FOR OFFICIAL USE

G

KU	PS

Total Marks

0300/29/01

NATIONAL QUALIFICATIONS 2013

WEDNESDAY, 15 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.

SQA ©

DO NOT WRITE IN THIS MARGIN

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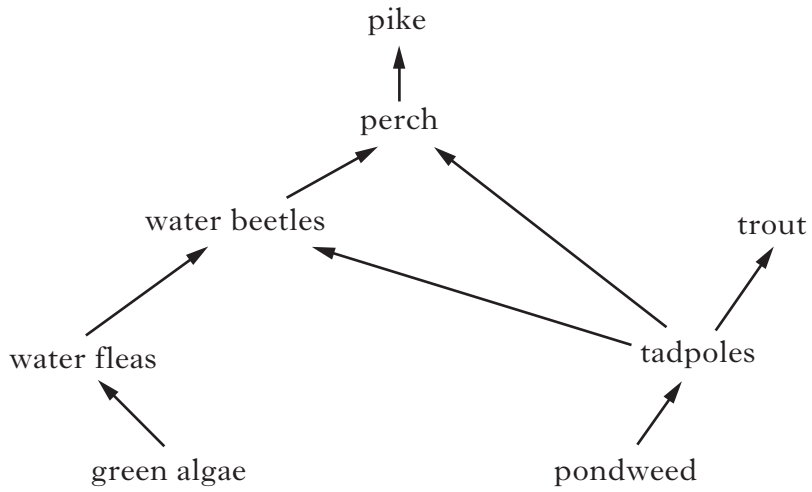
1. The diagram below shows part of a food web in a freshwater loch.



(*a*) (i) Name **all** the producers in the food web.

_____ **1**

(ii) Sticklebacks eat water fleas and perch eat sticklebacks.

Use this information to **add sticklebacks** to the **food web diagram**. **1**

(iii) Name **two** organisms from the food web which are in competition with each other.

1 _____

2 _____ **1**

(iv) State **one** possible effect that competition in a food web may cause.

_____ **1**

(v) Name an abiotic factor which might affect the number of water fleas in the loch and state how that factor could be measured.

Factor _____ **1**

Method of measurement _____

_____ **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

1. (continued)

(*b*) Sticklebacks build nests in which eggs are released and fertilised. A survey was carried out to estimate the number of sticklebacks by counting the nests in five separate areas of the loch.

The results are shown in the table below.

Area	*Number of nests*
1	6
2	12
3	9
4	11
5	7

(i) Calculate the average number of nests found in the five areas.

Space for calculation

_____ nests **1**

(ii) If each nest represents a pair of sticklebacks, estimate the total number of sticklebacks in the five areas.

Space for calculation

_____ sticklebacks **1**

(*c*) Underline one option from each of the brackets to make the following sentences correct.

Animals, plants and their habitat together make { an ecosystem / a community / an environment }.

All the organisms of the same species in that area form a

{ biosphere / community / population }. **1**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

2. Aquatic plants are placed in fish tanks to supply oxygen. The oxygen is a product of photosynthesis.

(*a*) (i) Name the raw materials of photosynthesis.

_____ and _____ **1**

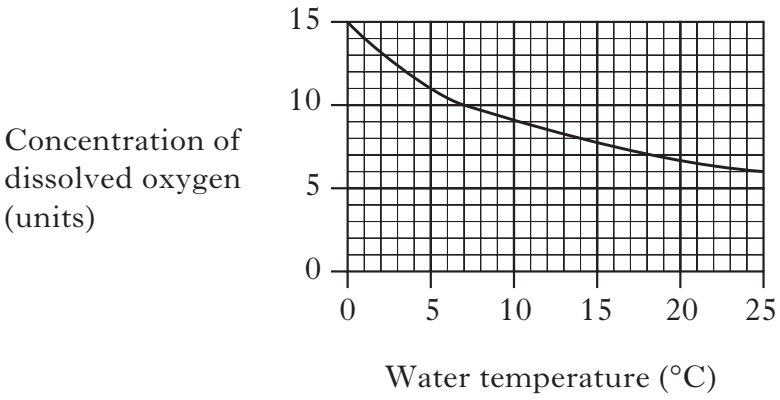
(ii) Name the green chemical which plants need to carry out photosynthesis.

_____ **1**

(iii) Name the form of energy used by producers for photosynthesis.

_____ **1**

(*b*) The graph below shows how the concentration of dissolved oxygen changes with water temperature.



(i) Describe the relationship between the water temperature and the concentration of dissolved oxygen.

_____

_____ **1**

(ii) A fish tank contains fish which need an oxygen concentration of 8 to 10 units.

Suggest a suitable temperature for the water in the fish tank.

_____ °C **1**

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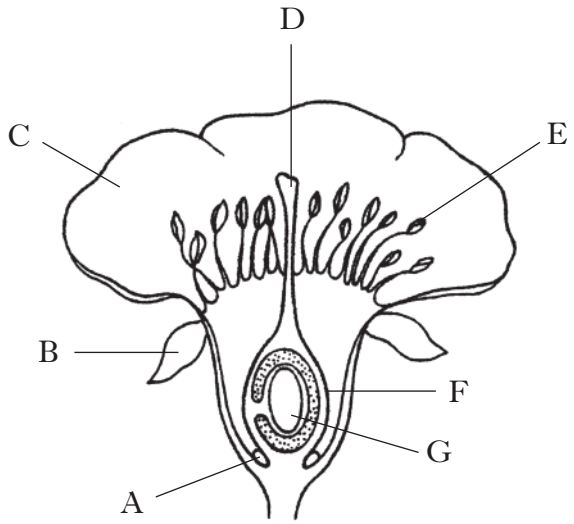
Marks | KU | PS

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



(*a*) Complete the following table using information from the diagram.

Letter	*Name of structure*	*Function*
	anther	
B	sepal	
		collects pollen
G		site of fertilisation

3

(*b*) Using information from the diagram, identify the method of pollination used by this flower.

Give a reason for your answer.

Method _____

Reason _____

_____

2

[Turn over

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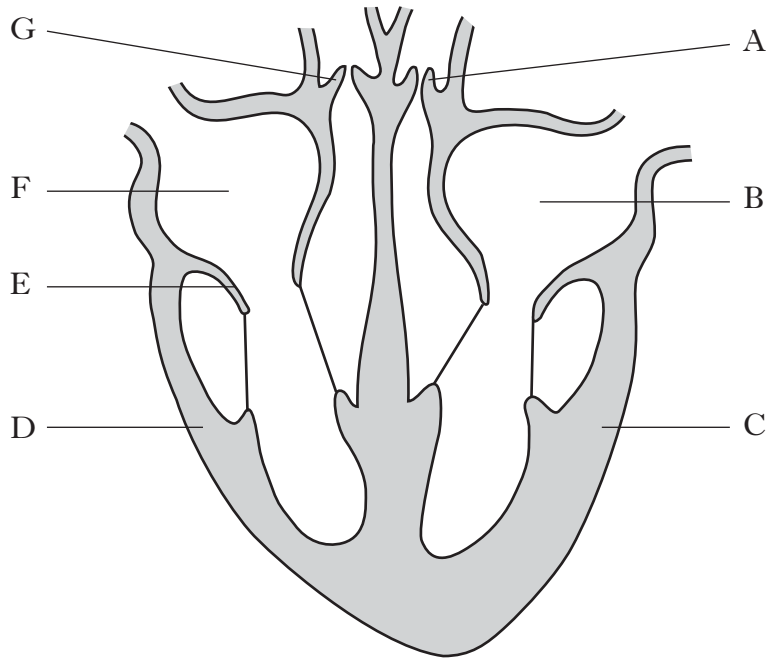
Marks | KU | PS

4. (*a*) The following diagram shows the structure of the heart.



From the diagram select the letters which match the statements below.

(i) Produces maximum pressure to push blood round the body.

Letter _____ **1**

(ii) Prevents backflow of blood into the right ventricle.

Letter _____ **1**

(iii) Receives oxygenated blood from the lungs.

Letter _____ **1**

(*b*) Name the blood vessel which supplies blood to the heart muscle.

_____ **1**

DO NOT WRITE IN THIS MARGIN

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4. (continued)

(*c*) The table below gives information about structures in the blood.

Name of structure	*Number in* 1 cm^3 *of blood* (millions)	*Diameter* (mm)	*Features*
Red blood cells	56 000	0·008	Made in bone marrow. Body produces 280 million each hour. Carry oxygen.
White blood cells	80	0·02	Made in bone marrow and lymph nodes. Fight infection by engulfing bacteria or by producing antibodies.
Platelets	4 000	0·003	Made in bone marrow. Contain proteins which form blood clots.

Use this information to answer the following questions.

(i) State **one** way that blood cells fight infection.

_____

_____ **1**

(ii) Name the substance which forms blood clots.

_____ **1**

(iii) Complete the simple whole number ratio below to show the relative numbers of each structure in 1 cm^3 of blood.

Space for calculation

white blood cells	:	platelets	:	red blood cells
1	:		:	

1

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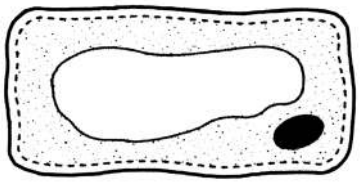
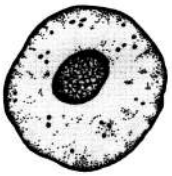
5. (*a*) (i) The diagrams below represent two cells.

Onion root cell



Human cheek cell



Name **three** structures, or parts, shown to be present in **both** cells.

_____

_____

_____ **2**

(ii) Name a structure which would be found in a green leaf cell of a plant, but **not** in a root cell.

_____ **1**

(iii) What name is given to a substance added to make cell structures more visible when viewing them with a microscope?

_____ **1**

(*b*) Complete the following table about the sex cells of mammals.

Sex	*Name of sex cell*	*Where produced*	*Relative size (large or small)*	*Contains food store*	*Able to swim*
Male		Testes		No	
Female	Egg/Ova				

3

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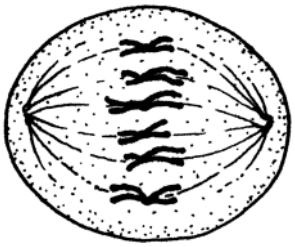
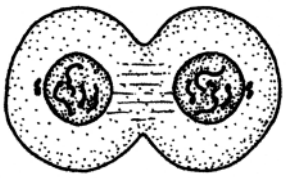
Marks	KU	PS

6. (*a*) The following diagrams show two stages in cell division.



Stage X



Stage Y

Draw **one** line from each of the stages named below to its correct description.

Stage	*Description of stage*
	Chromosomes become visible in the nucleus
Stage X	Chromosomes line up at the equator
	Nuclear membrane breaks down
Stage Y	Cytoplasm divides

2

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

Cell division is controlled by the { membrane / nucleus / cytoplasm }.

The number of chromosomes in the daughter cells is

{ greater than / less than / the same as } the original cell.

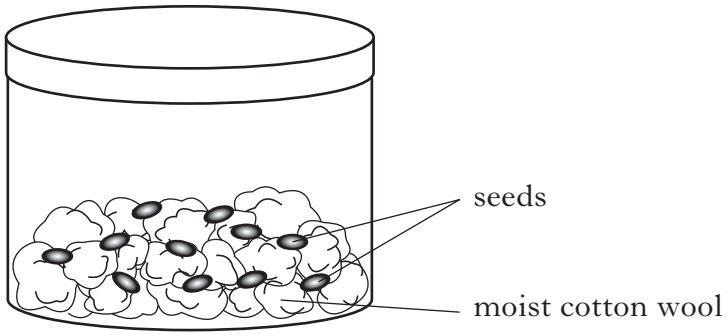
2

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

7. In an investigation into the effect of temperature on seed germination, six dishes were set up as shown below. Each dish contained 20 seeds.



Each dish was left for five days at a different temperature and then examined to see how many seeds had germinated.

The results are shown in the table below.

Temperature (°C)	*Seed germination*	
	Number	(%)
10	2	10
15	10	50
20		80
25	12	60
30	2	10
35	0	0

(*a*) (i) Complete the table to show the number of seeds germinating at 20 °C.

Space for calculation

1

(ii) What feature of this investigation increased the reliability of the results?

_____

1

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

7. (*a*) (continued)

(iii) Identify **two** variables, not already mentioned, which should be kept constant to make the experiment valid.

1 _____ **1**

2 _____ **1**

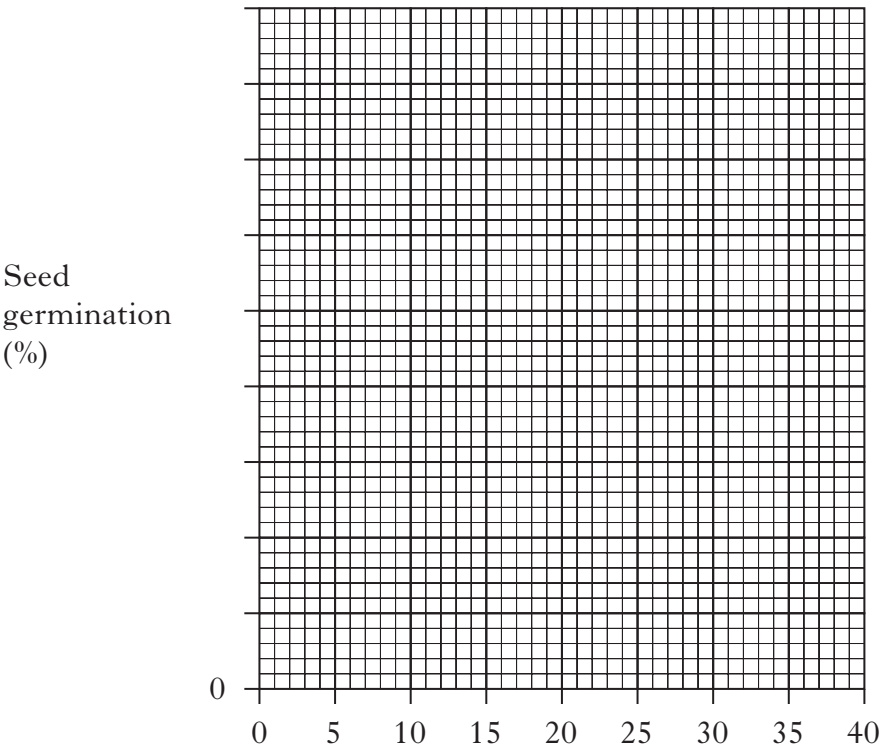
(*b*) On the grid below, complete a line graph of the percentage seed germination by:

(i) labelling the horizontal axis; **1**

(ii) adding a scale to the vertical axis; **1**

(iii) plotting the graph. **1**

(An additional grid, if required, will be found on *Page twenty-eight*.)



(*c*) Describe the effect of temperature on seed germination in this investigation.

_____

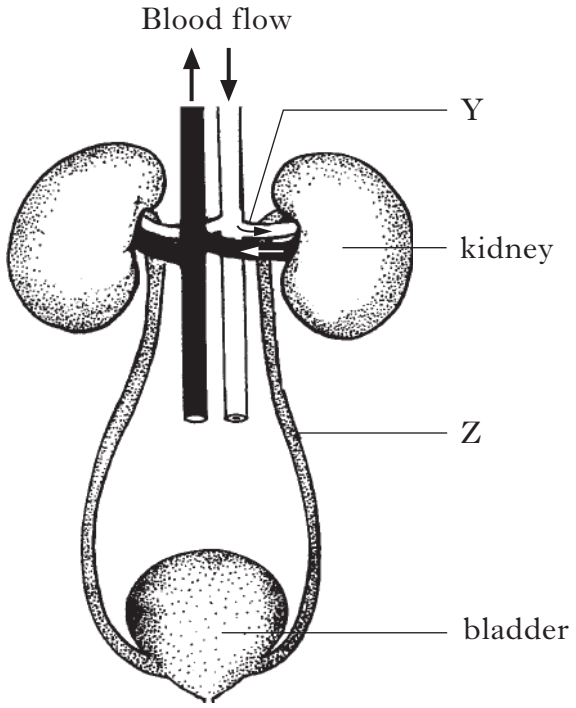
_____

_____ **2**

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

8. (*a*) The following diagram represents part of the urinary system.



(i) Name blood vessel Y.

_____ **1**

(ii) Name structure Z.

_____ **1**

(iii) What is the function of the bladder?

_____ **1**

(iv) Name the toxic waste product removed from the blood by filtration in the kidney.

_____ **1**

(v) Name the process in the kidney which follows filtration and which prevents useful materials being lost from the body.

_____ **1**

DO NOT WRITE IN THIS MARGIN

8. (continued)

Marks | KU | PS

(*b*) The table below shows the daily water gains and losses of a person at three different environmental temperatures.

		Environmental temperature (°C)		
		15	20	25
Water gain (cm^3)	In drinks	1500	1500	1500
	In food	800	800	800
	From respiration	300	300	300
	Total	2600	2600	2600
Water loss (cm^3)	In breath		400	500
	In sweat	600	1000	3200
	In urine	1500	1100	600
	In faeces	100	100	100
	Total	2600	2600	4400

(i) **Complete the table** by calculating the volume of water lost in the breath at 15 °C.

Space for calculation

1

(ii) Water balance is usually achieved by the body.

What evidence from the table supports this statement?

_____

_____ **1**

(iii) From information in the table, describe **two** changes which take place as the environmental temperature rises.

1 _____

2 _____ **1**

(iv) What would the person normally do to restore water balance at 25 °C?

_____ **1**

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

9. In an investigation into the judgement of distance, a volunteer was asked to hammer a nail into a piece of wood.

The task was repeated six times with two eyes open and then with only one eye open.

The time taken for each attempt is recorded in the table below.

Attempt	*Time taken to hammer nail* (seconds)	
	Two eyes open	*One eye open*
1	25	40
2	22	36
3	20	34
4	17	34
5	14	32
6	12	30

(*a*) Give **two** conclusions which can be drawn from the results.

1 _____

_____ **1**

2 _____

_____ **1**

(*b*) Give **two** factors which should be kept constant to allow valid conclusions to be drawn from the investigation.

1 _____ **1**

2 _____ **1**

DO NOT WRITE IN THIS MARGIN

Marks KU PS

9. (continued)

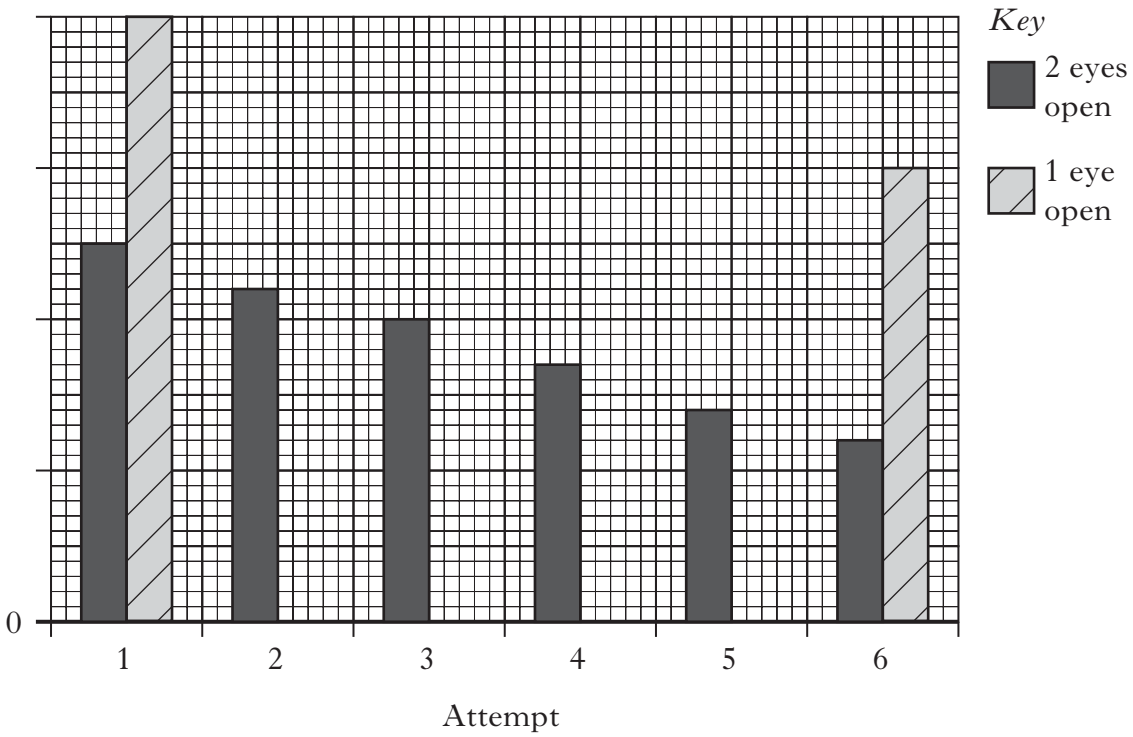
(*c*) Use the results to complete the bar chart below by

(i) labelling the vertical axis; **1**

(ii) adding an appropriate scale to the vertical axis; **1**

(iii) drawing the missing bars. **1**

(An additional grid will be found, if required, on *Page twenty-eight*.)



[Turn over

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

10. Read the following passage carefully and answer the following questions.

Adapted from "*The latest superfood revealed: electric potatoes*"
The Herald, 23 August 2010.

Potatoes could become one of nature's superfoods. Scientists have tested the effects of mechanical stress on the potato, one of the world's most widely consumed plant foods.

Scientists know that bruising and exposure to periods of drought stimulate the production of useful compounds such as antioxidants and polyphenols in fresh fruit and vegetables. These antioxidants help the plants to survive droughts, disease and attack by pests by mopping up molecules which can damage cells. Scientists have also shown that zapping potatoes with ultrasound or electricity causes them to double their production of antioxidants, including vitamin C.

When consumed, antioxidants have been shown to combat heart disease, protect arteries and reduce the risk of diabetes and neurological diseases. Antioxidants also prevent damage to DNA which leads to cells becoming cancerous.

(*a*) (i) Name **two** natural causes of increased antioxidant levels in fruit and vegetables.

1 _____

2 _____ **1**

(ii) Give **two** treatments carried out by scientists to increase the production of antioxidants in potatoes.

1 _____

2 _____ **1**

(iii) State **one** benefit of antioxidants for plants.

_____

_____ **1**

(iv) Name **one** antioxidant found in potatoes.

_____ **1**

DO NOT WRITE IN THIS MARGIN

Marks

KU	PS

10. (continued)

(*b*) (i) Explain how antioxidants reduce the risk of cancer.

_____

_____ **1**

(ii) Give **one** other benefit of antioxidants in our diet.

_____

_____ **1**

[Turn over

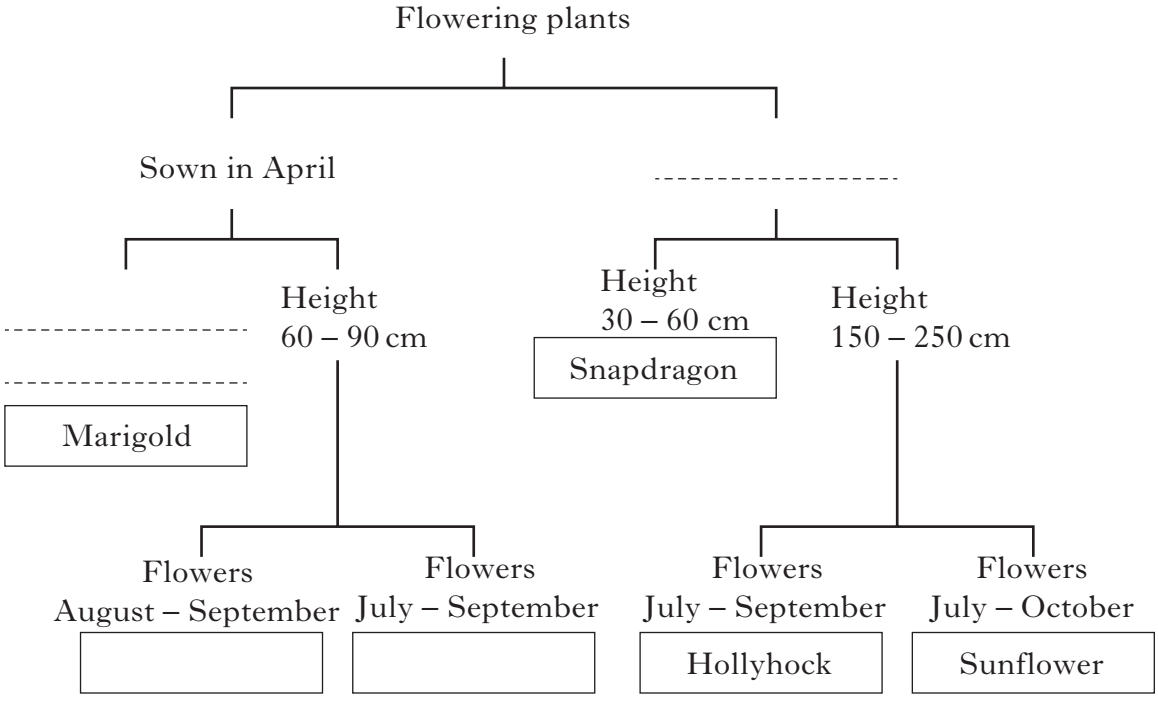
DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

11. The table below gives information about some common garden flowering plants.

Flowering plant	*Height* (cm)	*Seed sowing time*	*Flowering time*
Hollyhock	150 – 250	March	July – September
Snapdragon	30 – 60	March	July – October
Marigold	30 – 60	April	May – October
Cosmea	60 – 90	April	August – September
Mallow	60 – 90	April	July – September
Sunflower	150 – 250	March	July – October

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



3

(*b*) Which feature could be used to distinguish between Snapdragon and Sunflower plants?

_____

1

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

11. (continued)

(*c*) A plant grows to 50 cm tall and flowers in August.

Why would it be difficult to identify this plant using this key?

_____

_____ **1**

(*d*) Name **all** the plants that are sown in March and flower in September.

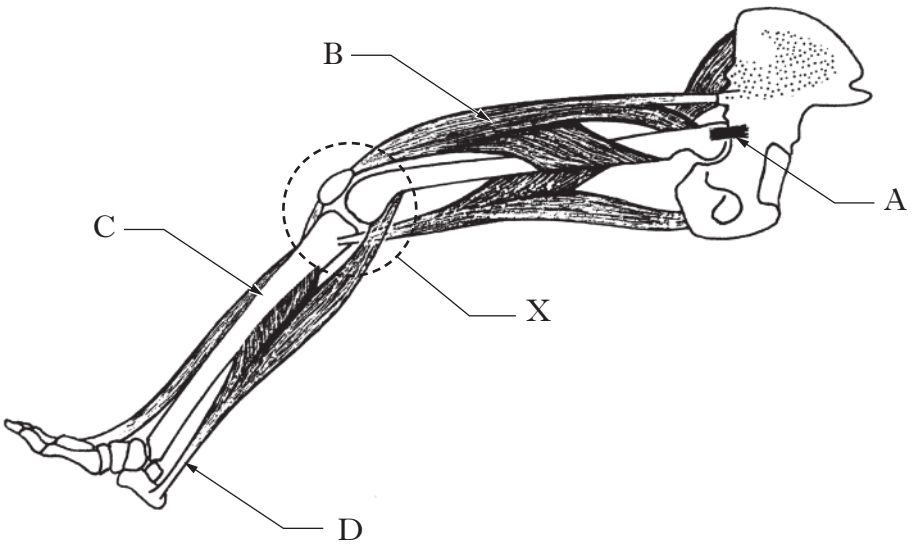
_____ **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

12. The diagram below represents some structures of the human leg.



(*a*) Complete the table below with the letters, names and functions of the structures labelled A – D in the diagram.

Letter	*Name*	*Function*
B		Produces a force to move bones at a joint
	Bone	Framework for muscle attachment
		Joins muscle to bone
A	Ligament	

3

(*b*) What type of joint is the knee joint, shown at **X** on the diagram?

_____

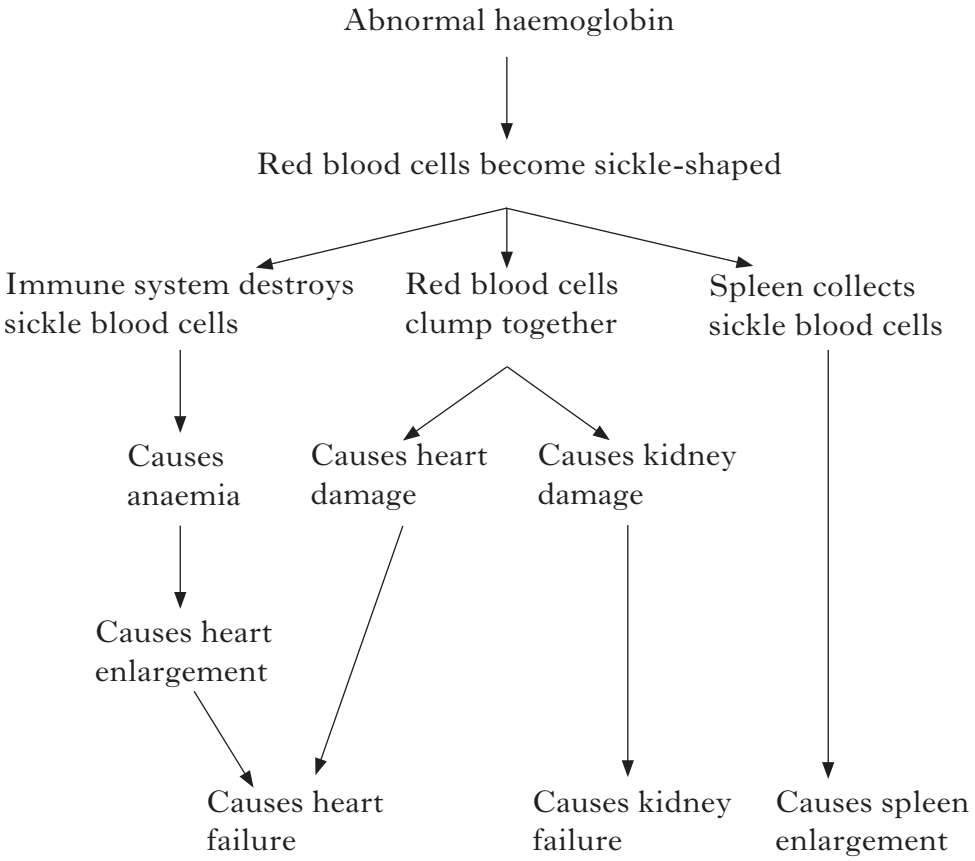
1

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

13. An inherited characteristic can give rise to abnormal haemoglobin in the blood.

The flow chart shows some of the consequences of this.



(*a*) What is the first effect on red blood cells if the body makes abnormal haemoglobin?

_____ **1**

(*b*) Which system of the body destroys sickle blood cells?

_____ **1**

(*c*) Name **two** organs which become enlarged because of sickle blood cells.

_____ and _____ **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

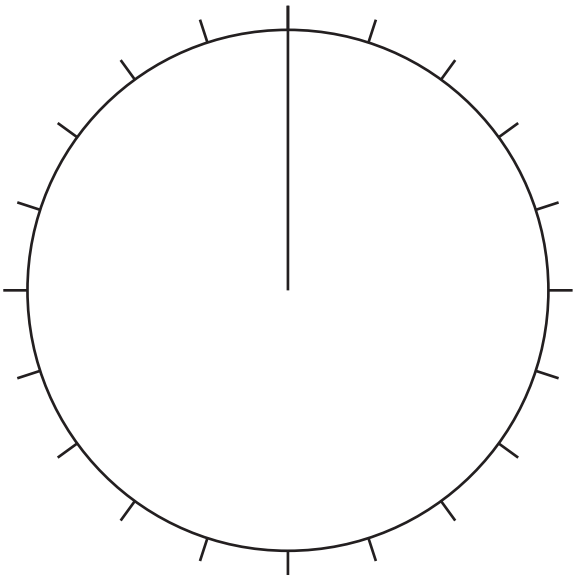
Marks | KU | PS

14. The following table gives information about the frequency of blood groups in two different countries.

Country	*Blood group frequency* (percentage of population)			
	Group O	Group A	Group B	Group AB
X	40	10	45	5
Y	20	35	40	5

(*a*) Use information from the table to complete the pie chart to show the frequency of blood groups for **country Y**.

(An additional chart, if required, can be found on *Page twenty-nine*.)



2

(*b*) Which blood group shows the greatest difference in frequency between the two countries?

Blood group _____ **1**

(*c*) The population of Country X is 5 million people.

Calculate the number of people who have blood group O.

Space for calculation

_____ **1**

[Turn over for Question 15 on *Page twenty-four*

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

15. (*a*) The shape of the human ear lobe is controlled by two different alleles of the same gene.

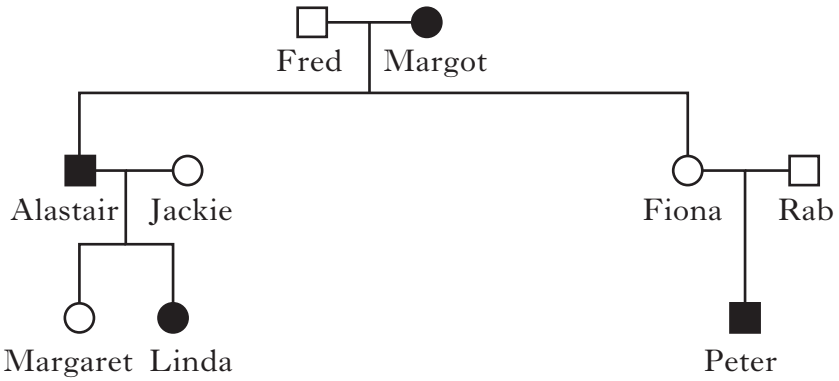
The family tree below shows the inheritance of ear lobe type.

□ male with attached ear lobes

○ female with attached ear lobes

■ male with free ear lobes

● female with free ear lobes



(i) Name the **two** phenotypes of this characteristic, shown in the family tree.

1 _____

2 _____ **1**

(ii) From the information, identify:

1 A male with attached ear lobes _____

2 A female with free ear lobes _____ **1**

(iii) From the information, state which form of ear lobe shape is dominant.

_____ **1**

(iv) What symbol is used to identify the generation of each of the following individuals?

Fiona _____

Linda _____ **1**

(v) What type of variation is shown by this genetic characteristic?

_____ **1**

DO NOT WRITE IN THIS MARGIN

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15. (continued)

(*b*) What term refers to the genetic information for a characteristic, in terms of the alleles present in an individual?

_____ **1**

(*c*) (i) Sex cells contain only one set of chromosomes compared to the two sets present in body cells.

What term is used to refer to all types of sex cells?

_____ **1**

(ii) Name the process which restores the double number of chromosome sets of the body cells.

_____ **1**

[Turn over

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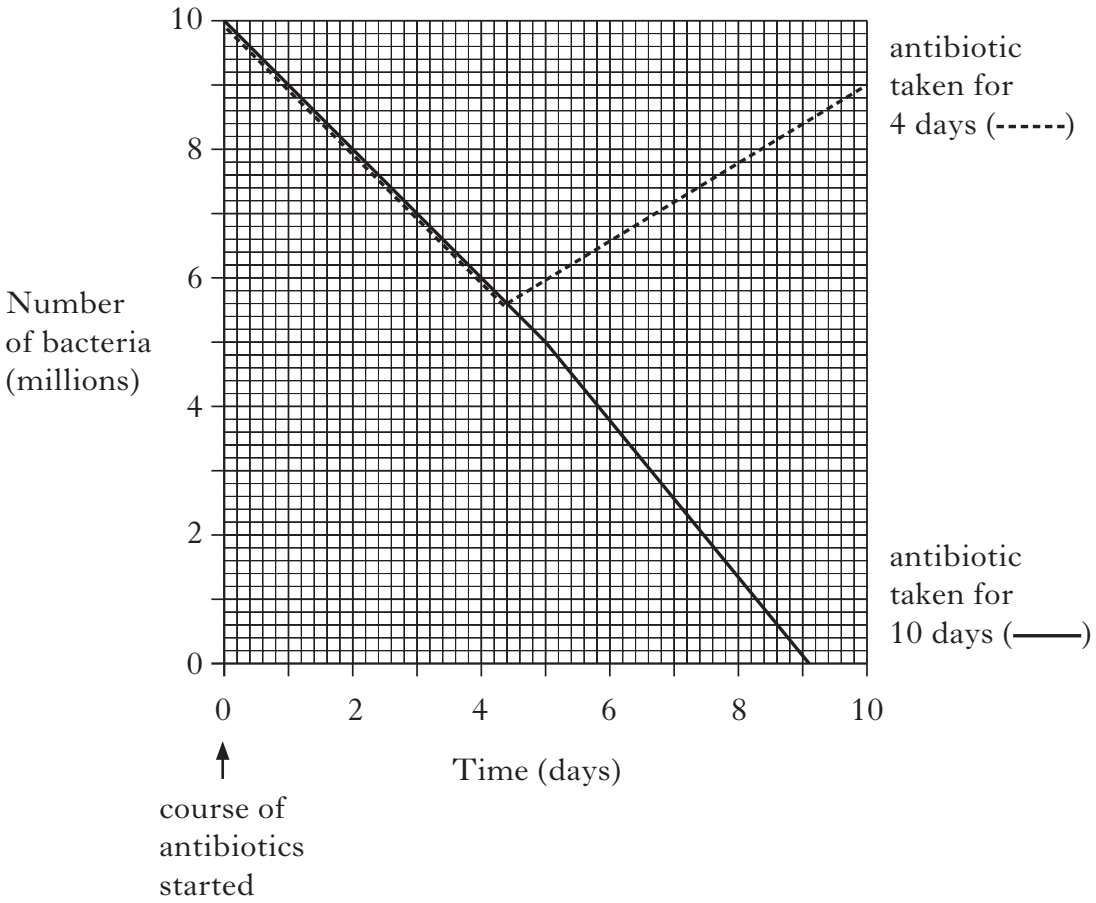
Marks	KU	PS

16. Antibiotics may be prescribed by doctors. Patients are always told that it is important to complete a course of antibiotics.

(*a*) What is the function of antibiotics?

_____ **1**

(*b*) The graph below shows the effect of an antibiotic on bacterial growth in patients with a throat infection.



(i) From the information in the graph, explain why it is important to complete a course of antibiotics.

_____

_____ **1**

(ii) One patient took the antibiotic four times a day as 250 mg tablets for 10 days.

How much antibiotic had been taken by the time the number of bacteria had been halved?

Space for calculation

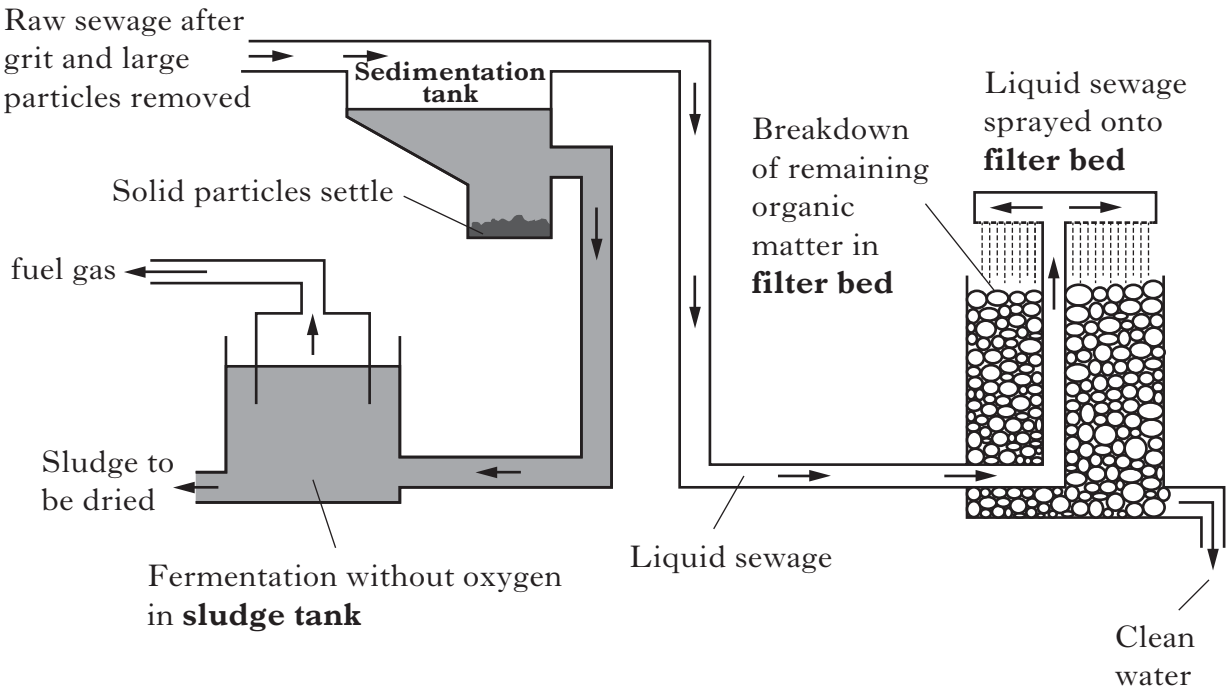
_____ mg **1**

DO NOT WRITE IN THIS MARGIN

Marks KU PS

17. Micro-organisms are used in sewage works to breakdown sewage into harmless products.

The diagram below shows a type of sewage treatment works.



(*a*) (i) Name the fuel gas produced in the sludge tank.

_____ **1**

(ii) Give an advantage of using fuel produced in this way, rather than by using fossil fuels.

_____ **1**

(*b*) What important requirement for the micro-organisms is provided by the filter bed?

_____ **1**

(*c*) Give an example of a disease which can be spread by untreated sewage.

_____ **1**

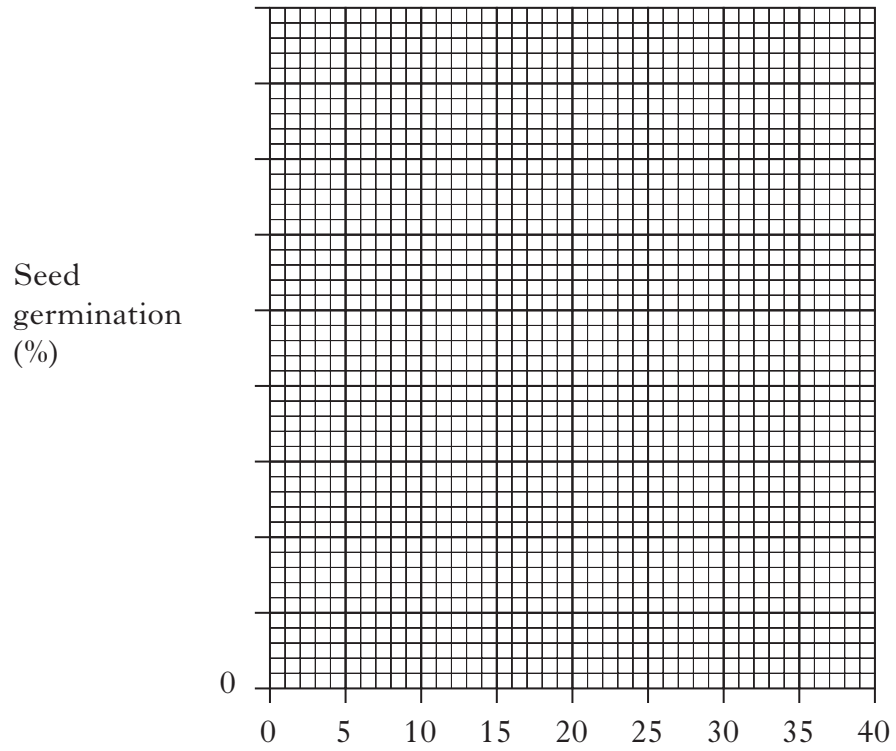
[*END OF QUESTION PAPER*]

DO NOT WRITE IN THIS MARGIN

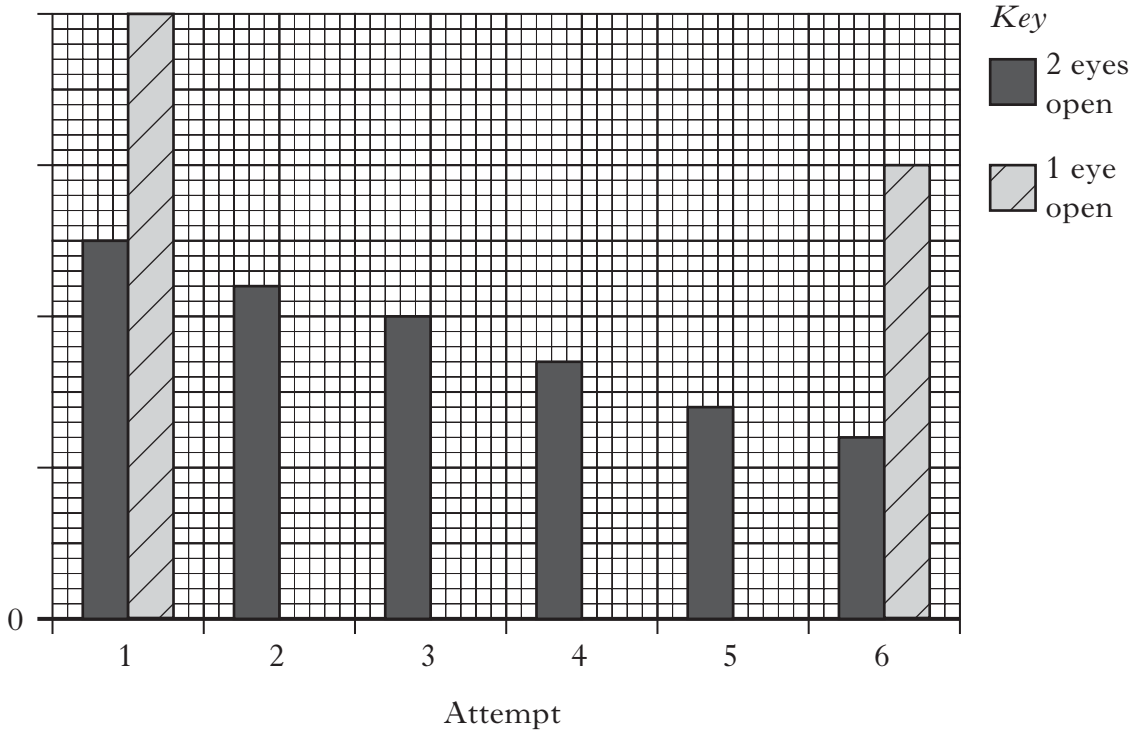
KU	PS

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL GRID FOR QUESTION 7(*b*)



ADDITIONAL GRID FOR QUESTION 9(*c*)



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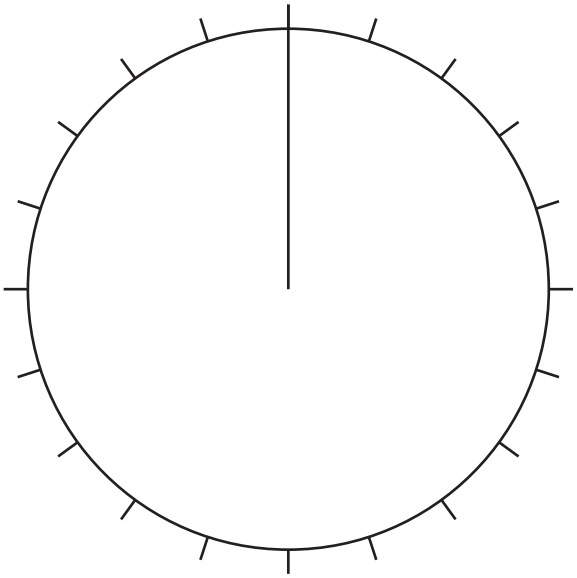
KU	PS

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL GRID FOR QUESTION 14(*a*)



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ACKNOWLEDGEMENTS

Question 10—Article is adapted from "The latest superfood revealed: electric potatoes," taken from *The Herald*, 23 August 2010. Reproduced by kind permission of Newsquest (Herald and Times Ltd).