

FOR OFFICIAL USE

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

G

KU	PS

Total Marks

0300/401

NATIONAL
QUALIFICATIONS
2008

TUESDAY, 27 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.



Marks	KU	PS

1. (a) The key gives information about some water plants growing in a pond.
- 1 Plant is fully submerged in waterGo to 2
Plant has leaves on or above surface.....Go to 3
 - 2 Grows in deep water*Elodea*
Grows in shallow water.....*Starwort*
 - 3 Plant has roots in soil.....Go to 4
Plant is free floating on water surface.....*Water hyacinth*
 - 4 Long and thin leaves*Water hawthorn*
Round leavesGo to 5
 - 5 Resistant to frost*Water lily*
Cannot survive frost*Lotus*
- (i) Use the key to identify the plant from the photograph and its description.

Photograph



Description

The plant has its roots in the soil at the bottom of the pond and does not tolerate frost very well.

Name of plant _____

1

- (ii) Which plant grows submerged in deep water?

1

- (iii) Give **three** features that the Water lily and the Lotus have in common.

1 _____

2 _____

3 _____

2

Marks

KU	PS
1	
1	
1	

1. (continued)

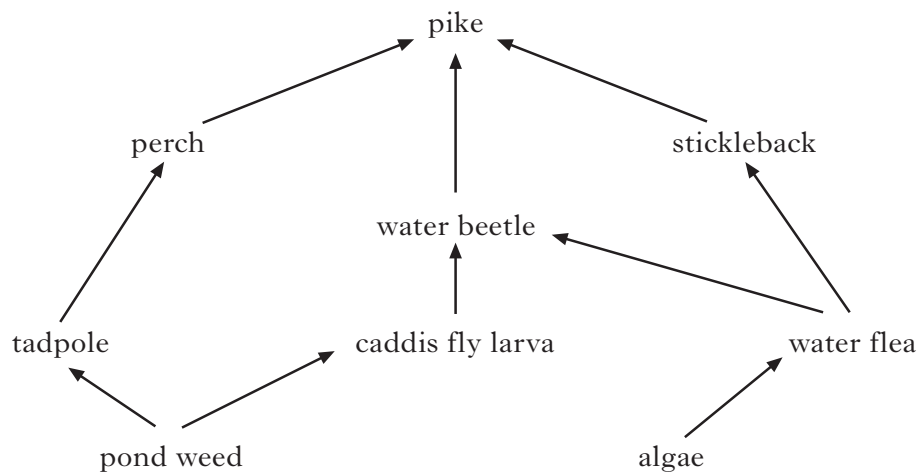
(b) Use words from the list to complete the following sentences.

List population community habitat

A pond provides a _____ for a
_____ of many different types of organisms.

Plants of the same species form a _____.

(c) The food web shows the feeding relationships of some of the organisms in a pond.



(i) What do the arrows in the food web represent?

(ii) A predator is an animal which hunts and kills other animals for food.

Give the names of **two** predators from the food web.

1 _____

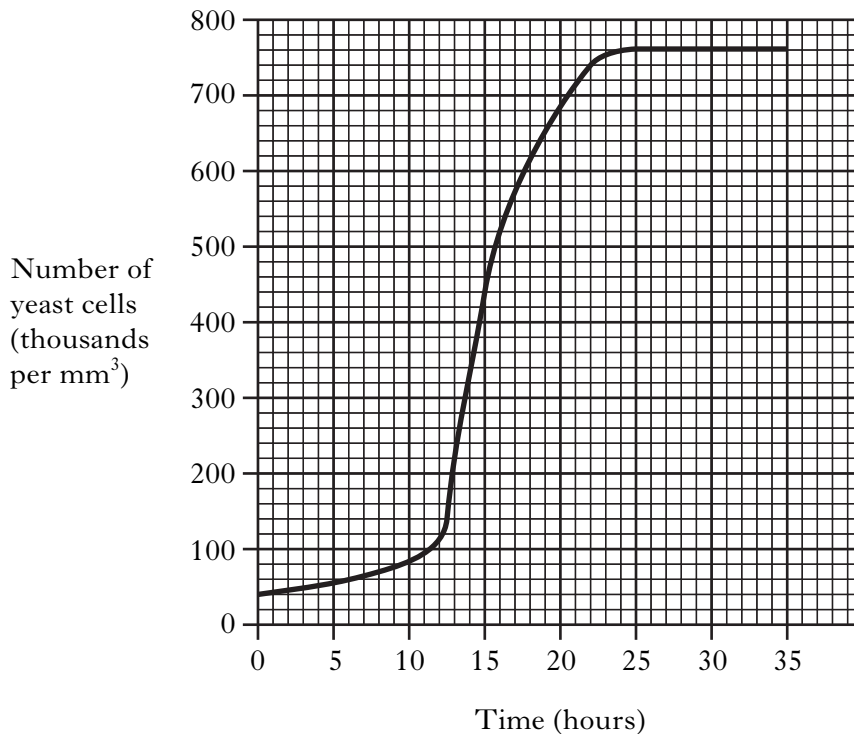
2 _____

[Turn over

Marks

KU	PS
1	
1	
2	

2. Yeast cells were grown and their numbers recorded over a 35 hour period. The results are shown on the graph.



- (a) How many times greater was the maximum number of yeast cells compared to the number at the start?

Space for calculation.

_____ times greater

1

- (b) In terms of birth rate and death rate, explain why the population of yeast increased during the first 20 hours.

1

- (c) Name **two** factors which could limit the growth of the population of yeast cells after 20 hours.

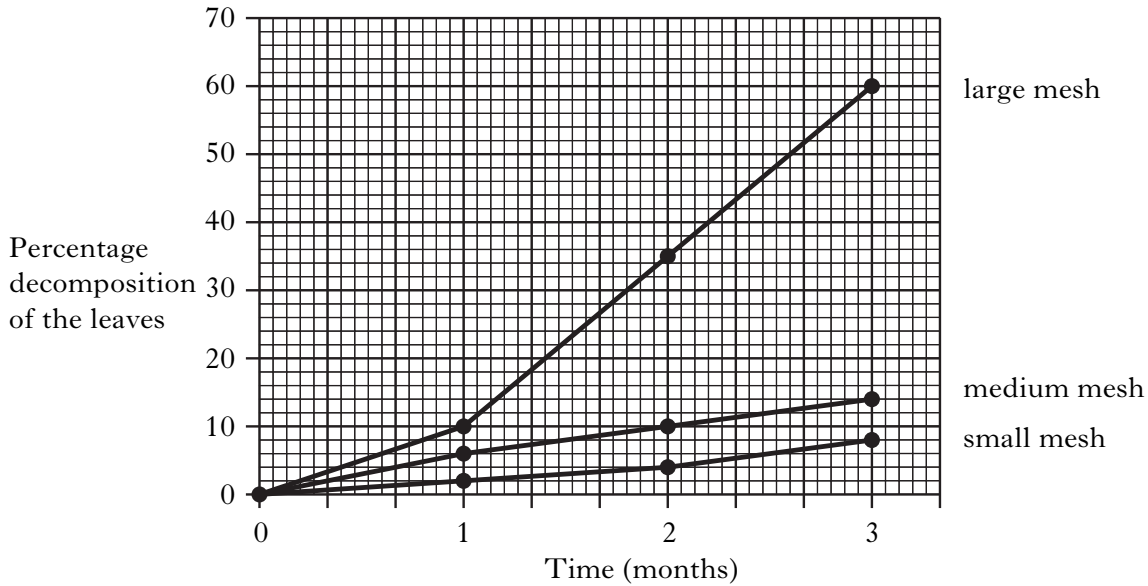
1 _____

2 _____

2

Marks

3. The activity of soil organisms was investigated. Some leaves were placed in bags of different mesh sizes and buried in soil for three months. Each bag was dug up at one month intervals and the percentage decomposition of the leaves recorded. The results are shown on the graph.



- (a) After three months, what percentage of the leaves had decomposed in each bag?

Large mesh bag _____ %
 Medium mesh bag _____ %
 Small mesh bag _____ %

- (b) Give **one** feature of the bags and **one** feature of the leaves which would have to be kept constant when setting up the investigation.

Bags _____
 Leaves _____

- (c) Why was it necessary to wait for one month before collecting any results?

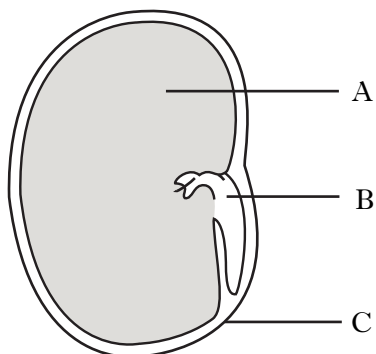
- (d) Explain why it is important that leaves and other dead material decompose.

	KU	PS
(a)		
(b)		
(c)		
(d)		

Marks

KU	PS

4. (a) The diagram shows the internal structure of a broad bean seed.



Which letter indicates the food store of the seed?

1

(b) From the list below, underline **two** factors needed for all seeds to germinate.

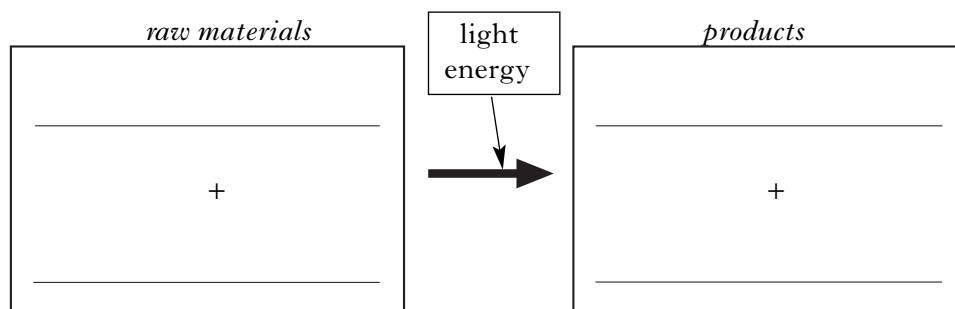
List water carbon dioxide light oxygen

1

Marks

KU	PS
2	
1	
1	
1	

5. (a) Complete the word equation for photosynthesis.



- (b) One of the products of photosynthesis may be converted into a storage carbohydrate in the plant. Name this storage carbohydrate.

- (c) Plants exchange gases with the air during photosynthesis.

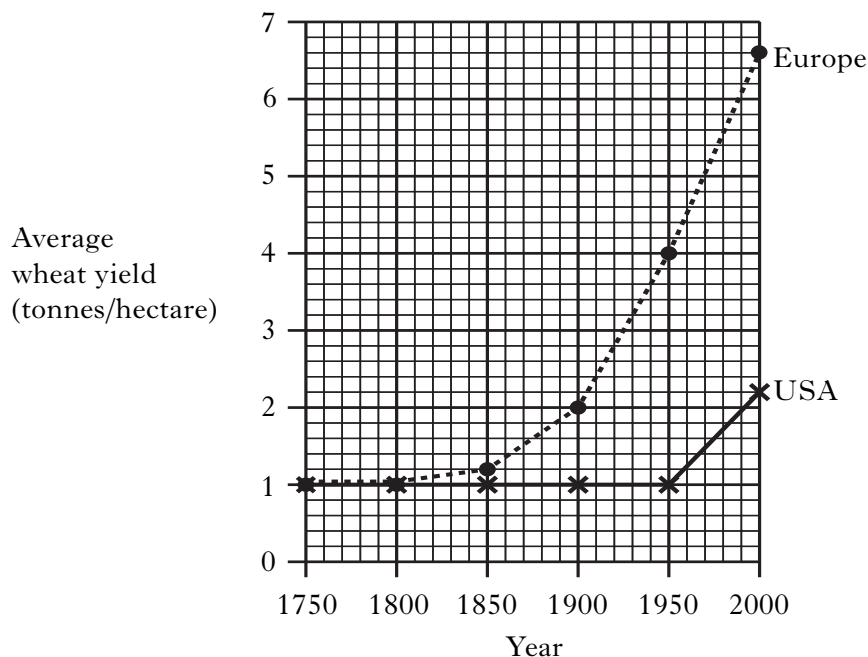
Name the openings which allow gases to pass into and out of the leaf.

- (d) What substance in green leaves absorbs the light energy for photosynthesis?

[Turn over

Marks

6. The graph shows the average wheat yields in the USA and in Europe from 1750 to 2000.



- (a) Describe the pattern of average wheat yield for the USA from 1750 to 2000.

- (b) During which 50 year period was there the greatest increase in average wheat yield in Europe?

from _____ to _____

- (c) Calculate the simple whole number ratio of average wheat yield in Europe to that in the USA in 2000.

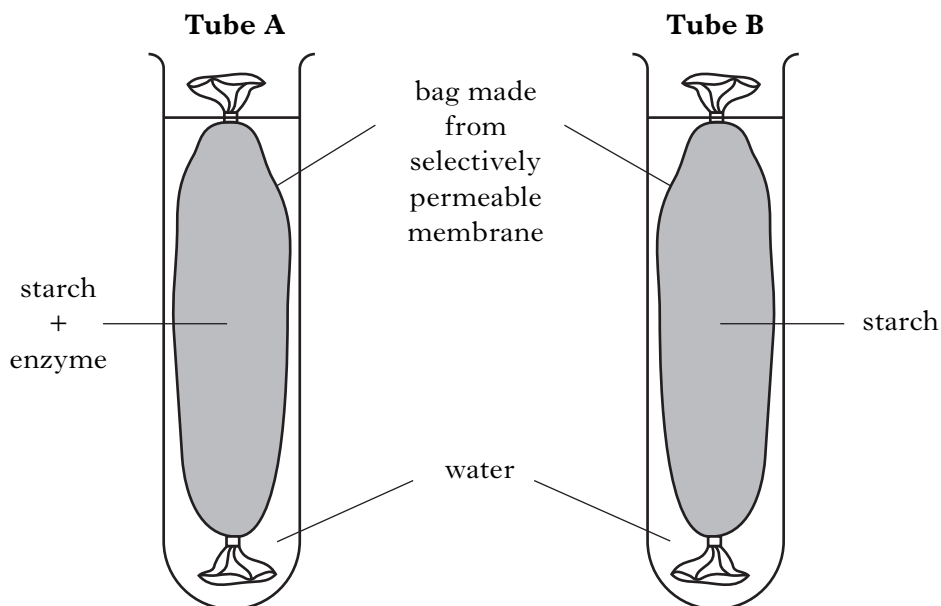
Space for calculation.

_____ : _____
Europe : USA

	KU	PS
2		
1		
1		

Marks

7. An investigation into the effect of a digestive enzyme on starch was set up as shown below.



The water from the two tubes was tested for the presence of starch and sugar at the start of the investigation. All the results were negative.

After 20 minutes the water from Tube A gave a positive result for sugar. The other results were negative.

The same results were obtained after 40 minutes.

- (a) Complete the following table of results for the investigation.

Time (minutes)	Water in Tube A		Water in Tube B	
	sugar	starch	sugar	starch
0	absent			
	present			

- (b) (i) Explain why sugar was present in the water in Tube A.

- (ii) By referring to the size of starch and sugar molecules explain why sugar was found in the water of Tube A.

2

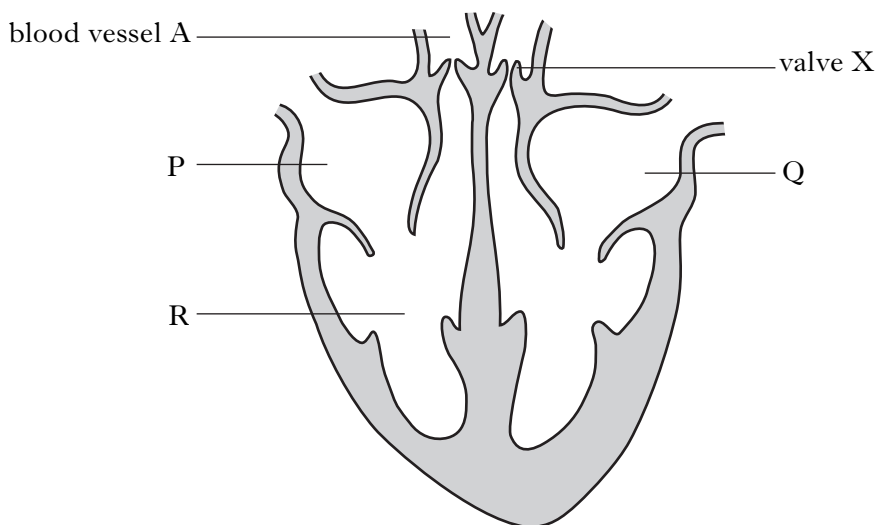
1

1

Marks

	KU	PS

8. (a) The diagram shows a section through the heart of a mammal.



(i) Identify chambers P, Q and R.

P _____

Q _____

R _____

(ii) State the function of valve X and name the blood vessel in which it is found.

Function _____

Blood vessel _____

(iii) Which one of the following statements is correct for blood vessel A?

Tick (✓) the correct box

It is a vein carrying blood to the lungs

It is an artery carrying blood to the lungs

It is a vein carrying blood to the body

It is an artery carrying blood to the body

1

<i>Marks</i>	KU	PS
1		
1		
1		

8. (continued)

(b) Blood is made of a liquid called plasma which contains red and white cells.

(i) What is the main function of the red blood cells?

(ii) State **one** function of plasma.

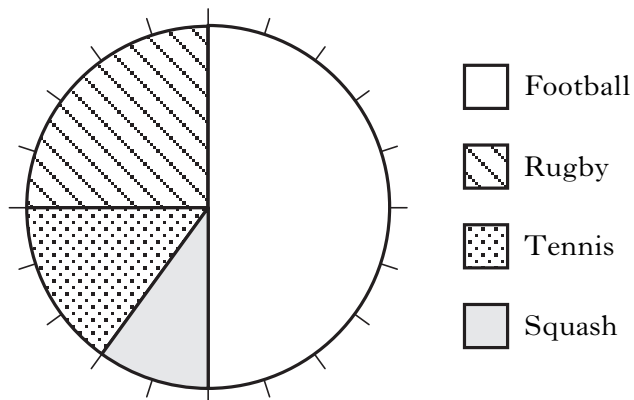
(c) Name the blood vessel that carries oxygen to the heart muscle.

[Turn over

Marks

KU	PS
1	
1	
1	

9. The pie chart shows the proportions of injuries resulting from different sports recorded at a sports injury clinic.



- (a) Which **one** of the following statements is correct?

Tick (✓) the correct box

- More people were injured playing squash than tennis
 More people were injured playing rugby than football
 Fewer people were injured playing squash than rugby
 Fewer people were injured playing football than tennis

- (b) Which sport resulted in 15% of the total injuries?

- (c) The number of injuries from playing squash was 32.

How many injuries resulted from playing rugby?

Space for calculation.

Marks

KU	PS

10. (a) Water regulation involves a balance of gains and losses.

Give **one** method of water gain and **one** method of water loss in a mammal.

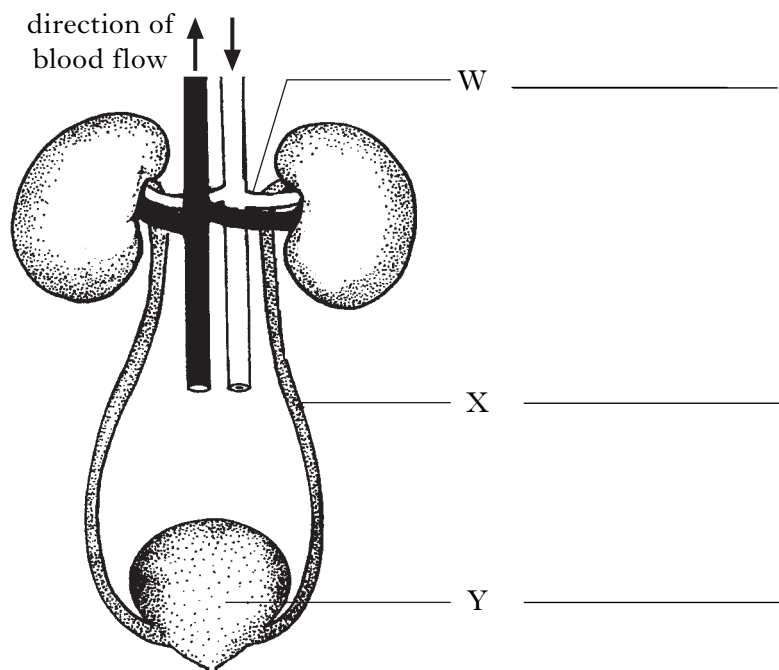
Water gain _____

Water loss _____

1

(b) The diagram shows the urinary system of a human.

Name structures W, X and Y on the diagram.



2

(c) Underline one alternative in each bracket to make the sentence correct.

Kidneys produce urine by $\left\{ \begin{array}{l} \text{filtration} \\ \text{absorption} \end{array} \right\}$ of blood and the $\left\{ \begin{array}{l} \text{osmosis} \\ \text{reabsorption} \end{array} \right\}$

of useful substances such as $\left\{ \begin{array}{l} \text{glucose} \\ \text{oxygen} \end{array} \right\}$.

2

(d) Other than water and salt, name a waste product that is removed from the body in the urine.

1

[Turn over

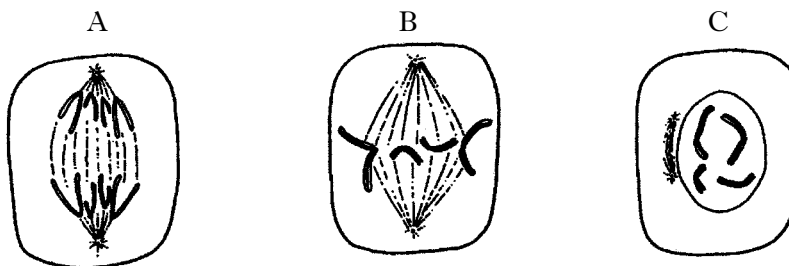
Marks

11. (a) Complete the table by entering the correct word for each description.

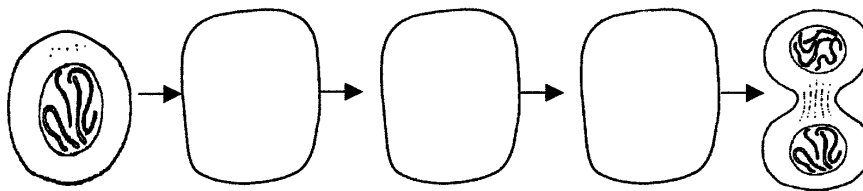
<i>Description</i>	<i>Word</i>
A substance used to make cell structures show up more clearly under a microscope.	
The movement of a substance from a high concentration to a lower concentration.	
Any substance which speeds up a reaction and is unchanged after the reaction.	
The structure which controls the movement of a substance into or out of a cell.	

3

(b) Diagrams A, B and C represent stages of cell division.



(i) Add the letters A, B and C to the empty cells below to show the correct order in which they occur.



1

(ii) What name is given to this process?

1

Marks

	KU	PS
1		
1		
1		
1		

12. Vaccinations are given to protect people from diseases caused by micro-organisms.

The following table gives information about some vaccines.

Vaccine	Time vaccine is effective (years)	Booster vaccine required within effective period	Method of vaccination
Hepatitis A	10	yes	injection
Hepatitis B	5	no	injection
Meningitis	5	no	injection
Polio	10	no	by mouth
Rabies	2	no	injection
Tetanus	10	no	injection
Typhoid	3	no	injection

(a) Which vaccine is effective for the shortest time?

(b) Which vaccine requires a booster to be given within the effective period?

(c) Which vaccine is effective for 10 years, is given by injection and does not require a booster to be given?

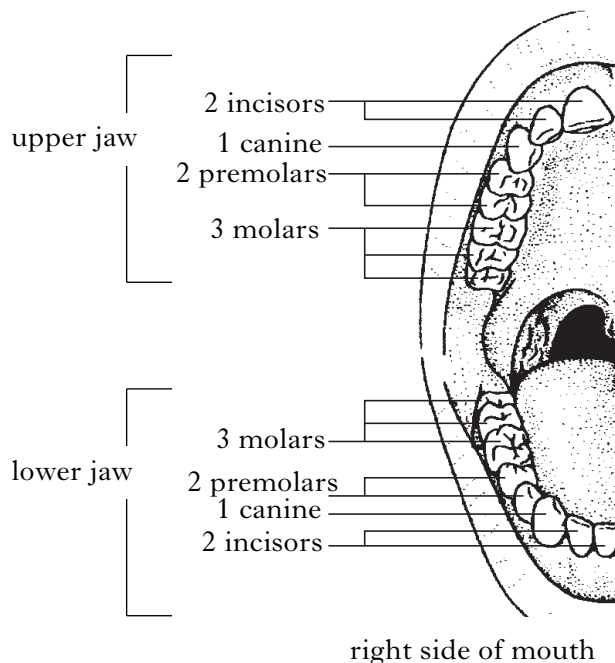
(d) List all the information which can be obtained from the table about the meningitis vaccine.

Marks

KU	PS
----	----

13. The dental formula of an animal describes the number of each type of tooth on the upper and lower jaw of one side of its mouth.

The diagram explains the dental formula for an adult human.



$$\text{Dental formula} = \text{incisors (I)} \frac{2}{2}, \text{ canine (C)} \frac{1}{1}, \text{ premolars (P)} \frac{2}{2}, \text{ molars (M)} \frac{3}{3} = 16$$

$$\text{Total number of teeth} = 16 \times 2 = 32$$

The table below gives the dental formulae for some animals.

<i>Animal</i>	<i>Dental formula</i>				<i>Total number of teeth</i>
Dog	I $\frac{3}{3}$	C $\frac{1}{1}$	P $\frac{4}{4}$	M $\frac{2}{3}$	42
Sheep	I $\frac{0}{3}$	C $\frac{0}{1}$	P $\frac{3}{3}$	M $\frac{3}{3}$	32
Rabbit	I $\frac{2}{1}$	C $\frac{0}{0}$	P $\frac{3}{2}$	M $\frac{3}{3}$	

- (a) (i) Complete the table to show the total number of teeth for a rabbit. **1**

- (ii) Which animal in the table has only 2 canine teeth?

1

<i>Marks</i>	KU	PS
--------------	----	----

13. (continued)

- (b) A puppy has a total of 12 incisor, 4 canine, 12 premolar and 0 molar teeth evenly distributed between the upper and lower jaws.

Complete the following dental formula for a puppy.

I — C — P — M —

1

[Turn over

Marks	KU	PS
1		
1		
1		
2		

14. Read the following passage and answer the questions based on it.

The term “raptor” refers to birds of prey. This group includes diurnal types (such as hawks, eagles, falcons and vultures) which feed in daylight. It also includes nocturnal types (such as owls) which feed mostly at night.

With the exception of the vultures, which feed on the leftovers other hunters leave behind, all of the raptors use their feet to catch and kill their prey. Many falcons have an elongated middle toe which they wrap around the prey while still in flight. Hawks’ feet have a ratchet-like mechanism to aid capturing and holding their prey without too much exertion. Once the toes and talons have tightened around the prey, they remain locked in place without further effort.

Raptors are completely carnivorous, obtaining all of their required nutrients from their prey. The nutrients which normally come from vegetable matter are often found in the stomachs of their prey. A lot of the water required for survival is also extracted from the prey. Raptors devour the prey entirely, regurgitating the indigestible matter in pellet form once or twice a day.

All of the raptors have hook-tipped beaks which are used for ripping the dead prey. Falcons have a notch on each side of the upper beak forming a tooth-like projection, while some hawks have a more prominent hooked tip to the beak, probably for a similar reason. Vultures have developed a much larger, stronger beak for tearing the hides of dead animals and cracking their bones.

(a) Describe the main difference, mentioned in the passage, between hawks and owls.

(b) Describe the feeding habits of vultures which make them different from other raptors.

(c) Explain how raptors can obtain vitamins and minerals found only in plants, even though they are entirely carnivorous.

(d) Describe **two** differences mentioned in the passage between falcons and hawks.

1 Falcons _____

Hawks _____

2 Falcons _____

Hawks _____

Marks

KU	PS
----	----

15. (a) The table contains information about an experimental cross involving coat colour of mice. The original parents were both true breeding.

	<i>Symbol</i>	<i>Phenotypes</i>
<i>Parents</i>		brown × white
<i>First generation of offspring</i>		
<i>Second generation of offspring</i>		75% brown 25% white

Complete the table to show:

- (i) the symbols used for each generation;
- (ii) the coat colour(s) of the first generation of offspring.
- (b) Decide if each of the following statements is **True** or **False** and tick (✓) the appropriate box.
- If the statement is **False**, write the correct word in the **Correction** box to replace the word underlined in the statement.

<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
Information about the forms of a gene in an individual is called the <u>genotype</u> .			
In the nucleus of a cell each gene is part of a <u>characteristic</u> .			
Cells which carry only one form of a gene to the offspring are called <u>embryos</u> .			

[Turn over

Marks

	KU	PS
1		
1		
1		
2		

16. (a) An investigation of the effect of pH on the enzyme trypsin was carried out. Trypsin solution was added to cloudy suspensions of protein at different pH values.

The suspension became clear as the protein was digested.

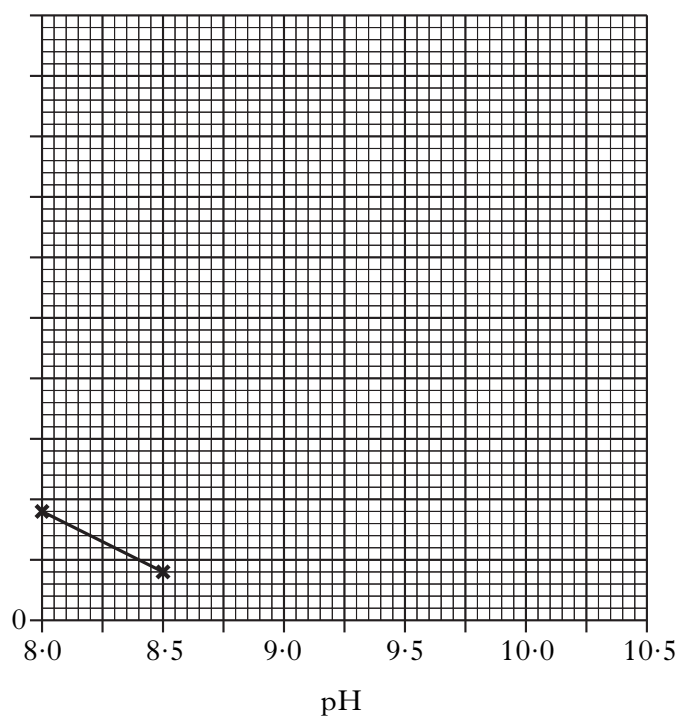
The time taken for the suspension to become clear at each pH value is shown in the table.

pH	8.0	8.5	9.0	9.5	10.0	10.5
Time to clear (minutes)	9	4	7	15	30	50

(i) Use the results from the table to complete the line graph by:

- 1 labelling the vertical axis;
- 2 adding a scale for the vertical axis;
- 3 completing the graph.

(Additional graph paper, if required, will be found on page 27.)



(ii) Describe the effect of increasing the pH on the time for the suspension to clear.

2

<i>Marks</i>	KU	PS
1		
1		
1		

16. (continued)

(b) Complete the following sentences by underlining the correct option in each bracket.

Pepsin works best at pH $\left\{ \begin{array}{l} 3 \\ 7 \\ 11 \end{array} \right\}$ which is $\left\{ \begin{array}{l} \text{acidic} \\ \text{neutral} \\ \text{alkaline} \end{array} \right\}$.

Catalase works best at pH $\left\{ \begin{array}{l} 3 \\ 7 \\ 11 \end{array} \right\}$ which is $\left\{ \begin{array}{l} \text{acidic} \\ \text{neutral} \\ \text{alkaline} \end{array} \right\}$.

(c) Name the substance from which all enzymes are made.

[Turn over

Marks

KU	PS
----	----

17. (a) What is meant by the term “antibiotic”?

1

(b) The table shows the results of treating an infection in cows with various antibiotics.

<i>Antibiotic treatment</i>	<i>Number of cows treated</i>	<i>Number of cows cured</i>	<i>Percentage of cows cured</i>
no antibiotic	2011	1450	72
Amoxicillin	56	48	86
Cephapirin	18	16	89
Cloxacillin	33	25	76
Erythromycin	8	6	75
Penicillin	25	17	68

(i) Why is it better to use the percentages of cows cured rather than the actual numbers cured when drawing conclusions from the results?

1

(ii) The researchers stated that the results for erythromycin were not reliable. Why is this so?

1

(iii) Which antibiotic was the most successful treatment for this infection?

1

(iv) What conclusion can be drawn by comparing the results of the treatment with penicillin to the control group?

1

Marks

KU	PS

17. (b) (continued)

(v) Use the information in the table to complete the bar chart to show the percentage of cows cured by:

1 labelling the vertical axis;

1

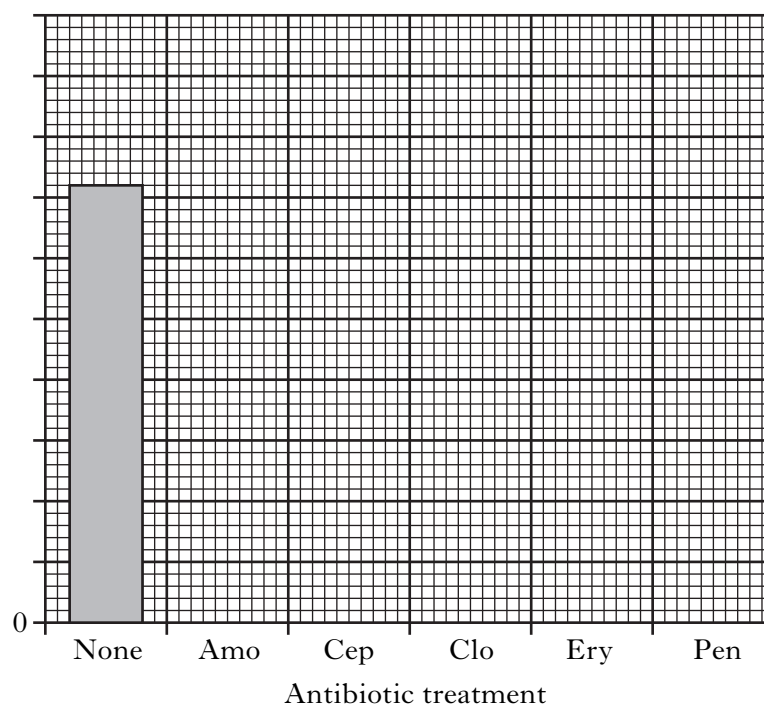
2 adding a scale to the vertical axis;

1

3 completing the bars.

1

(Additional graph paper, if required, will be found on page 27.)



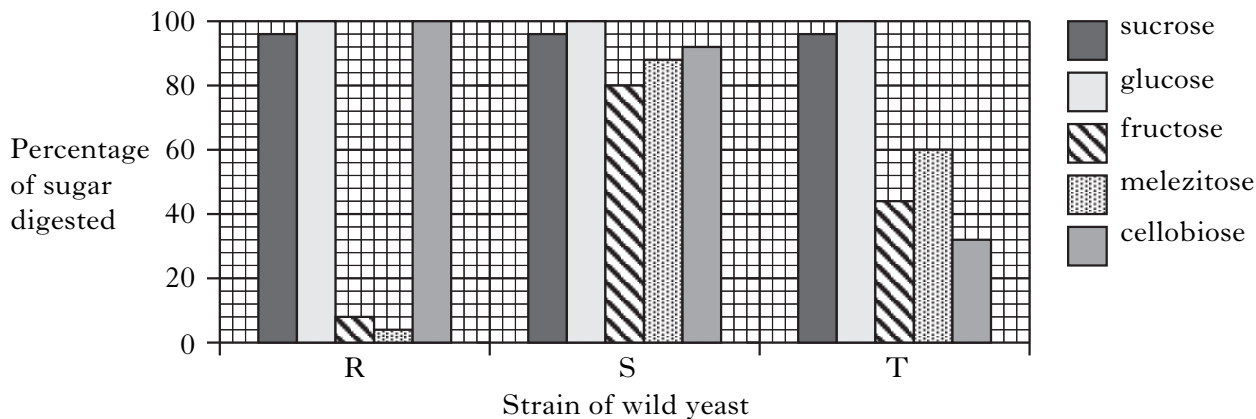
[Turn over

Marks

	KU	PS

18. (a) When greenfly feed on cotton plants, they release a sticky mixture of sugars onto the leaves. This causes problems in the cotton industry. Researchers tested three wild yeasts to find a strain which could digest and remove the sugars without harming the cotton plants.

The results are shown on the chart below.



- (i) Which sugar was completely digested by all the strains of yeast?

1

- (ii) By comparing the results of all three strains of yeast, which sugar was the least well digested?

1

- (iii) Which strain of yeast would be the most useful in solving the problem caused by the greenfly?

Give a reason for your answer.

Strain _____

Reason _____

1

- (b) (i) What type of micro-organism is yeast?

1

- (ii) Yeast is important in making bread and beer through the process of fermentation.

State why yeast is required in each case.

Bread _____

Beer _____

2

<i>Marks</i>	KU	PS
1		
1		
1		

18. (continued)

- (c) (i) Name the type of micro-organism used in the manufacture of yoghurt from milk.

- (ii) Explain why containers are sterilised before being used for making yoghurt.

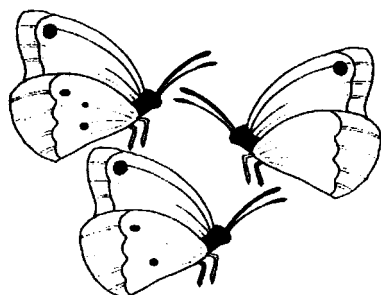
- (d) Micro-organisms carry out fermentation of the sugars in milk. What effect does this have on the milk?

[Turn over

Marks

KU	PS
----	----

19. The meadow brown butterfly shows variation in wing pattern. There are different numbers of black spots on the underside of the hind wings.



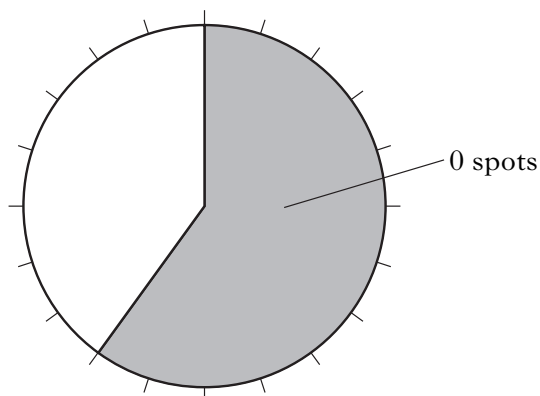
The table shows the number of wing spots in a Scottish population of the butterflies.

<i>Number of spots on hind wing</i>	0	1	2	3
<i>Percentage of population</i>	60	20	15	5

- (a) (i) Is the variation in the number of spots on the hind wing continuous or discontinuous?

1

- (ii) Use the table to complete the pie chart below.
(An additional chart, if required, will be found on page 28.)



2

- (b) It has been suggested that the variation in meadow brown butterflies could mean that they come from different species.

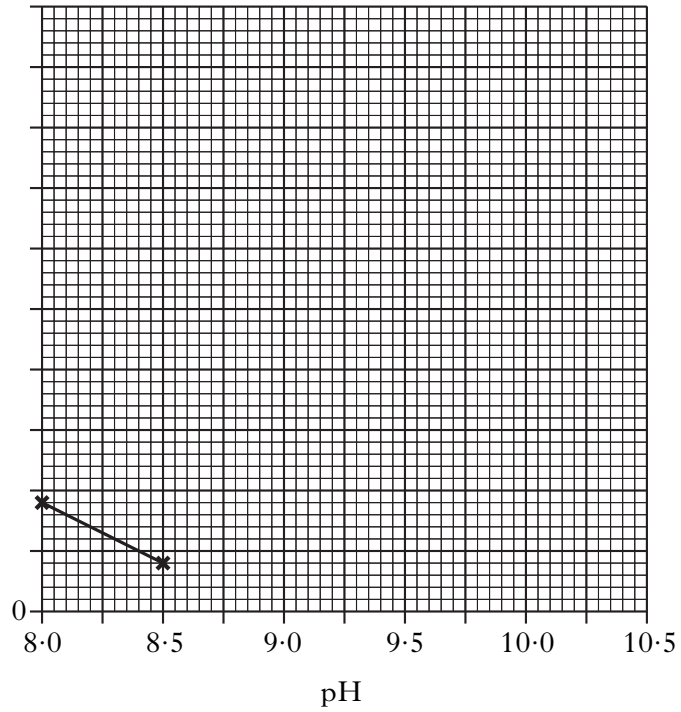
What evidence would be required to show that these butterflies all belong to the same species?

1

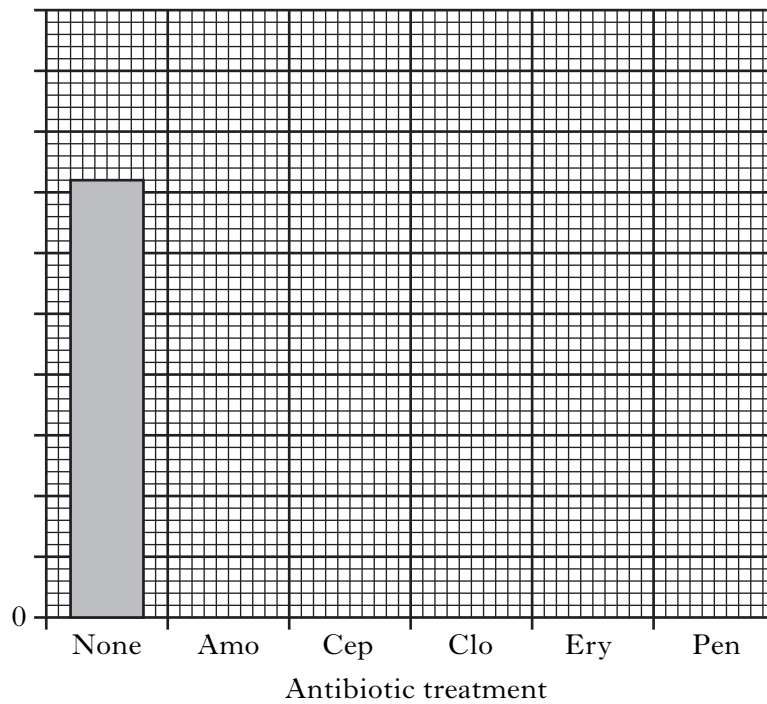
[END OF QUESTION PAPER]

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL GRAPH PAPER FOR QUESTION 16(a)(i)

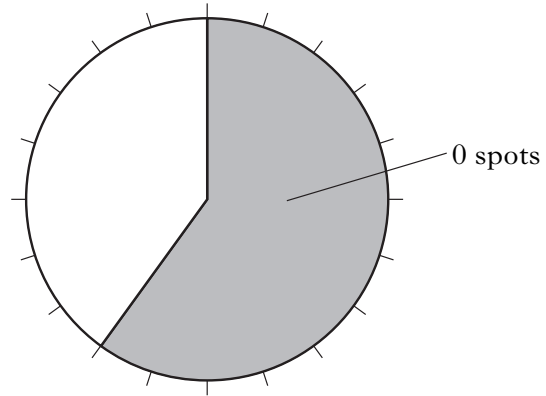


ADDITIONAL GRAPH PAPER FOR QUESTION 17(b)(v)



SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL CHART FOR QUESTION 19(a)(ii)



SPACE FOR ANSWERS
AND FOR ROUGH WORKING

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

[BLANK PAGE]

[BLANK PAGE]