

FOR OFFICIAL USE

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KU PS

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Total Marks

0300/29/01

NATIONAL
QUALIFICATIONS
2012

WEDNESDAY, 23 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

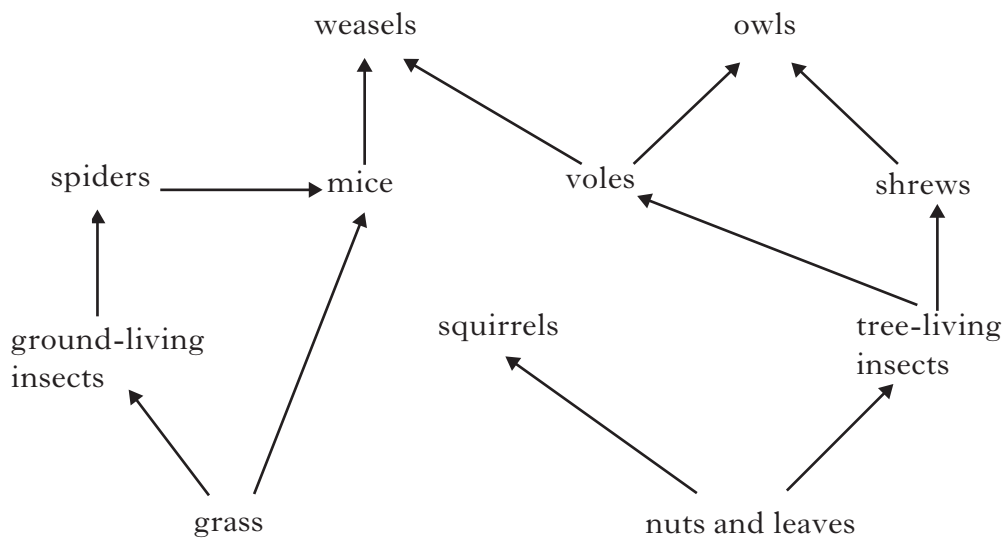
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Number of seat

- 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.



1. The diagram below shows the feeding relationships between some organisms in a woodland ecosystem.



- (a) What name is given to this type of diagram?

1

- (b) The arrows in the diagram show the direction of energy flow in the ecosystem.

- (i) Grass is a producer.

What form of energy do producers use to make food?

1

- (ii) Name the process by which producers make food.

1

- (c) (i) Using information from the diagram, name **three** organisms which are **not** eaten by other animals.

1

- (ii) Omnivores eat both plants and animals.

Name the omnivore shown in the diagram.

1

- (d) State what is meant by the term *consumer*.

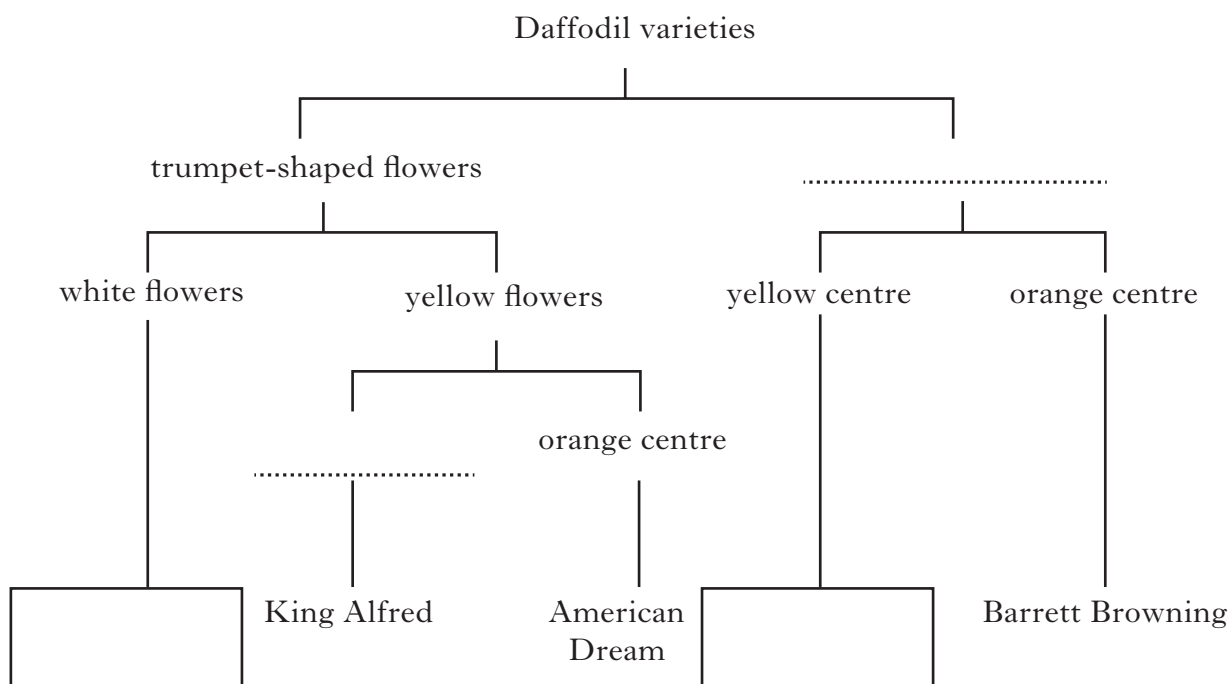
1

2. Some features of five varieties of daffodils are shown in the table below.

Marks

<i>Variety</i>	<i>Flower shape</i>	<i>Flower colour</i>	<i>Centre colour</i>
American Dream	trumpet	yellow	orange
Mount Hood	trumpet	white	white
Ice Follies	cup	white	yellow
King Alfred	trumpet	yellow	yellow
Barrett Browning	cup	white	orange

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



2

(b) Give **three** features of the American Dream daffodils.

1

(c) Describe **one** difference between Ice Follies and Barrett Browning daffodils.

1

Marks

3. (a) The two lists below contain main sources of pollution and examples of pollutants. Draw a straight line from each source of pollution to its correct example.

<i>Main source of pollution</i>	<i>Example of pollutant</i>
Domestic	Sulphur dioxide
Industry	Fertiliser run-off
Agricultural	Household waste

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1	
1	
1	

- (b) Untreated sewage was released by accident into a river.

- (i) Explain why the release of sewage into the river caused an increase in the number of micro-organisms present.

- (ii) State the effect of the increased numbers of micro-organisms on the oxygen available to other organisms.

Tick (✓) the correct box.

Increase

Decrease

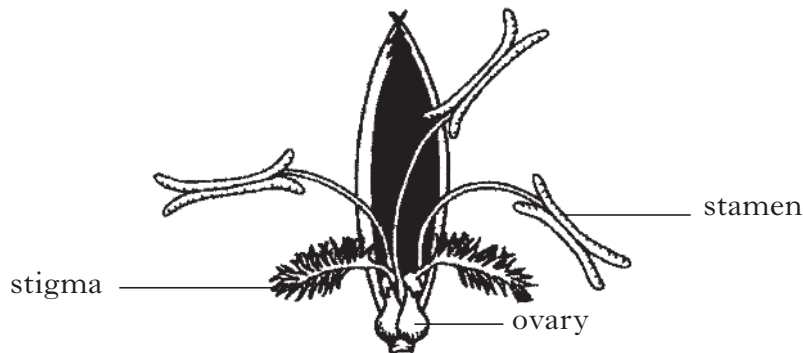
Stay the same

- (iii) Name a disease which may be spread by untreated sewage.

Marks

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1		
1		
1		

4. The diagram below represents a wind-pollinated flower.



(a) Use names from the diagram to identify the parts of the flower described below.

(i) Produces pollen _____

(ii) Produces female sex cells _____

1

(b) Name the **other** most common method of pollination from one flower to another.

1

(c) (i) Name the part of a flower which develops into a seed.

1

(ii) What process must take place in the ovary before the seeds and fruit can develop?

1

[Turn over

Marks

5. The moisture content of soil can be measured using a meter of the type shown below. The scale goes from 1 (driest) to 10 (wettest).

The following table gives information about watering some different plant species.



<i>Plant species</i>	<i>Ideal moisture reading</i>	<i>How often soil moisture should be checked</i>
African violet	3	**
Azalea	8	***
Begonia	7	***
Fuchsia	7	***
Orchid	1	**
Poinsettia	1	*
Rubber plant	4	*

* once a week ** every 4/5 days *** every 3 days

- (a) How often should the soil moisture of a Begonia be checked?

1

- (b) Which of the plant species needs the most water?

1

- (c) The table below gives actual moisture readings for two plants.

Compare these readings with the ideal moisture readings and decide if each plant needs watered.

Complete the table.

<i>Plant species</i>	<i>Actual moisture reading</i>	<i>Does the plant need watered?</i>
Poinsettia	3	
Orchid	1	

1

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5. (continued)

Marks

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(d) Each of the plants belongs to a particular species.

Which of the following describes what is meant by the term *species*?

Tick (✓) the correct box.

A species is a group of organisms which

contain identical genetic material

have the same phenotype

share the same habitat

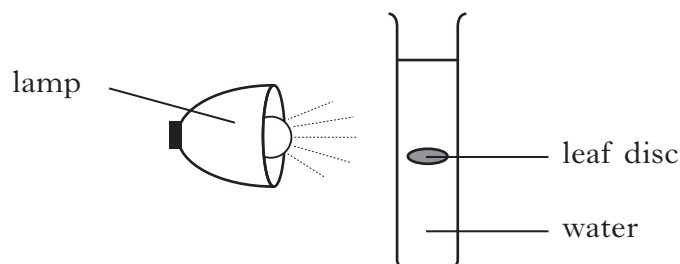
breed together to produce fertile offspring.

1

[Turn over

Marks

6. (a) An investigation into photosynthesis was carried out using the apparatus shown in the diagram below.



After the lamp was switched on, the leaf disc floated to the surface because oxygen gas was produced in the leaf. The time taken for this to happen was measured.

The experiment was repeated six times and the results are shown in the table below.

<i>Experiment</i>	1	2	3	4	5	6
<i>Time for disc to reach surface (seconds)</i>	18	17	12	15	12	16

- (i) Calculate the average time for the leaf discs to reach the surface.

Space for calculation

_____ seconds

- (ii) 1 State **one** feature of the leaf disc which must be kept the same for each experiment.

- 2 State **one** other feature, not relating to the leaf disc, which must be kept the same for each experiment.

- (iii) Describe how this method could be used to investigate the effect of light intensity on the rate of photosynthesis.

1

1

1

2

6. (continued)

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- (b) Name the green coloured chemical, present in plants, which is needed for photosynthesis.

1

- (c) Decide whether each of the following statements is **TRUE** or **FALSE**.

If the statement is **TRUE**, tick (✓) the **True** box. If the statement is **FALSE**, tick the **False** box and write the correct word or phrase in the **Correction** box to replace the word or phrase underlined in the statement.

<i>Statement</i>	<i>True</i>	<i>False</i>	<i>Correction</i>
Repeating an investigation several times improves the <u>reliability</u> of the results.			
To calculate <u>a percentage</u> , add up all the values and divide the total by the number of values.			
A control experiment is set up to prove that the result is caused by changing <u>two</u> of the possible variables.			

3

[Turn over

Marks

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7. (a) Complete the following sentences about food and digestion by underlining the correct option in each bracket.

Food provides animals with energy for processes such as $\left. \begin{array}{l} \text{diffusion} \\ \text{cell division} \end{array} \right\}$.

During digestion, $\left. \begin{array}{l} \text{large} \\ \text{small} \end{array} \right\}$ particles of food are $\left. \begin{array}{l} \text{built up} \\ \text{broken down} \end{array} \right\}$

to allow them to be absorbed into the bloodstream.

2

(b) The list below contains names of parts of the digestive system.

stomach *small intestine* *rectum*
large intestine *oesophagus* *pancreas*

Use names from the list to answer the following questions.

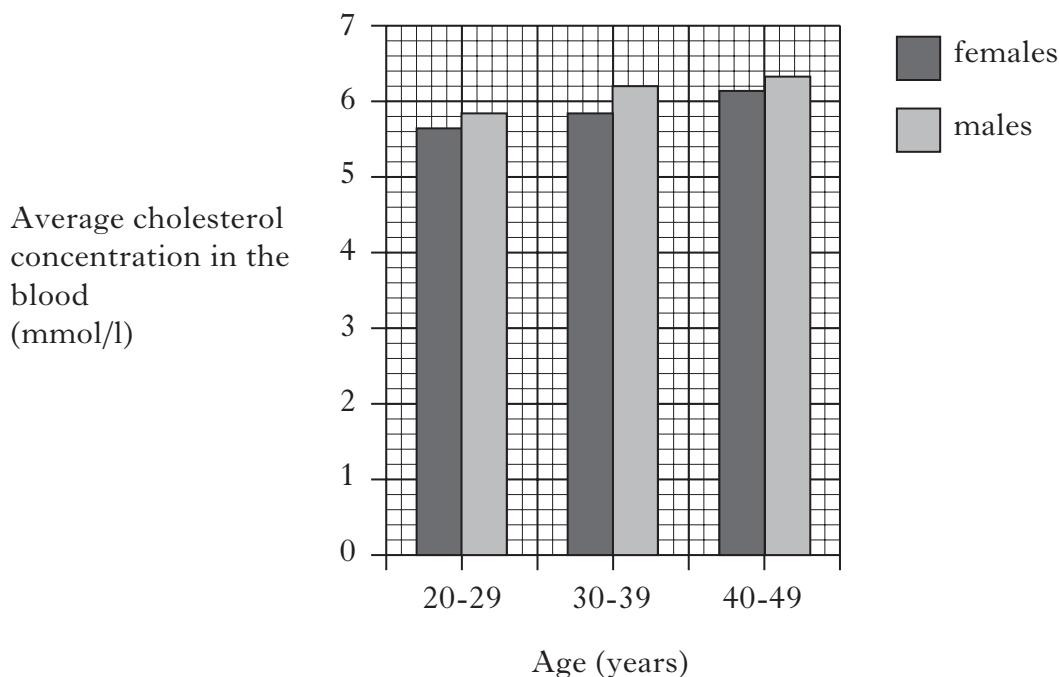
(i) Where are products of digestion absorbed into the bloodstream?

1

(ii) Where is water absorbed into the bloodstream from waste material?

1

(c) The following chart gives information about cholesterol in the blood.



7. (c) (continued)

Marks

- (i) What happens to the average cholesterol concentration in the blood as age increases?

- (ii) What conclusion can be drawn about average cholesterol concentration in males compared to females?

- (iii) Predict the average cholesterol concentration of females aged 50–59 years if males of that age had an average concentration of 6.8 mmol/l.
_____ mmol/l

1

1

1

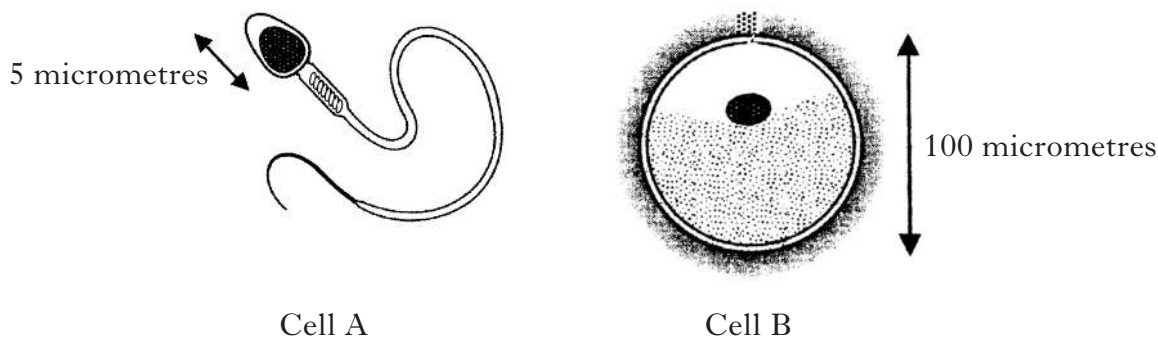
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8. (a) The following diagrams represent human sex cells.



(i) Name cells A and B.

Cell A _____ Cell B _____

1

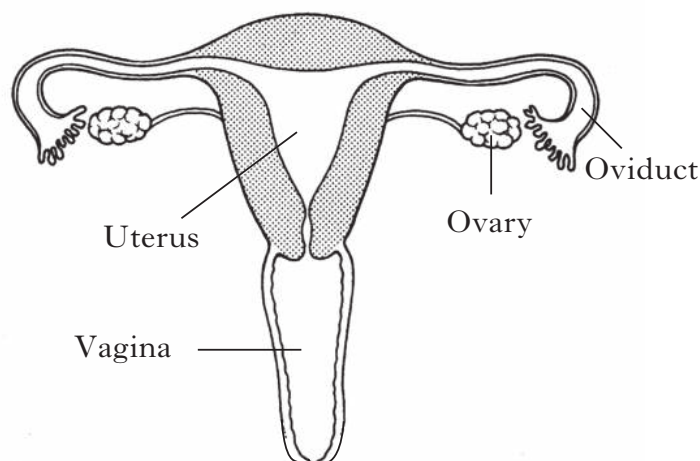
(ii) Give **one** feature of cell A which makes it different from cell B.

1

(iii) Name the organ which produces cell A.

1

(b) The diagram below represents the female reproductive system.



In which of the named structures would the following take place?

(i) Fertilisation

1

(ii) Development of a fetus

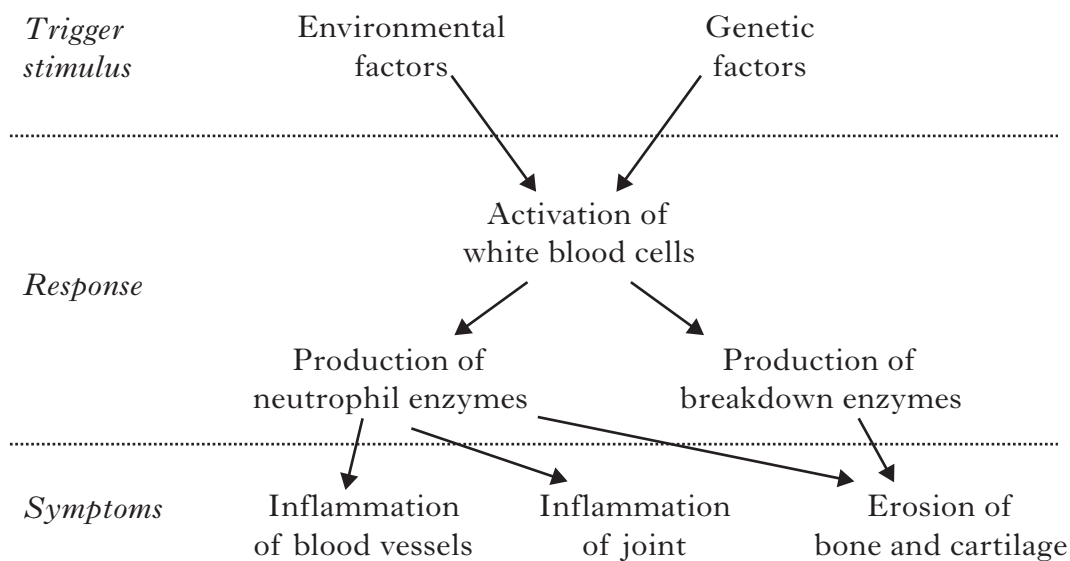
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9. Rheumatoid arthritis is a disease which damages joints in the body.

The flow diagram shows a sequence of events leading to the development of rheumatoid arthritis.



(a) What **two** factors trigger the development of rheumatoid arthritis?

1 _____ 2 _____

1

(b) State **all** the symptoms of rheumatoid arthritis caused by the action of neutrophil enzymes.

2

(c) In what **two** ways do white blood cells contribute to the erosion of bone and cartilage?

1

[Turn over

Marks		KU	PS
2			
1			
1			

10. Read the following passage and use the information to answer the questions.

Twins

Multiple births have been on the rise with increasing numbers of twins being born. There are several reasons for this, including the growing use of fertility drugs and the fact that more older women are having babies. Between 1996 and 2006 there was a 182% increase in multiple births in women aged 35 and over. About 1.25% of births from natural conception results in twins, but this increases to 25% if fertility drugs are used.

Twins can be identical or non-identical. An ultrasound scan can help to determine which is the case. If the babies develop together in a single sac with no separating membrane, or share one placenta, they are likely to be identical. Identical twins will always be the same sex because they carry the same genetic information. However, the only sure way to tell if twins are identical is to have a DNA test.

The chance of having identical twins is about 1 in 250 births. The chance of having non-identical twins varies according to whether there is a history of non-identical twins in the mother's family. If there is, she is more likely to have them. About 33% of all twins born are identical. They are formed when one egg is fertilised by one sperm and then the zygote divides into two halves which develop separately. Non-identical twins form when two eggs are fertilised by two different sperm.

(a) Give **two** reasons for the increase in the number of twins being born.

1 _____

2 _____

2

(b) Give **two** pieces of evidence from an ultrasound scan that would suggest that twins are identical.

1 _____

2 _____

1

(c) What is the only sure way to tell whether or not twins are identical?

1

10. (continued)

Marks

(d) How do identical twins form?

1

(e) What percentage of all twins are **non-identical**?

1

(f) Which parent's family history has more influence on the chance of having non-identical twins?

1

[Turn over

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1		
1		

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11. (a) Underline one option in each set of brackets to complete the following sentences correctly.

The basic units of living organisms are $\left\{ \begin{array}{l} \text{tissues} \\ \text{cells} \\ \text{organs} \end{array} \right\}$. Most of them can

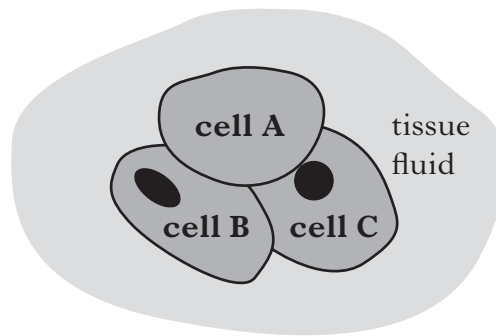
only be seen using a microscope. When examining them they can be

stained with, for example, iodine to $\left\{ \begin{array}{l} \text{make them divide} \\ \text{make them clearer} \\ \text{magnify them} \end{array} \right\}$.

2

- (b) Dissolved substances move from areas of high concentration to areas of lower concentration by the process of diffusion.

The following diagram represents three cells surrounded by tissue fluid.



The table below shows the relative concentrations of glucose, oxygen and carbon dioxide in the cells and tissue fluid.

	<i>Relative concentrations of substance</i>		
	<i>glucose</i>	<i>oxygen</i>	<i>carbon dioxide</i>
Cell A	medium	medium	medium
Cell B	high	high	low
Cell C	low	low	high
Tissue fluid	high	high	low

- (i) Which substance would diffuse from cell A to the tissue fluid?

1

11. (b) (continued)

Marks

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1	
1	
	1
	1

(ii) From which of the following would cell A gain oxygen by diffusion?

Tick (✓) the correct boxes.

Cell B Cell C tissue fluid

1

(iii) Into which of the following would glucose diffuse from cell B?

Tick (✓) the correct boxes.

Cell A Cell C tissue fluid

1

(c) Which cell structure controls the movement of substances into and out of cells?

1

(d) What name is given to the special case of diffusion of water into or out of cells?

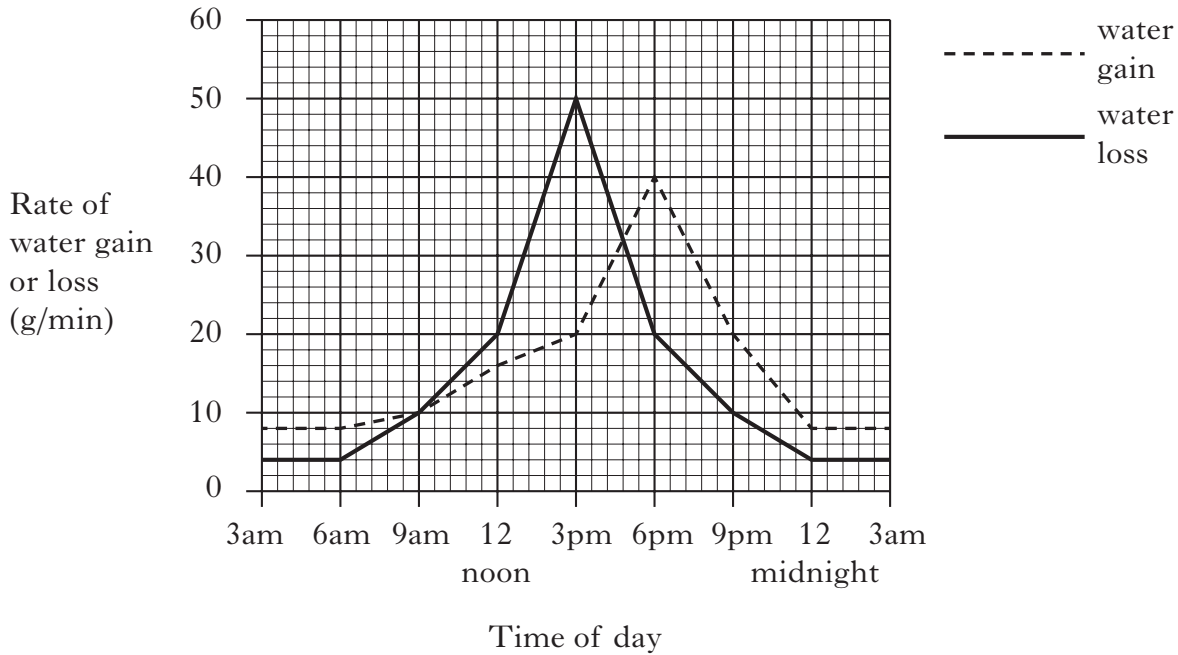
1

[Turn over

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13. (a) The following graph shows the rate of water gain and water loss by a plant during a 24 hour period in summer.



(i) How long after the time of maximum water loss did the plant show its maximum water gain?

Space for calculation

_____ hours

1

(ii) At what time in the morning did the rate of water gain exactly balance the rate of water loss?

1

(b) Plants gain water through their roots and lose it from their leaves.

(i) Name the plant tissue which transports water from the roots to the leaves.

1

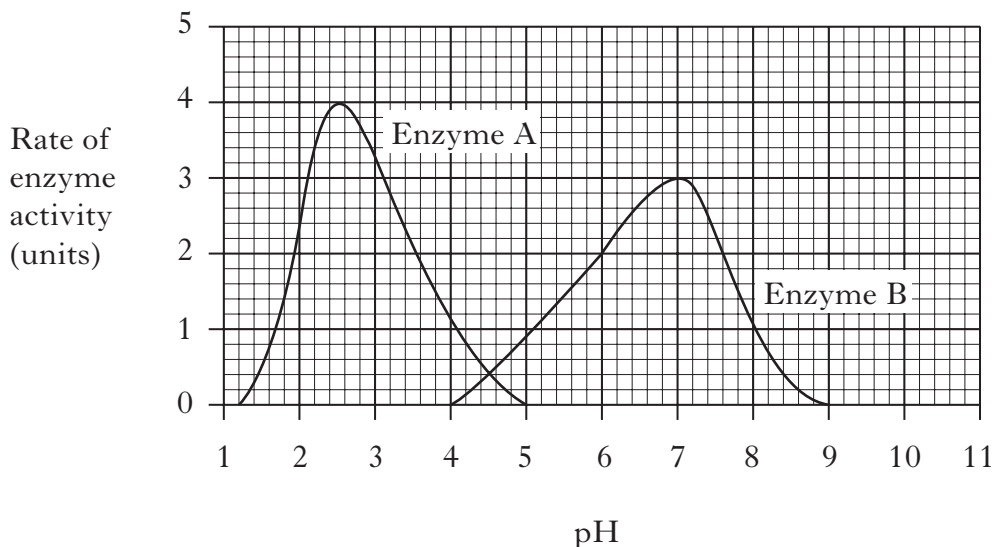
(ii) Name the pores in plant leaves through which water vapour is lost.

1

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1		
1		
1		
1		

14. (a) The following graph shows the relationship between pH and the rate of activity of two different enzymes.



- (i) Identify the enzyme which is likely to be pepsin and give a reason for your answer.

Enzyme _____

Reason _____

1

- (ii) Use information from the graph to answer the following questions.

- 1 Between which pH values are both enzymes active?

Between _____ and _____

1

- 2 How many times greater is the rate of activity of enzyme B at pH 7 than at pH 8?

Space for calculation

_____ times

1

- (b) Name **one** enzyme, other than pepsin, which is involved in the chemical breakdown of a substance.

1

14. (continued)

Marks

- (c) (i) Enzymes are biological catalysts. Describe what is meant by the term *catalyst*.

1

- (ii) Name the type of chemical substance from which enzymes are made.

1

[Turn over

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KU	PS

15. (a) (i) The skeleton is used for the attachment of muscles for support and movement.

Give **one other** function of the skeleton.

1

(ii) One type of joint found in the body is a hinge joint.

How many planes of movement are allowed by a hinge joint?

1

(iii) Give an example of a hinge joint in the body.

1

(b) The following table gives information about tissue damage among athletes.

<i>Tissue</i>	<i>Injuries (%)</i>
skin	8
muscle	33
tendon	5
ligament	50
cartilage	2
bone	2

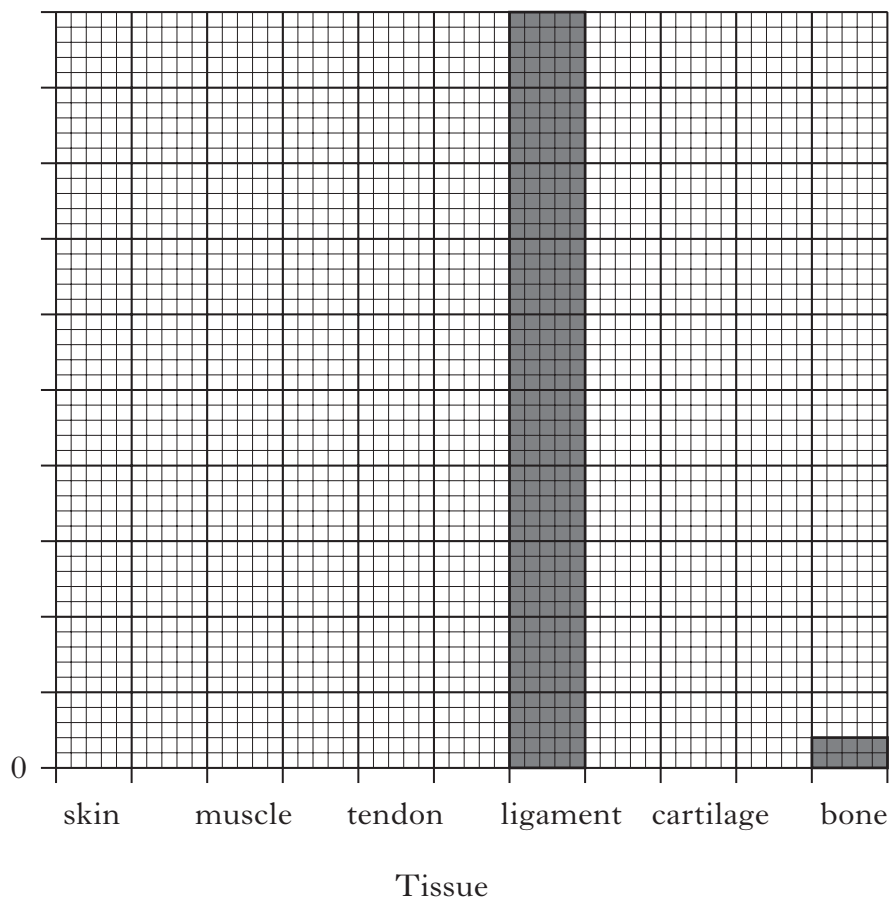
15. (b) (continued)

Marks

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Use the information to complete the bar chart below by:

- (i) labelling the vertical axis;
 - (ii) adding a scale to the vertical axis;
 - (iii) completing the missing bars.
- (An additional grid, if required, will be found on *Page twenty-nine.*)



- (iv) 50% of the injuries were to ligaments.
What is the function of ligaments?

1

[Turn over

Marks

16. (a) Complete the following table to show the three types of blood vessels and their functions.

<i>Blood vessel</i>	<i>Function</i>
vein	
artery	
	allows exchange of materials with tissues

2

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

1

- (c) The concentration of substances found in blood plasma is shown in the table below.

<i>Substance</i>	<i>Concentration</i> (g per 100 ml)
sugars	0.1
salts	0.8
proteins	6.4
fats	0.6
wastes	0.1

- (i) Express the concentration of salts to proteins as a simple whole number ratio.

Space for calculation

_____ : _____
salts proteins

1

- (ii) A man has 3 litres of blood plasma (1 litre = 1000 ml).
Calculate the total mass of proteins present in his blood.

Space for calculation

_____ g

1

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1		
1		
1		

17. (a) (i) Cells contain sets of chromosomes.

State the number of sets present in each of the following cells.

1 Body cells _____

2 Sex cells _____

(ii) What general name is given to the sex cells of animals and plants?

(b) In humans, the sex of a child is determined by a pair of sex chromosomes. A sex chromosome can be either an **X** or a **Y** chromosome.

One sex chromosome is found in each sex cell.

Complete the Punnett square below to show the inheritance of the sex chromosomes.

		Female Sex Cells	
		X	
Male Sex Cells	X	XX	
			XY

(c) A test can be carried out during pregnancy to find out if the baby has a chromosome mutation. A needle is inserted through the wall of the mother's abdomen to collect some of the fluid from around the baby.

(i) What is this test called?

(ii) Name **one** condition which can be detected by this method.

[Turn over

18. (continued)

Marks

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1	

(b) During which period was there the greatest increase in production?
Tick (✓) the correct box.

1998 – 2000

2000 – 2002

2002 – 2004

2004 – 2006

2006 – 2008

(c) What was the percentage increase in production from 1998 to 2004?

Space for calculation

_____ %

[Turn over for Question 19 on Page twenty-eight

Marks

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19. (a) Yeast is a micro-organism which carries out fermentation.

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

Yeast is a $\left\{ \begin{array}{l} \text{single-} \\ \text{multi-} \end{array} \right\}$ celled $\left\{ \begin{array}{l} \text{bacterium} \\ \text{fungus} \end{array} \right\}$.

1

- (ii) Alcohol is a fermentation fuel.

Name **one** other fuel that is produced by fermentation.

1

- (iii) What advantage is there in using fuels produced by fermentation instead of using fossil fuels?

1

- (b) Bacteria can be genetically engineered to produce proteins that are important to humans.

Give **one** example of a protein that can be made in this way and state what it is used for.

Protein _____

1

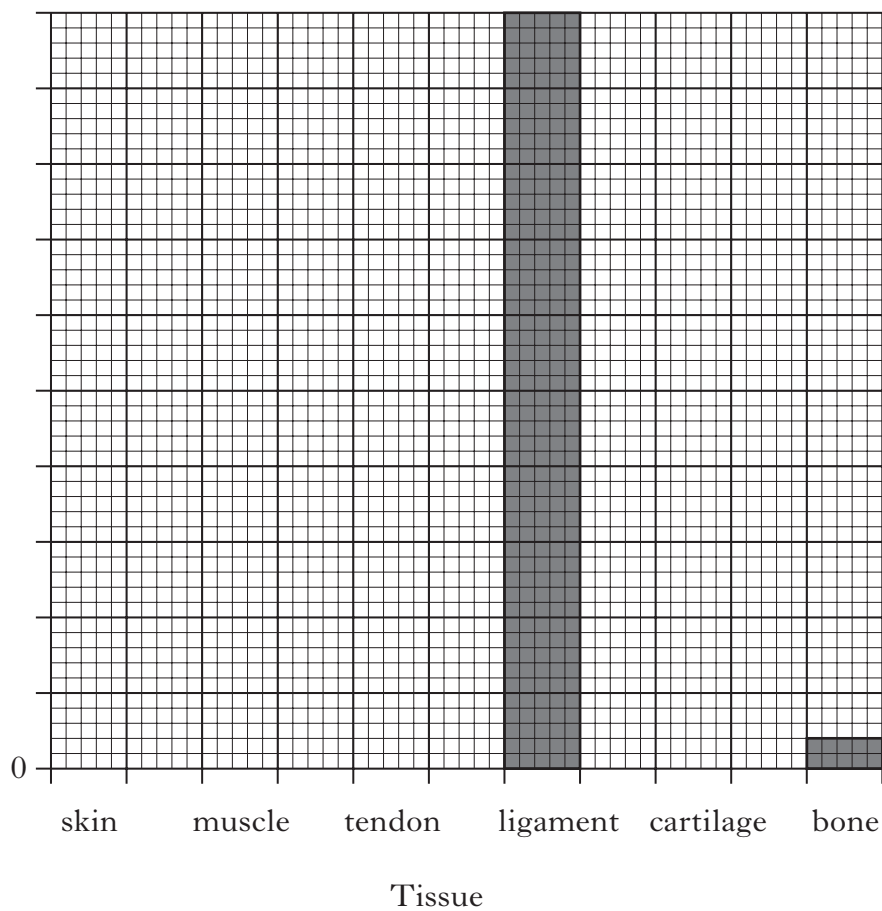
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1

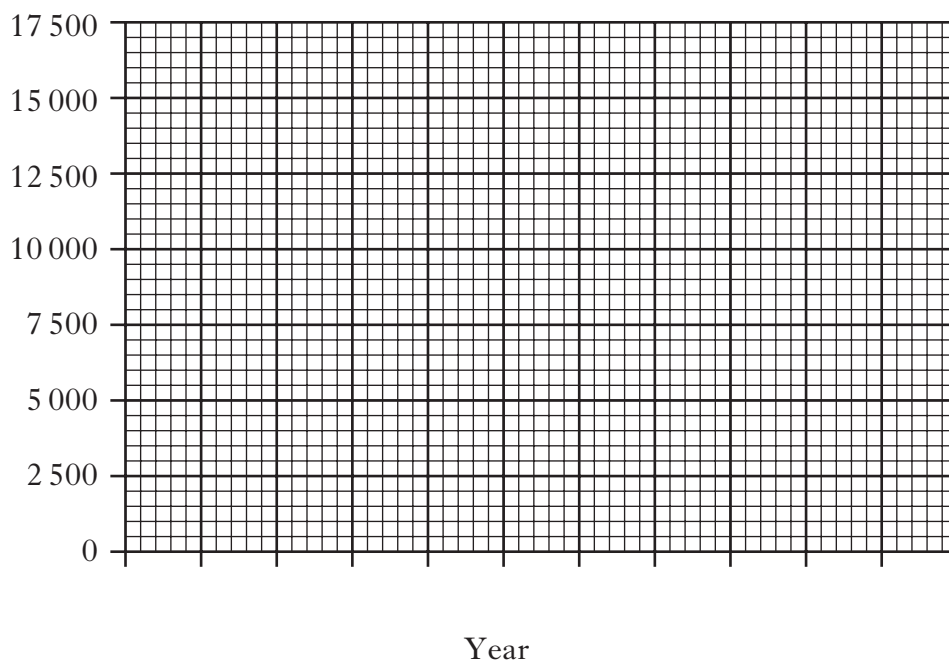
[END OF QUESTION PAPER]

SPACE FOR ANSWERS
AND FOR ROUGH WORKING

ADDITIONAL GRID FOR QUESTION 15(b)



ADDITIONAL GRID FOR QUESTION 18(a)



SPACE FOR ANSWERS
AND FOR ROUGH WORKING

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