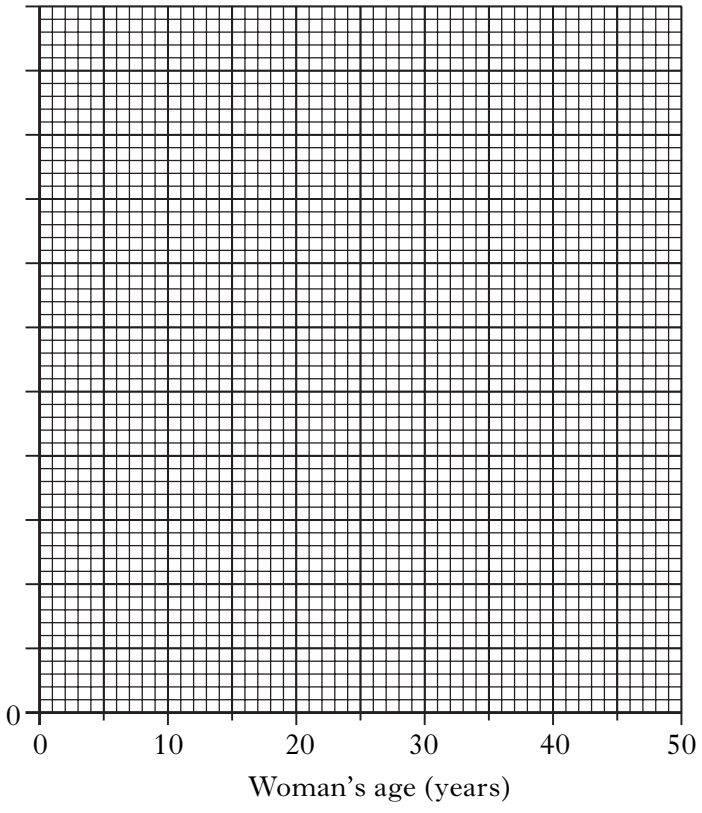
(ii) Complete the line graph below by:

1 completing the scale on the *y*-axis; **1**

2 adding a label to the *y*-axis; **1**

3 plotting the graph. **1**

(An additional grid will be found, if needed, on page 29.)



DO NOT WRITE IN THIS MARGIN

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 °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.

	pH of sample					
Temperature (°C)	*Start*	*1 hour*	*2 hours*	*3 hours*	*4 hours*	*5 hours*
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?

_____°C **1**

(iii) Explain why the mixture kept at 50 °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**

DO NOT WRITE IN THIS MARGIN

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.

Type of milk used	*Fat content of yoghurt* (%)
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.

	Composition	
Yoghurt	*fat* (%)	*lactose* (%)
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?

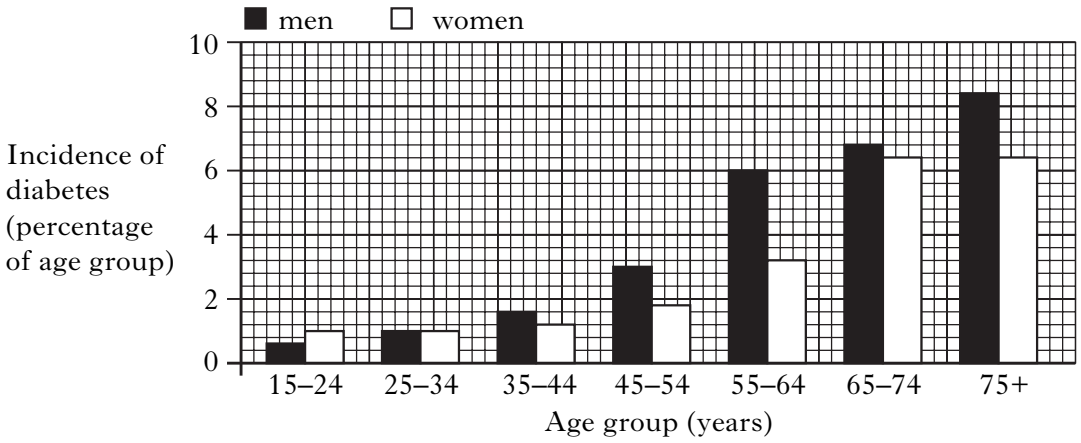
From _____ to _____% **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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 **1**

(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 _____ % **1**

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

_____ years **1**

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

_____ **1**

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

_____ **1**

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

_____ **1**

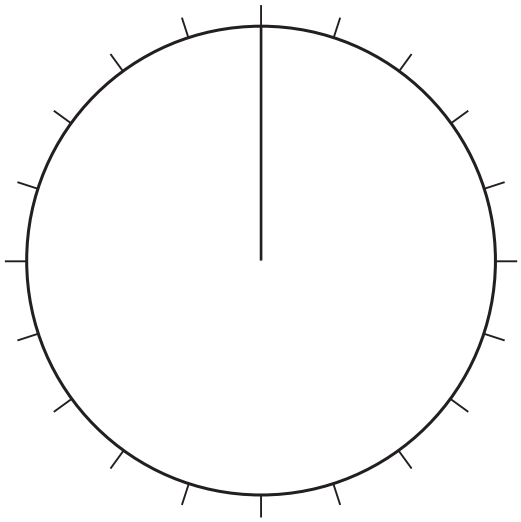
DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

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

Eye colour	*Number of school pupils*
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.)



2

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

_____

1

(*c*) What percentage of the school pupils had green eyes?
Space for calculation

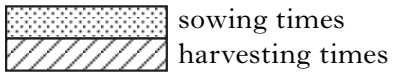
_____%

1

[*END OF QUESTION PAPER*]

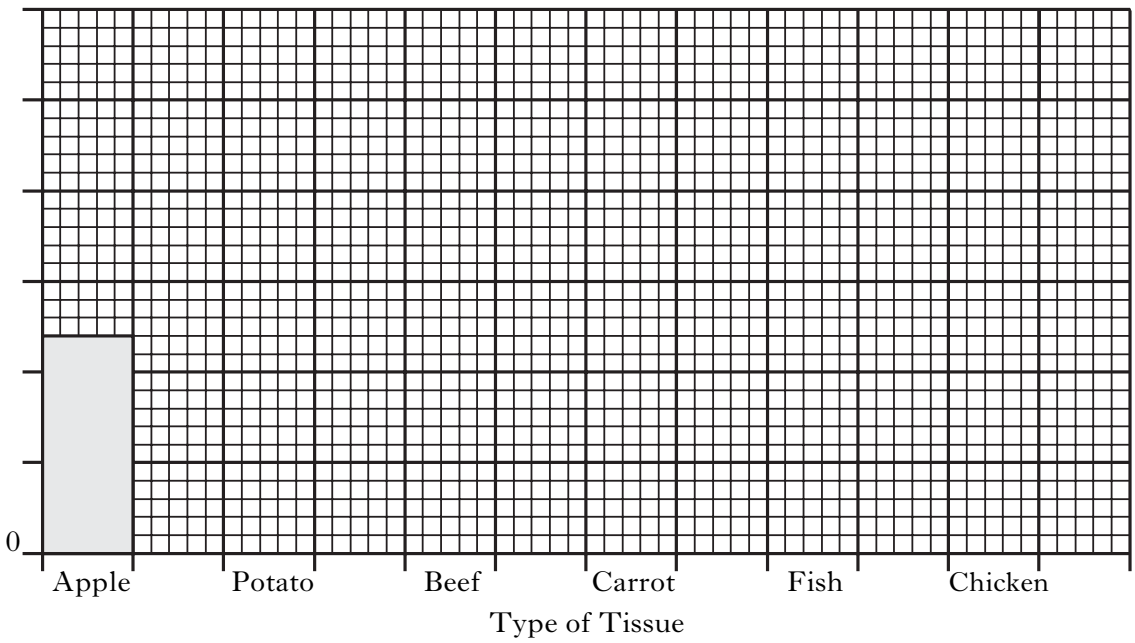
SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL CHART FOR QUESTION 6(*a*)



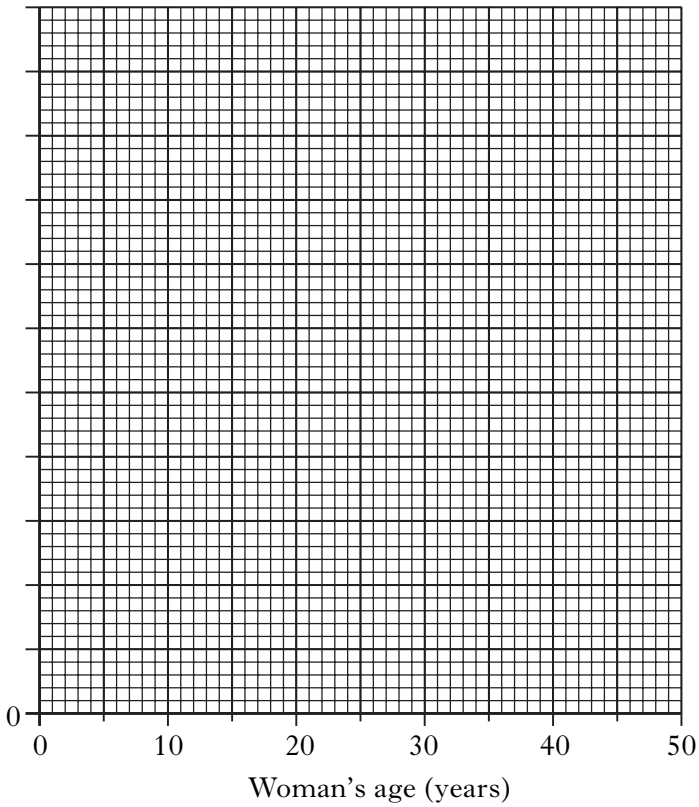
Vegetable	*Month*											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beetroot												
Carrot												
Cauliflower												
Leek												
Onion												
Parsnip												

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

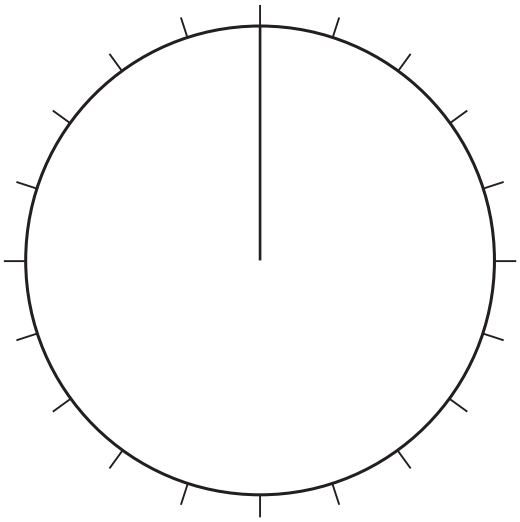


SPACE FOR ANSWERS
AND FOR ROUGH WORKING

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



ADDITIONAL CHART PAPER FOR QUESTION 18(*a*)



SPACE FOR ANSWERS
AND FOR ROUGH WORKING

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

[BLANK PAGE]