Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/11**

Paper 1 Multiple Choice (Core) **May/June 2016**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

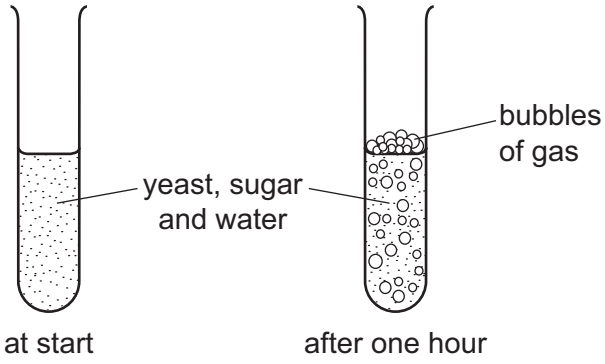
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

1 Some yeast, sugar and water are mixed in a test-tube. The diagrams show the test-tube at the start and after one hour.



Which process causes this change?

A growth

B reproduction

C respiration

D sensitivity

2 Which name is given to a group of individuals that can reproduce to produce fertile offspring?

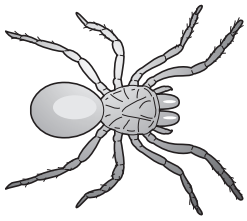
A a genus

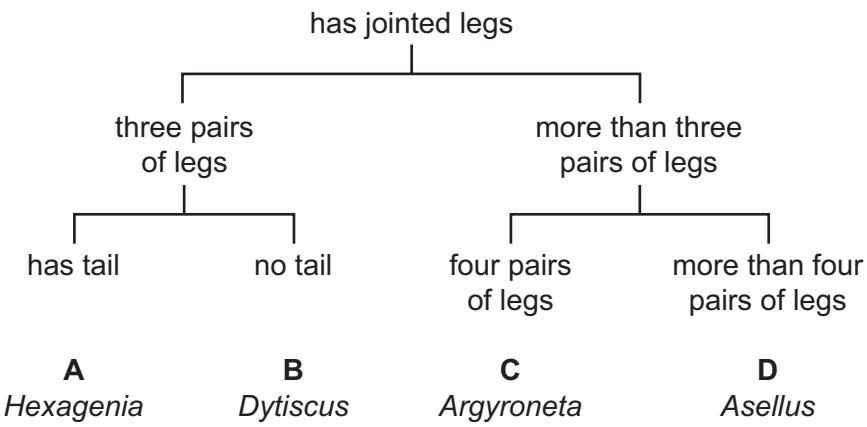
B a kingdom

C a species

D an organ system

3 Use the key to identify the animal shown in the diagram.





4 Which row matches the cell membrane and cell wall of a palisade cell to their functions?

	cell membrane	cell wall
A	active transport	active transport
B	active transport	support
C	support	active transport
D	support	support

5 In a plant, what is formed by a group of xylem vessels?

A a cell

B a tissue

C an organ

D an organ system

6 What are the functions of xylem vessels?

	absorption	conduction	photosynthesis	support
A	✓	✓	✓	✗
B	✓	✓	✗	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

7 Active transport is the movement of

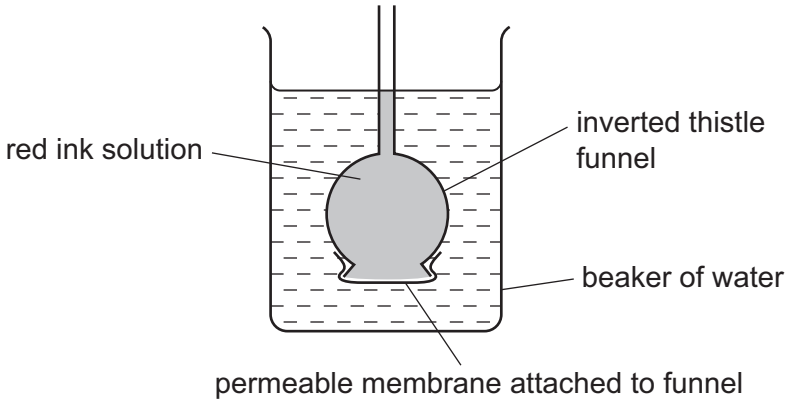
A molecules from a region of their higher concentration to a region of their lower concentration.

B particles from a region of lower concentration to a region of higher concentration using energy from respiration.

C urine by relaxation of a sphincter muscle in the bladder.

D water through a partially permeable membrane from a more dilute to a more concentrated solution.

8 The diagram shows an experiment to demonstrate the movement of molecules.



After one hour, the water in the beaker turned red.

What is the most likely reason for this colour change?

A Molecules of red ink move through the membrane by diffusion.

B Molecules of red ink move through the membrane by osmosis.

C Molecules of water move through the membrane by diffusion.

D Molecules of water move through the membrane by osmosis.

9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

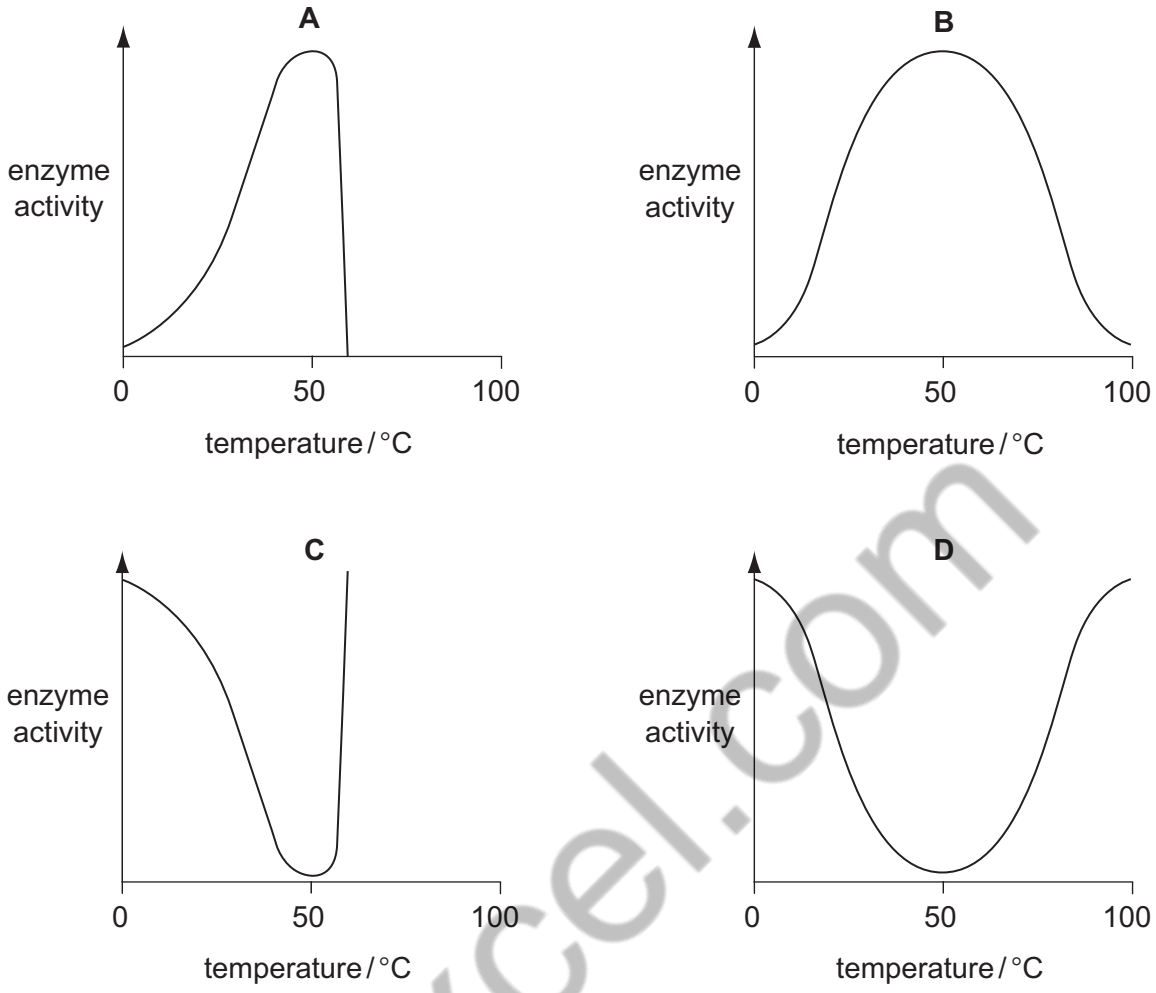
A Amino acids are basic units of carbohydrates.

B Fatty acids are basic units of glycogen.

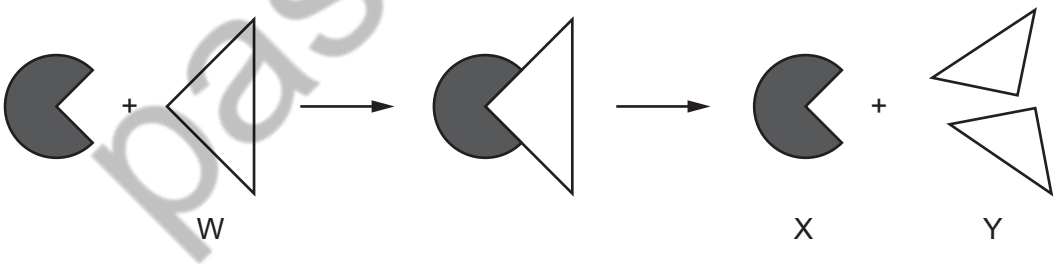
C Glycerol is a basic unit of oils.

D Simple sugar is a basic unit of protein.

10 Which graph shows the effect of temperature on the activity of an enzyme?



11 The diagram represents enzyme action.

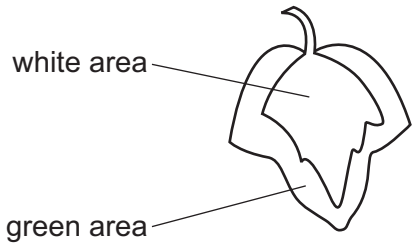


What are parts W, X and Y in this chemical reaction?

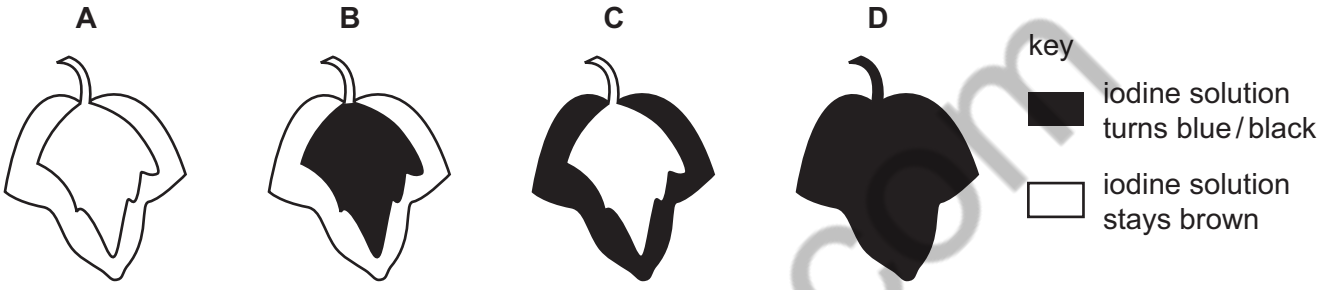
	enzyme	product	substrate
A	W	X	Y
B	X	W	Y
C	X	Y	W
D	Y	W	X

12 In a photosynthesis experiment, a plant is left in bright sunlight for several hours. A leaf is then removed from the plant and tested for starch, using iodine solution.

The diagram shows the leaf from the plant that was used in the experiment.



Which diagram shows the result of the experiment?



13 Which substance, needed for protein synthesis, is carried into a leaf from the stem?

A carbon dioxide

B nitrate

C oxygen

D starch

14 Which type of food is **not** digested before being absorbed by the body?

A carbohydrate

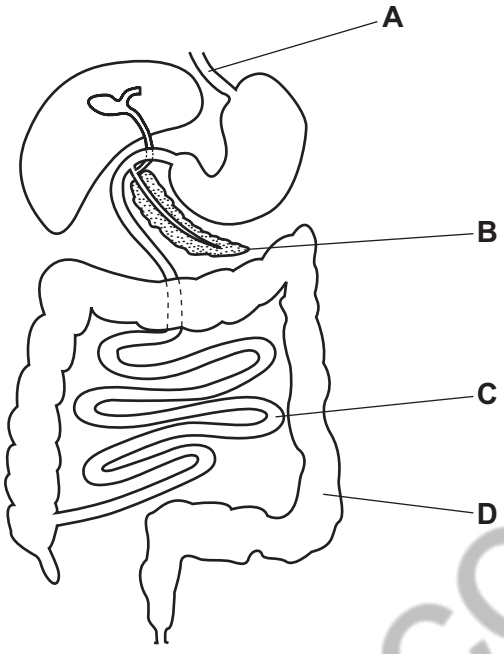
B fat

C protein

D water

15 The diagram shows the human alimentary canal.

In which structure is most glucose absorbed into the blood?



16 Which dietary component is **unlikely** to be deficient in a meat-free diet?

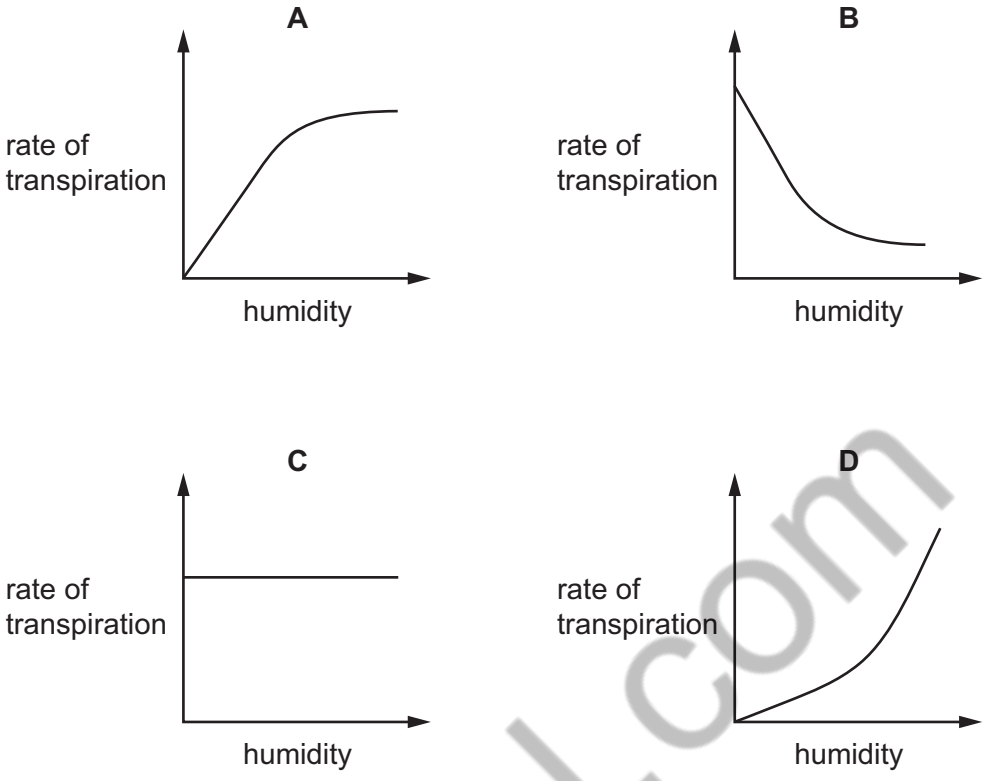
A fat

B fibre

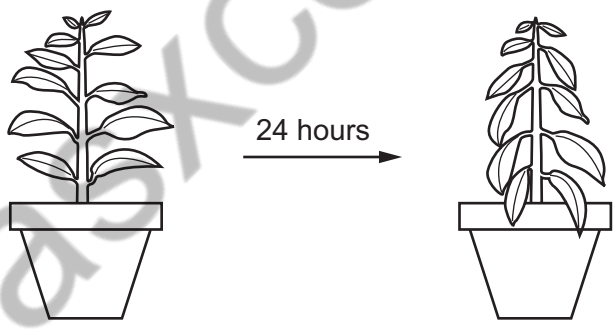
C protein

D vitamin D

17 Which graph shows most clearly what will happen to the rate of transpiration as humidity increases?



18 The diagram shows a potted plant and the same plant 24 hours later.



What causes the change in the appearance of the plant?

A Water loss is greater than water uptake.

B Water moves from the leaves to the stem.

C Water uptake is equal to water loss.

D Water uptake is greater than water loss.

19 Which substances are dissolved in human blood plasma?

A carbon dioxide, haemoglobin and glucose

B carbon dioxide, oxygen and haemoglobin

C glucose, hormones and urea

D oxygen, urea and starch

20 Which chamber of the heart has the thickest muscle wall?

A left atrium

B left ventricle

C right atrium

D right ventricle

21 What is the approximate percentage of oxygen in expired air?

A 0.04% **B** 4% **C** 16% **D** 21%

22 Compared with atmospheric air, air breathed out by a human contains

A less water vapour, less carbon dioxide.

B less water vapour, more carbon dioxide.

C more water vapour, less carbon dioxide.

D more water vapour, more carbon dioxide.

23 What is produced by anaerobic respiration in yeast?

	lactic acid	carbon dioxide
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

24 What is the word equation for aerobic respiration in plants?

A carbon dioxide + water → glucose + oxygen

B glucose + carbon dioxide → water + oxygen

C glucose + oxygen → carbon dioxide + water

D glucose + water → carbon dioxide + oxygen

25 Where is urea made?

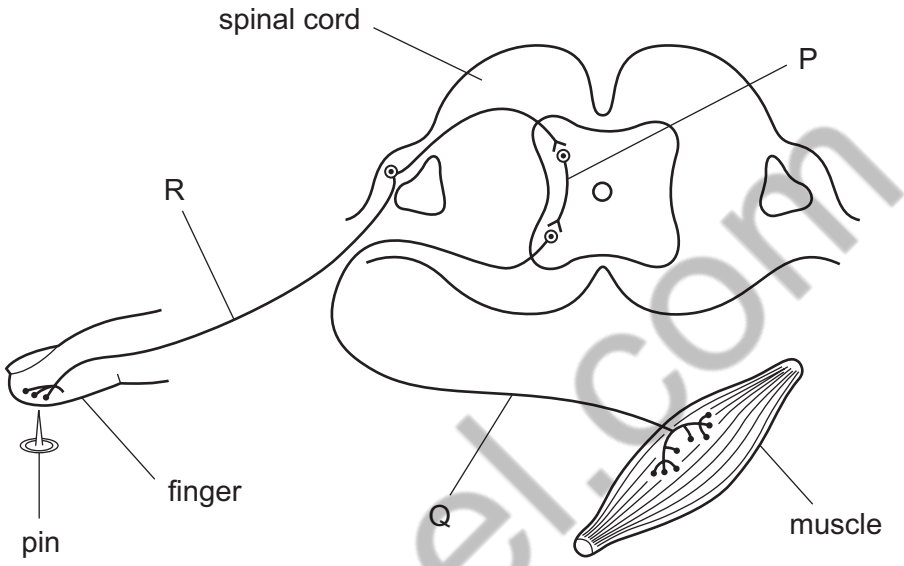
A bladder

B kidney

C liver

D urethra

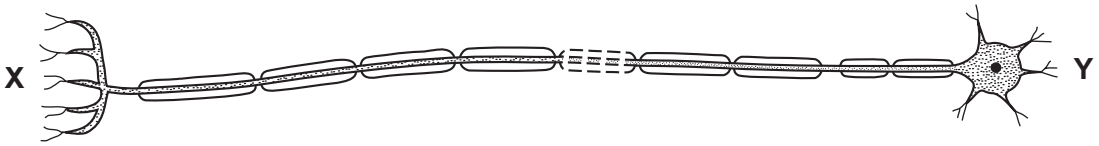
26 The diagram represents a simple reflex arc.



What is the sequence of nerve cells through which an impulse passes during a reflex action?

	first →		last
A	P	Q	R
B	Q	R	P
C	Q	P	R
D	R	P	Q

27 The diagram shows a neurone.



Which structures could be found at **X** and **Y**?

	X	Y
A	brain	intestine
B	brain	leg
C	eye	hand
D	gland	spinal cord

28 What will be the effect of strenuous exercise on the volume of water lost through the skin and the kidneys?

	volume of water lost through the skin	volume of water lost through the kidneys
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

29 Which organ is most often damaged by regularly drinking too much alcohol?

A heart

B liver

C pancreas

D stomach

30 When a baby is born, these processes occur.

1 breaking of the amniotic sac

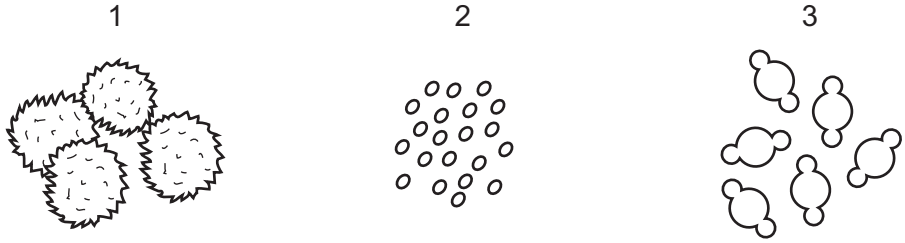
2 contraction of muscles in the uterus wall

3 cutting of the umbilical cord

In which order do these processes usually occur?

A $2 \rightarrow 1 \rightarrow 3$ **B** $2 \rightarrow 3 \rightarrow 1$ **C** $3 \rightarrow 1 \rightarrow 2$ **D** $3 \rightarrow 2 \rightarrow 1$

31 The diagrams show pollen grains from three different species of plant as they appear under the microscope. The diagrams are all to the same scale.

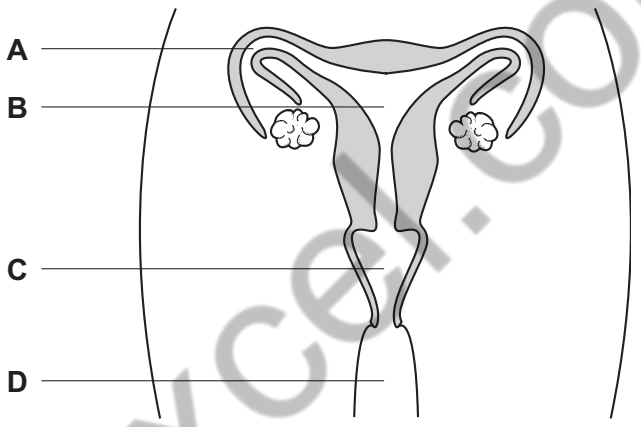


Which pollen grains are involved in insect-pollination?

A 1 and 2 **B** 1 only **C** 2 and 3 **D** 3 only

32 The diagram shows the human female reproductive system.

If a woman uses a femidom as a contraceptive, where would it be placed?

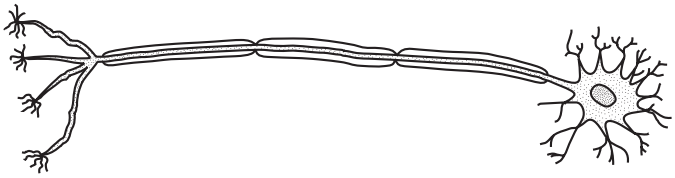


33 Cells are formed by the division of existing cells. Four different cells are shown.

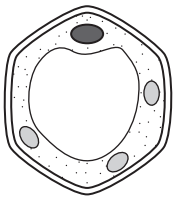
Which cell is produced by meiosis?

A

B



C



D

34 Albinism is an inherited condition in which pigment does not develop in the skin, hair and eyes.

The allele for albinism is recessive.

What are the chances of albino parents having an albino child?

A 0% **B** 25% **C** 75% **D** 100%

35 Which name is given to the observable features of an organism?

A alleles

B genes

C genotype

D phenotype

36 What is **not** a feature of natural selection?

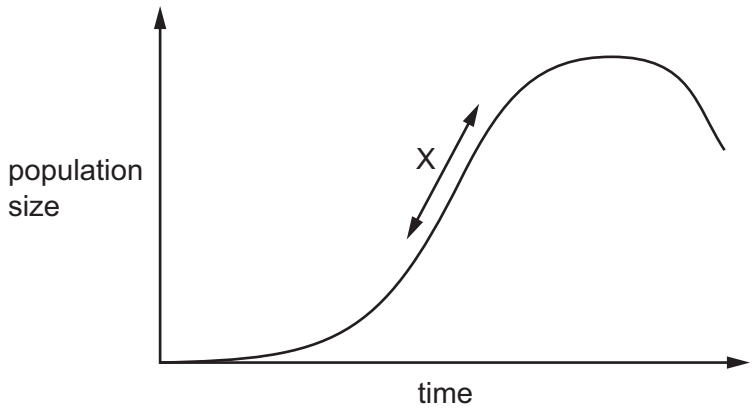
A competition for resources

B production of many offspring

C selection by humans

D variation within the population

37 The graph shows a population growth curve.



Which factors would cause region X on the graph to become steeper?

A decrease in predation, decrease in food supply

B increase in food supply, decrease in disease

C increase in food supply, increase in predation

D increase in predation, decrease in disease

38 The diagram shows a simple food chain.

green plant → herbivore → carnivore

If a disease causes the number of herbivores to decrease, what will be the effect on the numbers of green plants and carnivores?

	green plants	carnivores
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

39 A gene for insulin is taken from a human cell and placed in a bacterium.

The bacterium can then make human insulin.

What is this process called?

A artificial selection

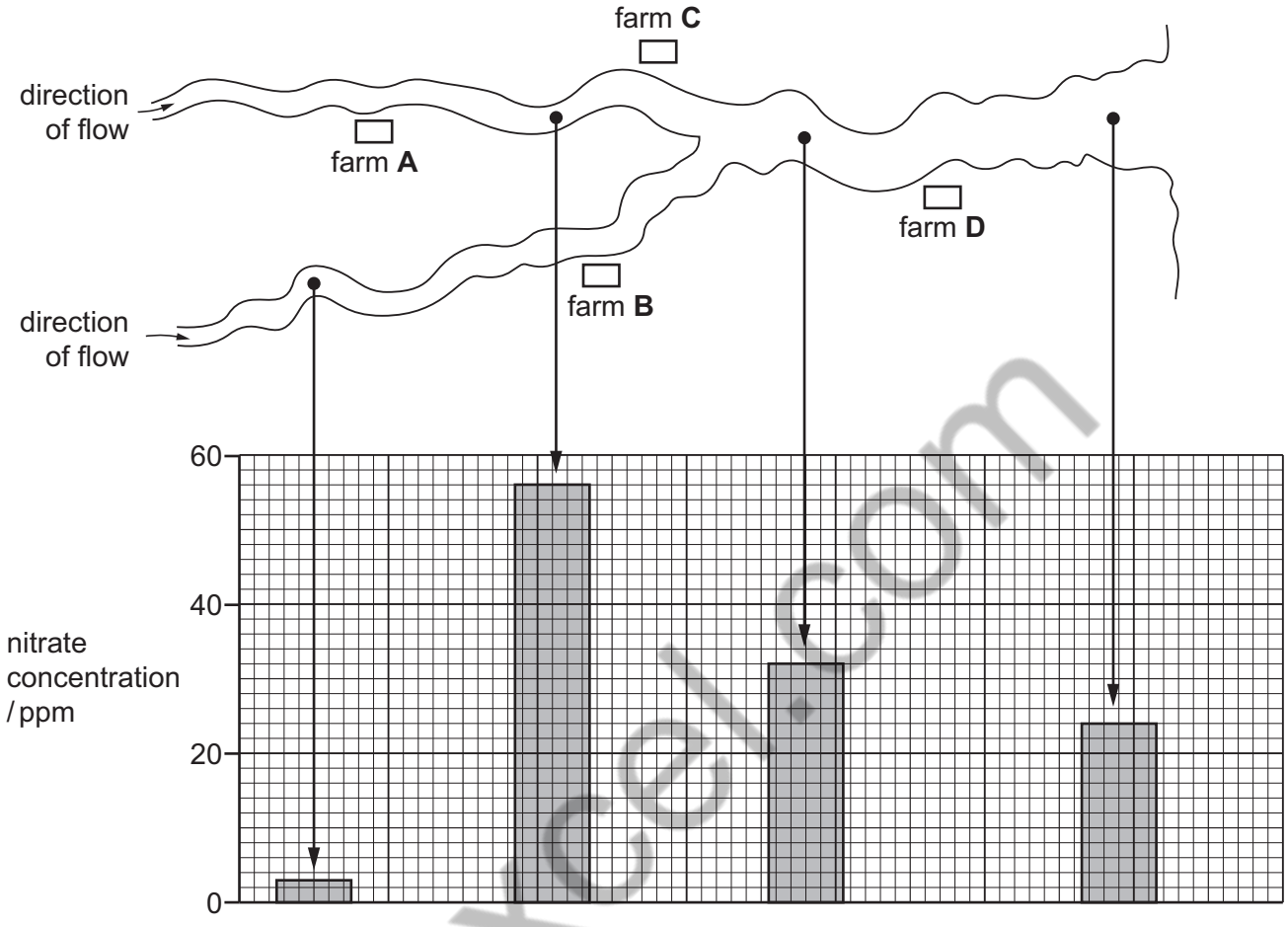
B genetic engineering

C heterozygous inheritance

D natural selection

40 The diagram shows the positions of four farms and the concentrations of nitrate at different points in a river.

Which farm is likely to have been using too much fertiliser on its land?



BLANK PAGE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/21**

Paper 2 Multiple Choice (Extended) **May/June 2016**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

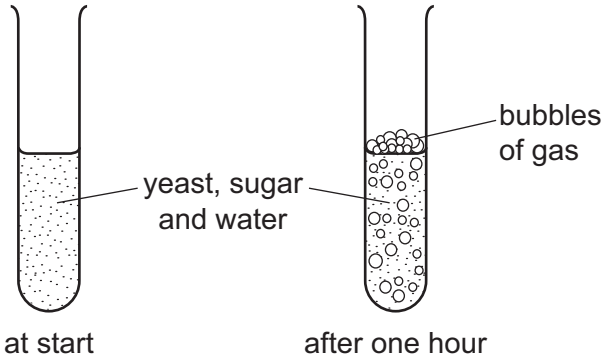
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 Some yeast, sugar and water are mixed in a test-tube. The diagrams show the test-tube at the start and after one hour.



Which process causes this change?

A growth

B reproduction

C respiration

D sensitivity

2 Which name is given to a group of individuals that can reproduce to produce fertile offspring?

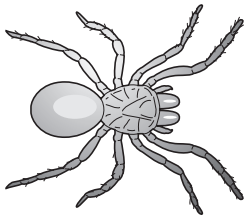
A a genus

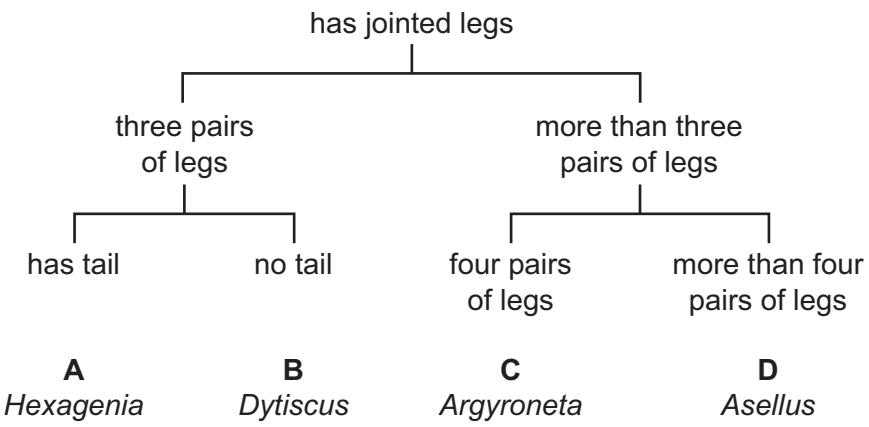
B a kingdom

C a species

D an organ system

3 Use the key to identify the animal shown in the diagram.





4 Which organelles are present in large numbers in cells that produce insulin?

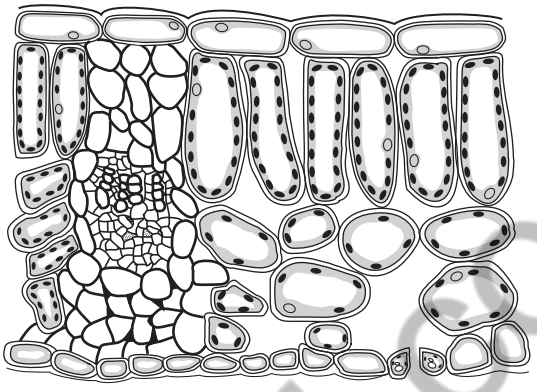
A nuclei and mitochondria

B ribosomes and mitochondria

C rough endoplasmic reticulum and cell walls

D vesicles and nuclei

5 The actual thickness of the leaf shown in the diagram is 2000 μm, but its thickness in the diagram is 50 mm.

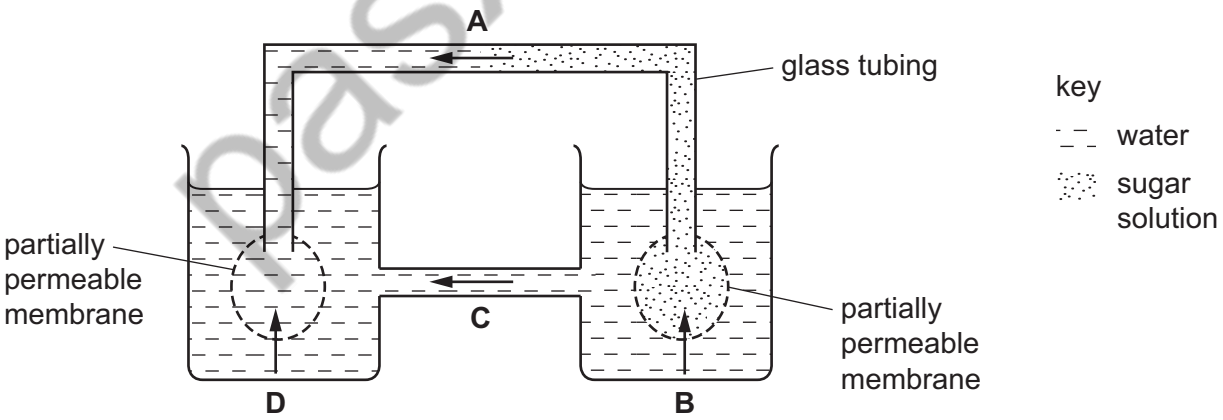


What is the magnification of the diagram?

A ×0.025 **B** ×25 **C** ×100 **D** ×100 000

6 The diagram shows an experiment on osmosis.

Which arrow shows the direction of the net movement of water at the start of the experiment?



7 Active transport is the movement of

A molecules from a region of their higher concentration to a region of their lower concentration.

B particles from a region of lower concentration to a region of higher concentration using energy from respiration.

C urine by relaxation of a sphincter muscle in the bladder.

D water through a partially permeable membrane from a more dilute to a more concentrated solution.

8 When bases pair up in the formation of DNA, what is one of the pairings?

A G with A **B** G with C **C** G with G **D** G with T

9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

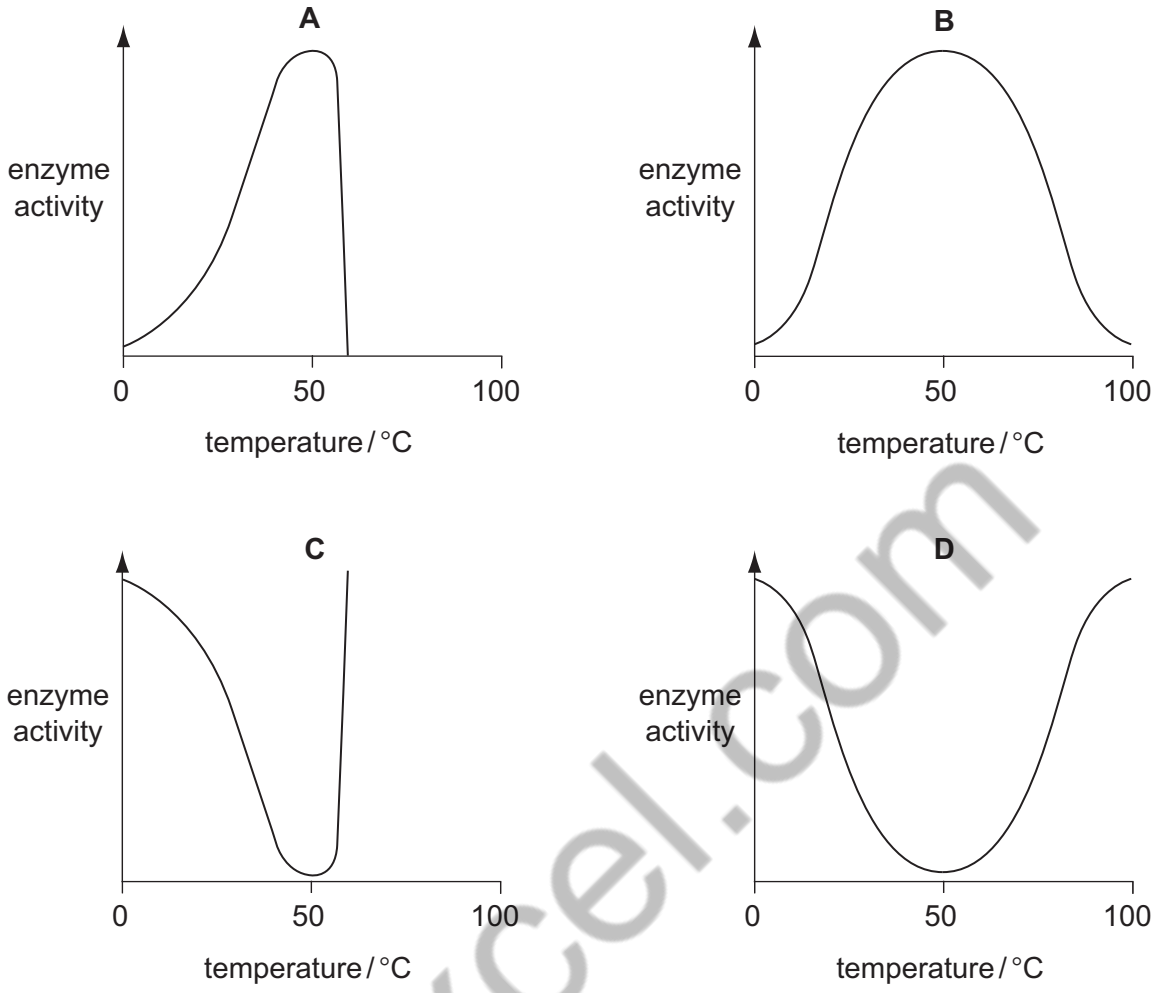
A Amino acids are basic units of carbohydrates.

B Fatty acids are basic units of glycogen.

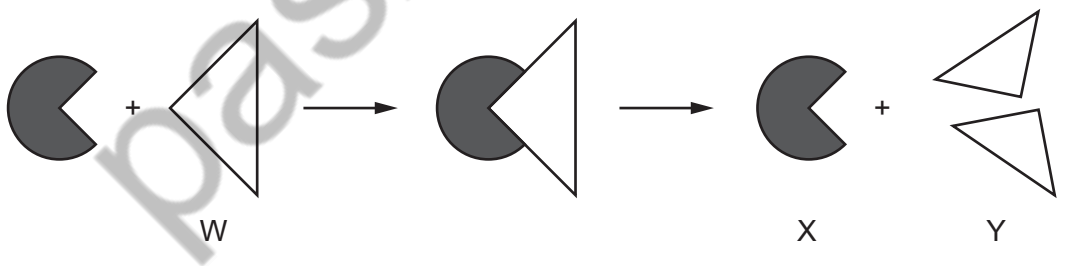
C Glycerol is a basic unit of oils.

D Simple sugar is a basic unit of protein.

10 Which graph shows the effect of temperature on the activity of an enzyme?



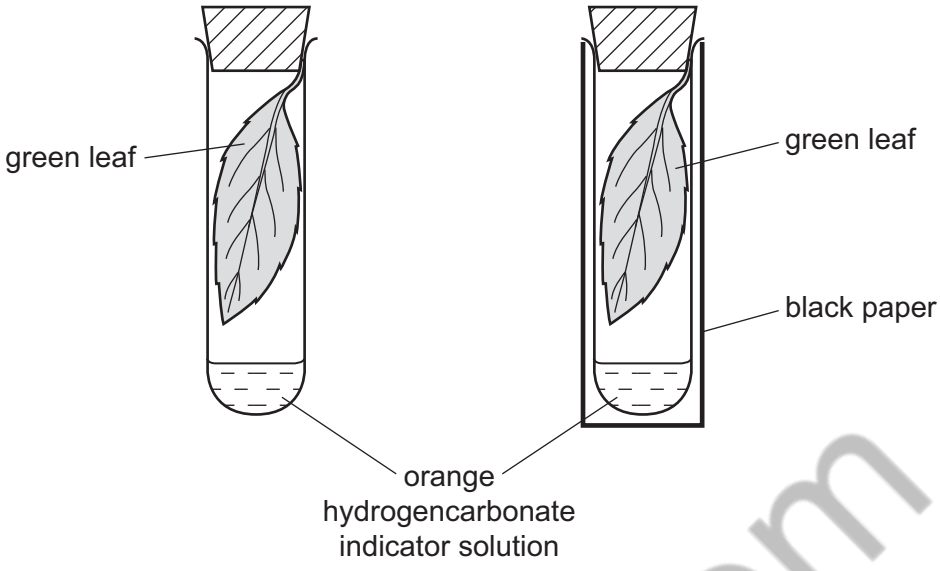
11 The diagram represents enzyme action.



What are parts W, X and Y in this chemical reaction?

	enzyme	product	substrate
A	W	X	Y
B	X	W	Y
C	X	Y	W
D	Y	W	X

12 Two similar leaves are set up in test-tubes as shown. One is exposed to light, while the other is kept in the dark.

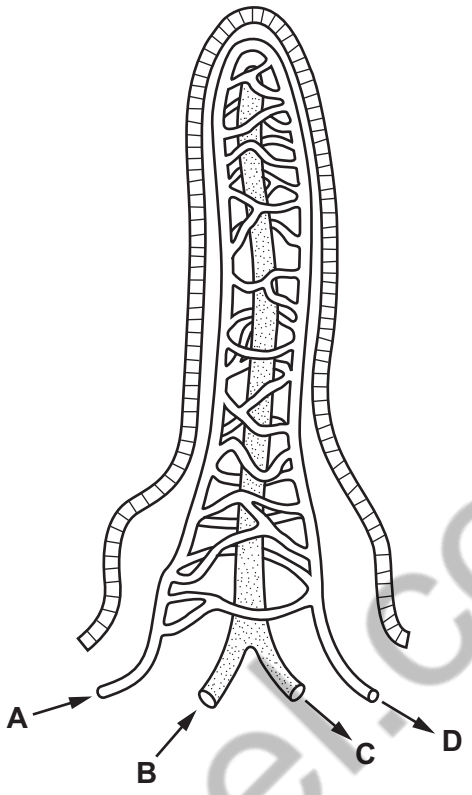


After a few hours, which colour would the hydrogencarbonate indicator solution be in each tube?

	light	dark
A	colourless	blue-black
B	purple	yellow
C	red	blue
D	yellow	purple

13 The diagram shows a villus. The arrows show the direction of flow within vessels associated with the villus.

Which vessel carries blood to the liver?



14 What is **not** a result of cholera infection?

A intestinal blockage

B loss of salts from blood

C severe dehydration of body tissues

D severe diarrhoea

15 What is the function of bile?

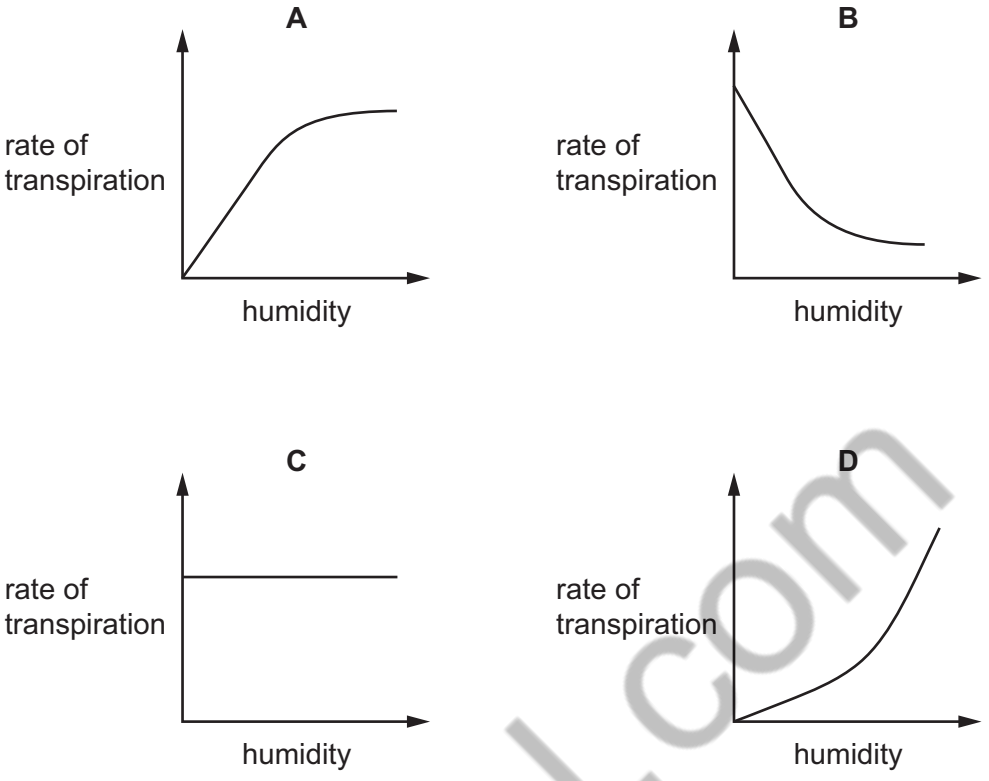
A to acidify food entering the duodenum

B to emulsify starch

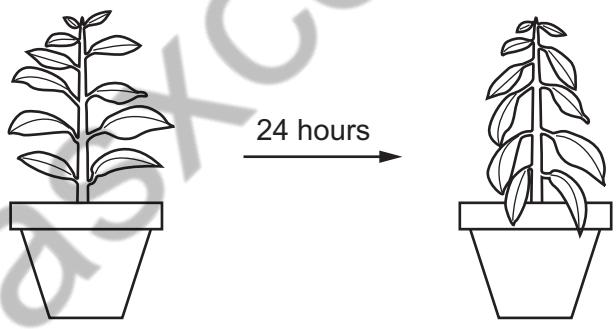
C to increase the surface area of fats for digestion

D to provide enzymes for fat digestion

16 Which graph shows most clearly what will happen to the rate of transpiration as humidity increases?



17 The diagram shows a potted plant and the same plant 24 hours later.



What causes the change in the appearance of the plant?

A Water loss is greater than water uptake.

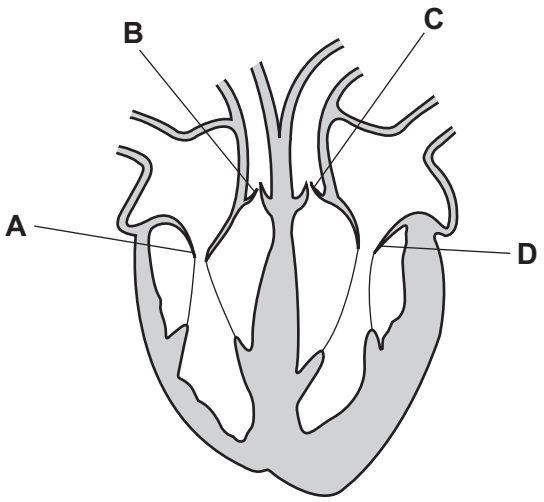
B Water moves from the leaves to the stem.

C Water uptake is equal to water loss.

D Water uptake is greater than water loss.

18 The diagram shows a section through the human heart.

Which is the right atrioventricular valve?



19 What is the function of lymphocytes in the blood?

A antibody production

B blood clotting

C phagocytosis

D transport of hormones

20 Which part of a pathogen is recognised by the immune system?

A active site

B antibiotic

C antibody

D antigen

21 Compared with atmospheric air, air breathed out by a human contains

A less water vapour, less carbon dioxide.

B less water vapour, more carbon dioxide.

C more water vapour, less carbon dioxide.

D more water vapour, more carbon dioxide.

22 What describes the actions of the intercostal muscles and the diaphragm when we breathe out?

	external intercostal muscles	internal intercostal muscles	diaphragm
A	contract	relax	falls
B	contract	relax	rises
C	relax	contract	falls
D	relax	contract	rises

23 What is the word equation for aerobic respiration in plants?

A carbon dioxide + water → glucose + oxygen

B glucose + carbon dioxide → water + oxygen

C glucose + oxygen → carbon dioxide + water

D glucose + water → carbon dioxide + oxygen

24 An amino acid is deaminated. This is the removal of

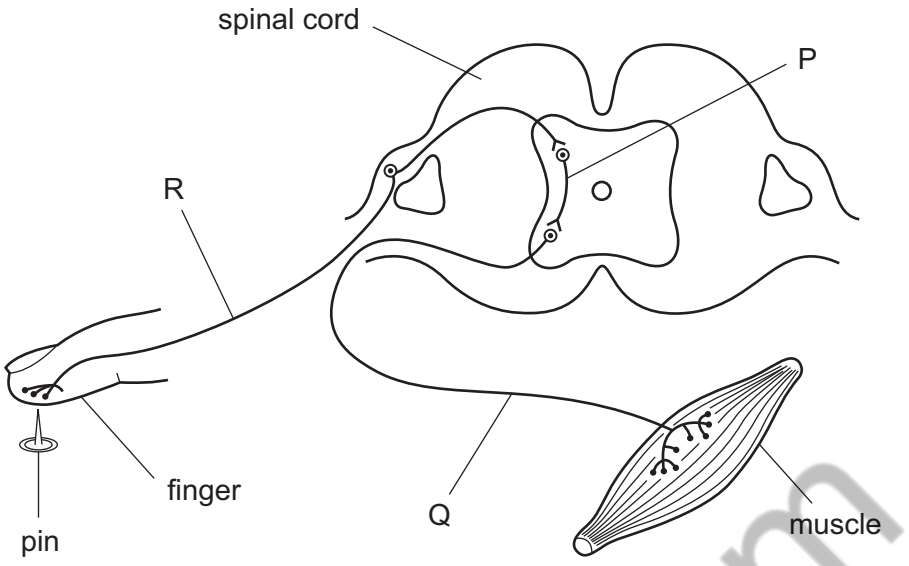
A the carbon-containing part.

B the nitrogen-containing part.

C the oxygen-containing part.

D the sulfur-containing part.

25 The diagram represents a simple reflex arc.

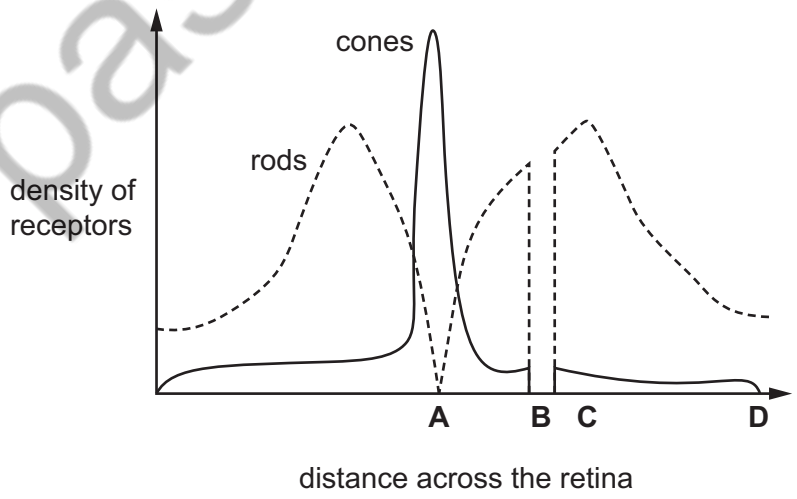


What is the sequence of nerve cells through which an impulse passes during a reflex action?

	first →		last
A	P	Q	R
B	Q	R	P
C	Q	P	R
D	R	P	Q

26 The diagram shows the density of rods and cones across a horizontal section of the retina.

What is the position of the optic nerve?



27 What are the effects of insulin and glucagon on the concentration of blood glucose?

	effect of insulin on blood glucose concentration	effect of glucagon on blood glucose concentration
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

28 Which organ is most often damaged by regularly drinking too much alcohol?

A heart

B liver

C pancreas

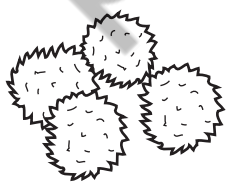
D stomach

29 What are advantages of sexual and asexual reproduction?

	advantage of sexual reproduction	advantage of asexual reproduction
A	less population growth	only one parent required
B	more energy efficient	gametes can be transferred by environment
C	more genetic variation	faster
D	no transfer of gametes needed	does not compete with the parent for nutrients

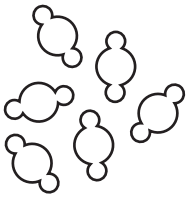
30 The diagrams show pollen grains from three different species of plant as they appear under the microscope. The diagrams are all to the same scale.

1



2

3



Which pollen grains are involved in insect-pollination?

A 1 and 2 **B** 1 only **C** 2 and 3 **D** 3 only

31 What happens to the chromosome number after meiosis and after mitosis?

	meiosis	mitosis
A	halved	halved
B	halved	stays the same
C	stays the same	halved
D	stays the same	stays the same

32 In the inheritance of ABO blood groups, when two parents have the genotypes I^AI^A and I^AI^o, what is the blood group of their offspring?

A group A

B group AB

C group B

D group O

33 Which structures are present in a bacterial cell?

	cell wall	nucleus
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

34 The whole of an island's population of short-haired bumblebees is descended from just two parents. These were introduced from the mainland.

Which statement about the island's short-haired bumblebee population, compared with that of the mainland, is correct?

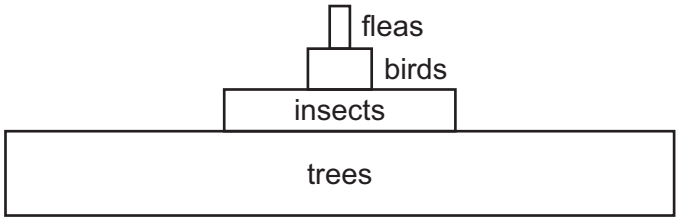
A The population is less in danger of collapsing from disease.

B The population is more able to adapt to environmental changes.

C The population shows more genetic variety.

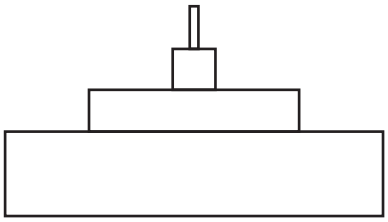
D The population will adapt to environmental changes more slowly.

35 The diagram shows a pyramid of biomass for a food chain in a woodland ecosystem.

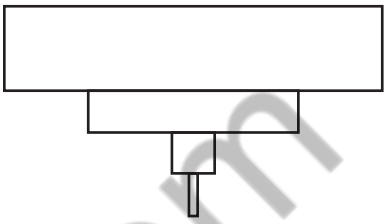


What is the pyramid of numbers for this food chain?

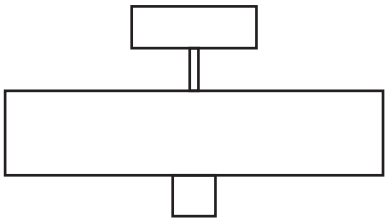
A



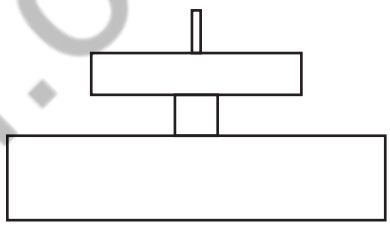
B



C

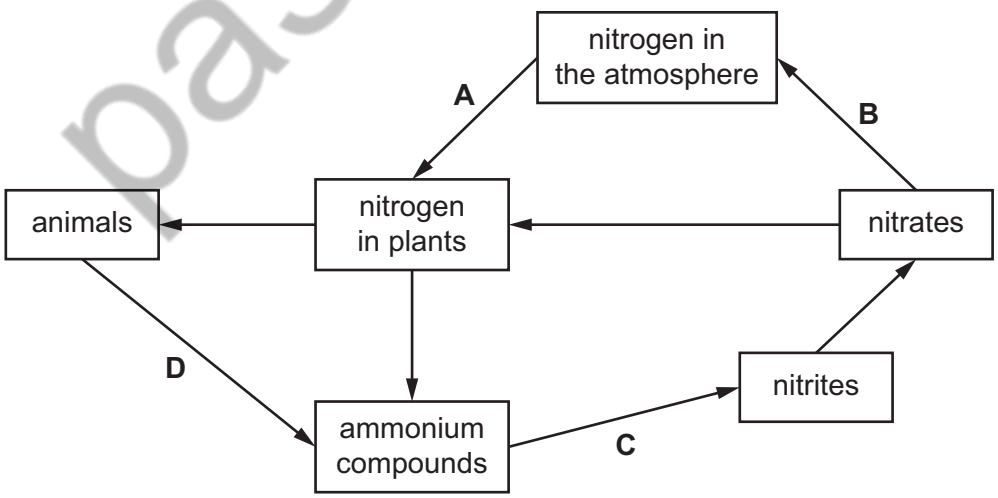


D

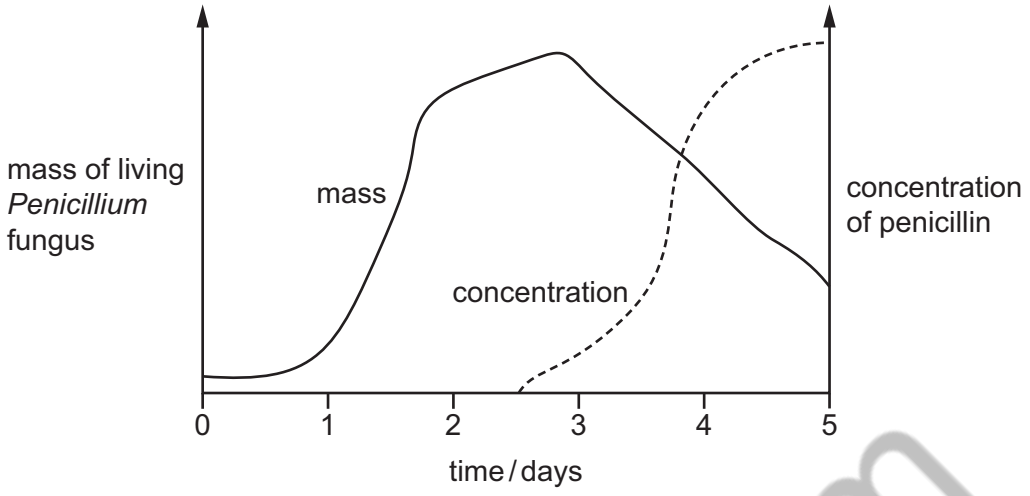


36 The diagram shows part of the nitrogen cycle.

At which stage is denitrification occurring?



37 Penicillin is produced in a fermenter by growing the fungus *Penicillium*. The graph shows how the mass of living *Penicillium* fungus and the concentration of penicillin changed over time.



When is the best time to collect the penicillin?

A at 1.5 days

B at 3 days

C at 3.5 days

D at 5 days

38 A gene for insulin is taken from a human cell and placed in a bacterium.

The bacterium can then make human insulin.

What is this process called?

A artificial selection

B genetic engineering

C heterozygous inheritance

D natural selection

39 Which effect is **least** likely to occur as a result of deforestation?

A an increase in biodiversity

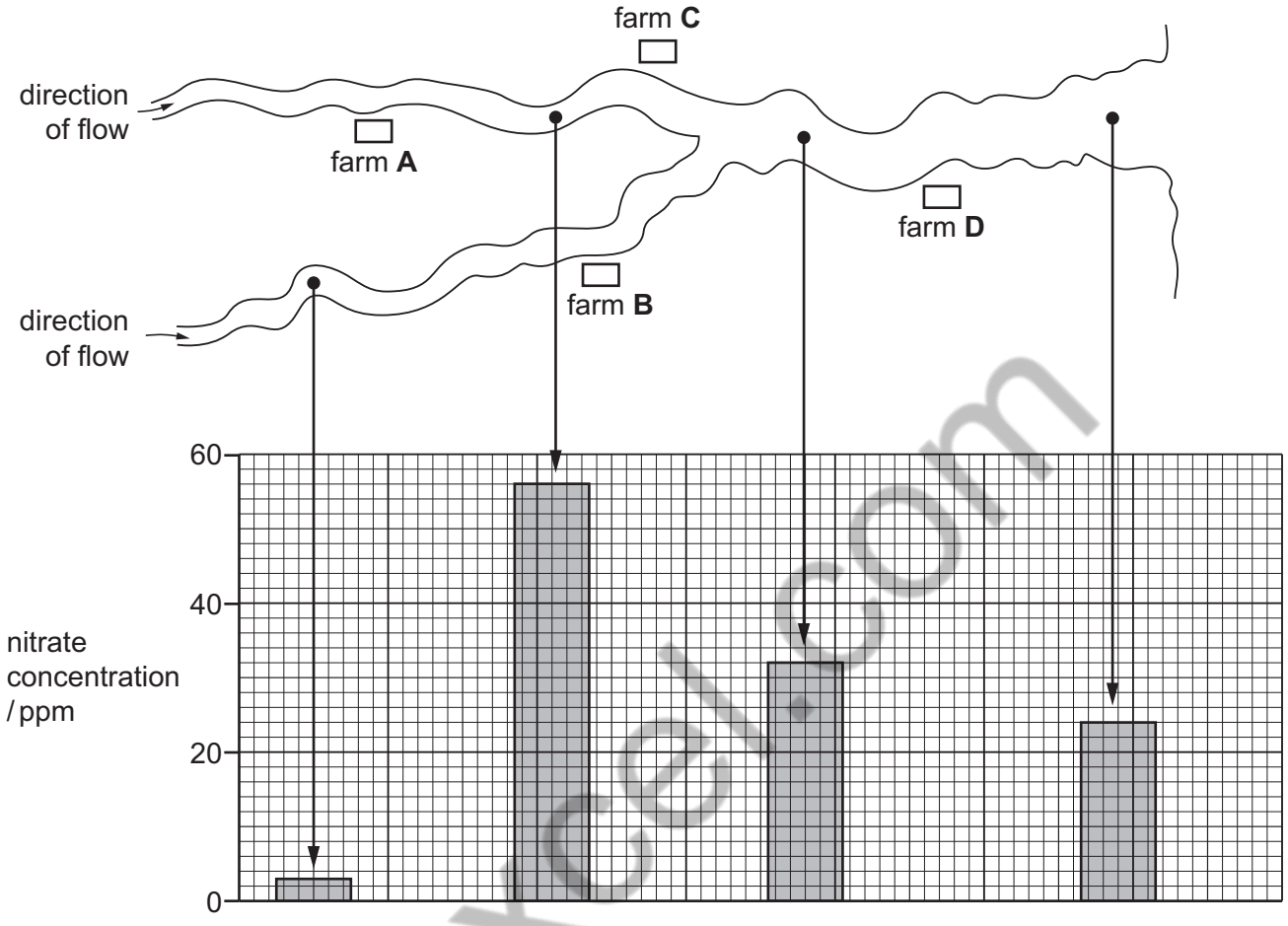
B an increase in soil erosion

C an increase in the level of carbon dioxide in the atmosphere

D an increased risk of flooding

40 The diagram shows the positions of four farms and the concentrations of nitrate at different points in a river.

Which farm is likely to have been using too much fertiliser on its land?



Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8508702162

BIOLOGY **0610/32**

Paper 3 Theory (Core) **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

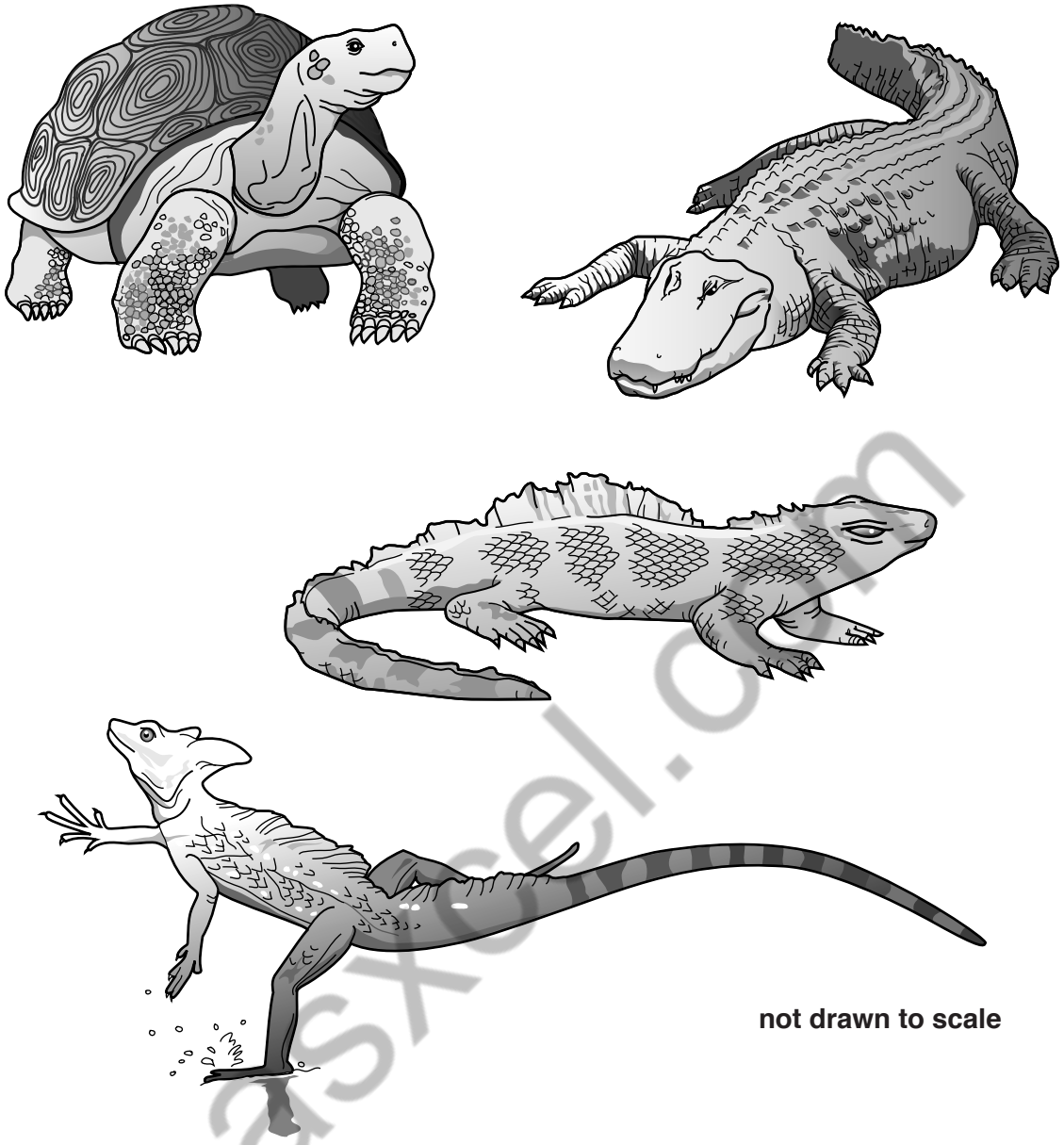
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

1 Fig. 1.1 shows four different reptiles.



not drawn to scale

Fig. 1.1

(a) (i) Reptiles are vertebrates.

State **one** feature which all vertebrates have in common.

.....

.....[1]

(ii) State **two** features which can be used to identify the animals in Fig. 1.1 as reptiles.

1 .....

.....

2 .....

.....
[2]

(iii) Fig. 1.2 shows a snake.

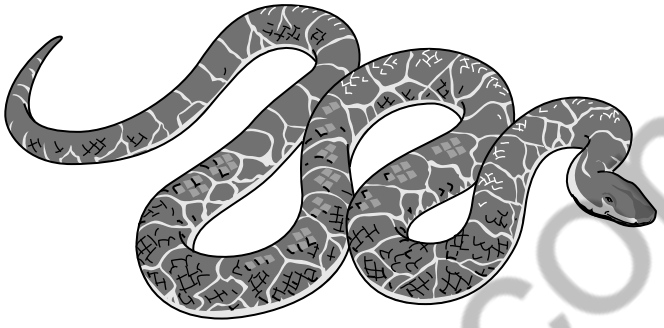


Fig. 1.2

Snakes are also reptiles. State **one** way, **visible** in Fig. 1.2, in which snakes are different from the reptiles shown in Fig. 1.1.

.....

.....[1]

Fig. 1.3 shows a newt, which looks similar to some reptiles, but belongs to a different vertebrate group.

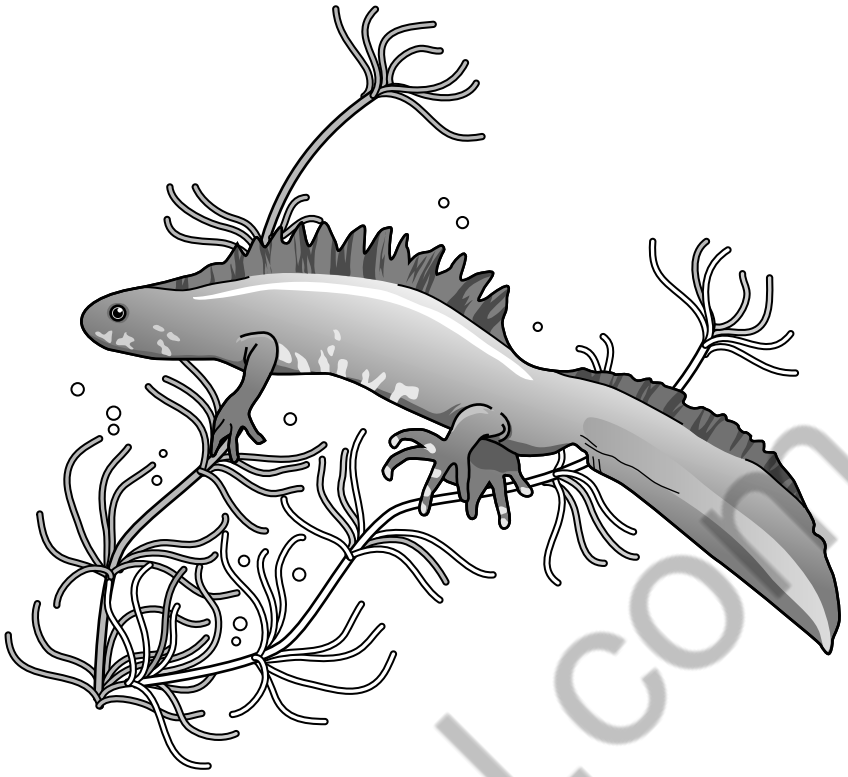


Fig. 1.3

(b) (i) State the vertebrate group to which the newt belongs.

Choose from this list and **circle** your answer.

amphibian **bird** **fish** **mammal**

[1]

(ii) State **two** features of this group which distinguish it from other vertebrate groups.

1 .....

.....

2 .....

.....

[2]

(c) In some species of reptile, the female keeps the fertilised eggs in her body until they are ready to hatch. Suggest **two** advantages of having this adaptive feature.

1 .....

.....

2 .....

.....

[2]

[Total: 9]

2 Fig. 2.1 shows a scientific project which involves growing tomato plants and fish in the same glasshouse.

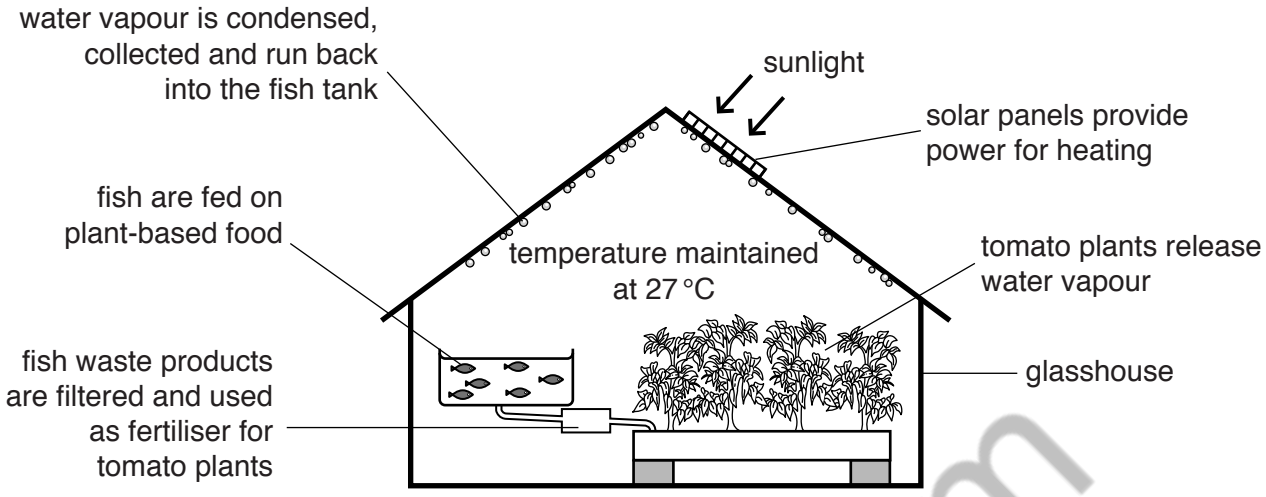


Fig. 2.1

(a) State the process in the water cycle which is **not** used in this project.

.....[1]

(b) State the name of the process by which:

(i) the plants release water vapour .....[1]

(ii) the fish release water and urea as waste products.

.....[1]

The fish in Fig. 2.1 are fed on plant-based food.

(c) **(i)** State the term used to describe animals which feed on plants.

.....[1]

(ii) The tomato plants in Fig. 2.1 are not grown in soil, because it can contain pathogens.

Define the term *pathogen*.

.....

.....

.....[1]

(d) Describe **and** explain **two** ways in which growing tomatoes in this project may save the grower money.

.....

.....

.....

.....

.....[3]

(e) The process of growing fish and tomatoes in Fig. 2.1 shows some characteristics of a sustainable resource.

(i) Define the term *sustainable resource*.

.....

.....

.....

.....

.....[2]

(ii) Suggest why growing a species of fish in tanks may help to prevent extinction of the species.

.....

.....

.....[1]

[Total: 11]

3 Flowers contain the male and female reproductive structures of a plant.

The female reproductive structure is the carpel.

The male reproductive structure is the stamen.

(a) Draw straight lines from the reproductive structures to show which parts of the flower are in each structure. You should draw only **five** lines.

reproductive structure	part of flower
	anther
	stigma
carpel	ovary
	petal
stamen	filament
	style
	sepal

[4]

(b) This question is about reproduction in humans.

Outline the events that occur between sperm being deposited in the vagina and the embryo being formed.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) State **two** ways in which meiosis is different from mitosis.

1 .....

.....

2 .....

.....

[2]

[Total: 10]

4 Fig. 4.1 shows a root hair cell.

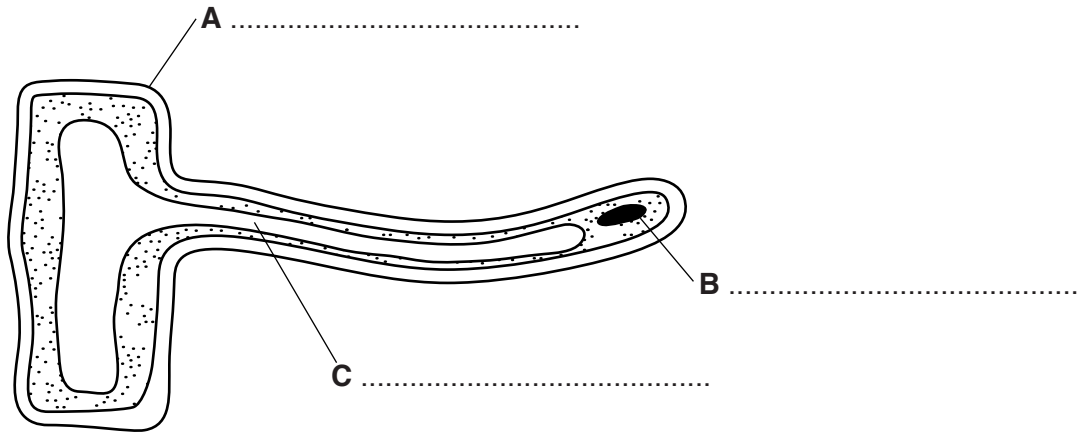


Fig. 4.1

(a) (i) Name the features labelled **A**, **B** and **C**.

Write your answers on Fig. 4.1. [3]

(ii) Feature **A** is made of cellulose. What is cellulose made from?

.....[1]

(iii) State **two** functions of a root hair cell.

1 .....

.....

2 .....

.....
[2]

(iv) Describe how a root hair cell is adapted for its function.

.....

.....

.....[1]

(b) Fig. 4.2 shows a palisade mesophyll cell.

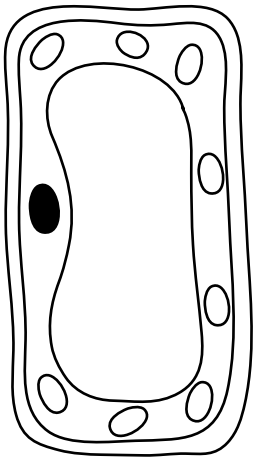


Fig. 4.2

The cell in Fig. 4.2 contains structures which are **not** present in root hair cells.

State the name of these structures **and** explain their function.

.....

.....

.....

.....

.....[3]

[Total: 10]

5 Fig. 5.1 shows the risk of coronary heart disease by age and gender.

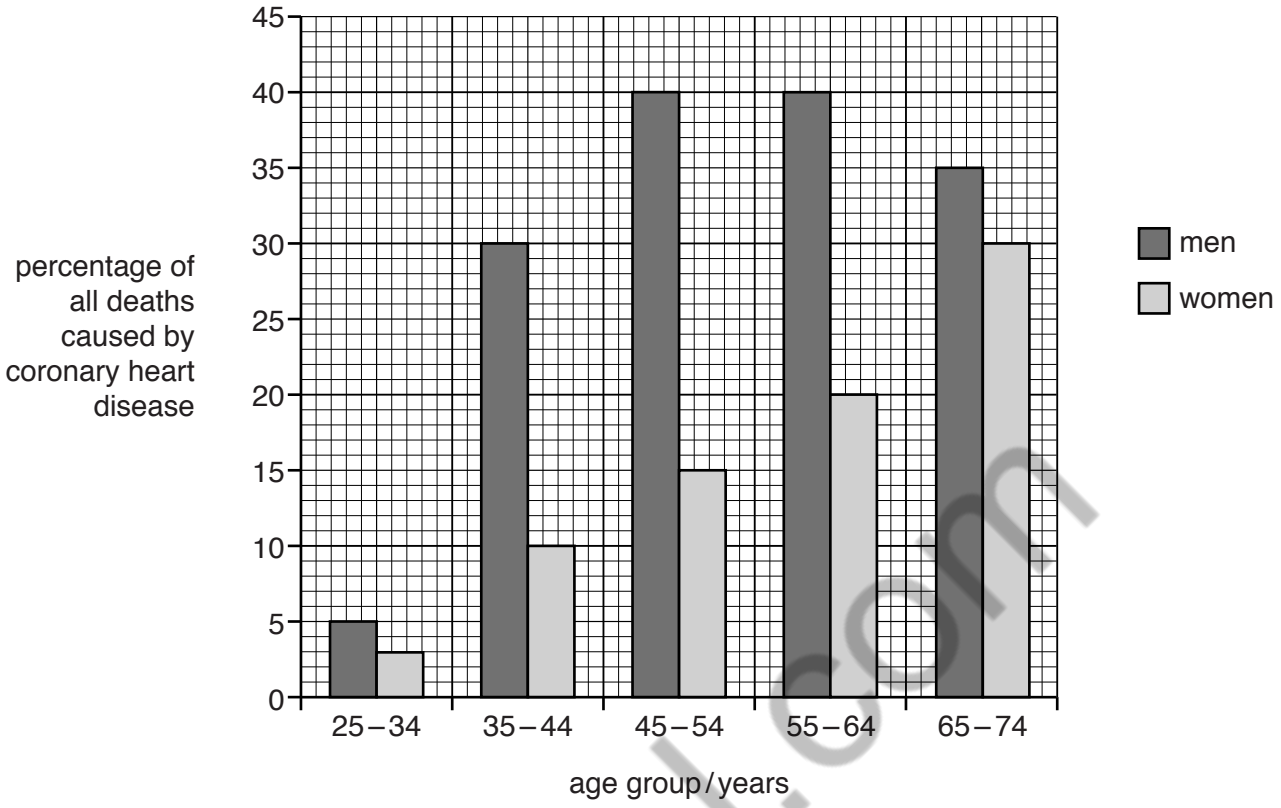


Fig. 5.1

(a) Use Fig. 5.1 to:

(i) state which age group has the lowest percentage of deaths caused by coronary heart disease

.....[1]

(ii) describe what happens to the risk of coronary heart disease as a man gets older

.....

.....

.....

.....

.....[2]

(iii) describe the difference in risk of coronary heart disease for a man and a woman between the ages of 55 and 64.

.....

.....

.....

.....

.....[2]

(b) State **three** risk factors for coronary heart disease, **other than** age and gender.

1 .....

2 .....

3 .....

[3]

(c) Fig. 5.2 shows a diagram of the human heart and its associated blood vessels.

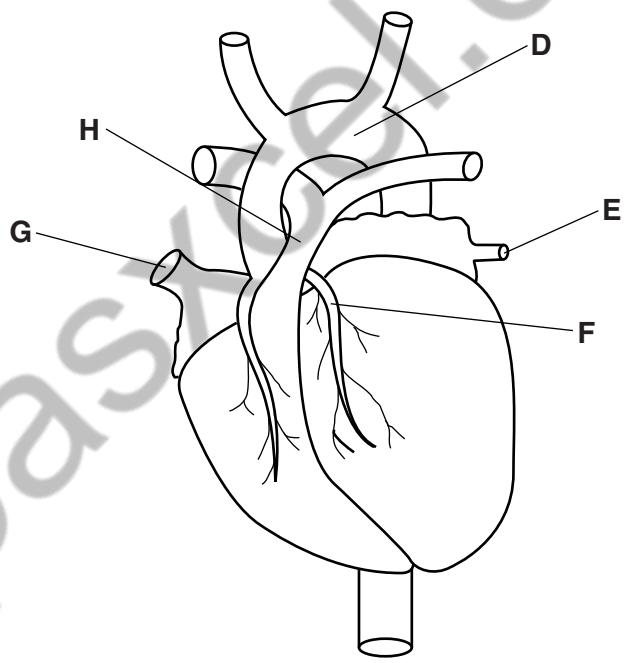


Fig. 5.2

On the diagram, **circle** the letter of the blood vessel which, when blocked, results in coronary heart disease. [1]

(d) The activity of the heart can be studied by monitoring the closing of the heart valves.

(i) Describe how this monitoring could be carried out.

.....

.....[1]

(ii) State the function of the heart valves.

.....

.....[1]

Fig. 5.3 shows heart activity (valves closing) over a period of ten seconds, for a person who is resting.

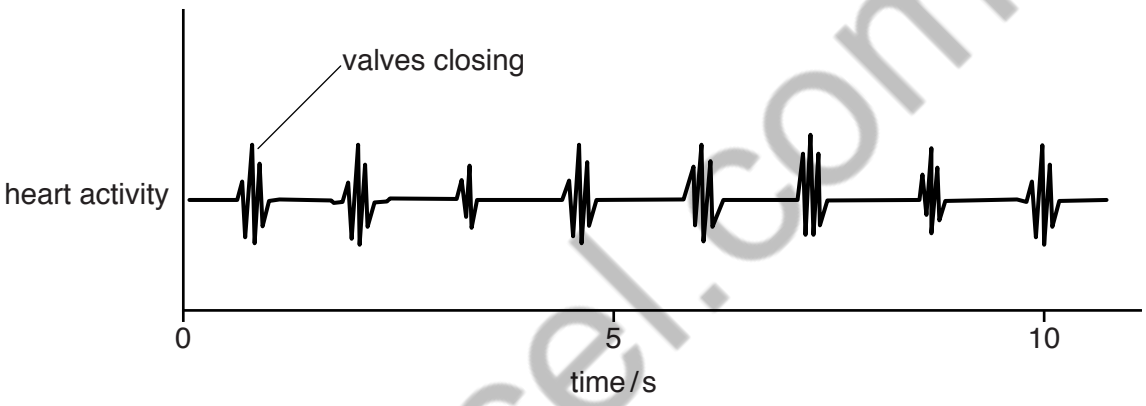


Fig. 5.3

(iii) State how many times the valves close in ten seconds.

.....[1]

(iv) Calculate the heart rate, in **beats per minute**, of the person being monitored. Show your working.

..... beats per minute [2]

(v) Suggest how the heart activity would be different if the person started to exercise.

.....

.....

.....[1]

[Total: 15]

6 **(a)** Define the term *genetic engineering*.

.....

.....

.....

.....

.....[2]

(b) **(i)** Outline why bacteria are useful in genetic engineering.

.....

.....

.....

.....

.....[2]

(ii) Table 6.1 contains six statements about biological processes. Only **two** of these use genetic engineering. Identify these two processes. Place a tick in the box (✓) next to your choices.

Table 6.1

statement	uses genetic engineering
producing fruit juice using pectinase	
introducing genes into crop plants to provide additional vitamins	
selective breeding to produce organisms with desirable features	
placing a section of DNA into bacteria to produce human insulin	
using yeast to produce ethanol	
using a contraceptive implant as a method of birth control	

[2]

(c) Scientists have used genetic engineering to develop crop plants which are resistant to herbicides.

(i) Explain why farmers use herbicides.

.....

.....

.....

.....

.....[2]

(ii) A field contains genetically modified crop plants which are resistant to herbicides. It also contains some weeds. The plants are sprayed with herbicides.

State how the herbicide affects:

the weeds

.....

.....

the crop plants.

.....

.....
[2]

[Total: 10]

BLANK PAGE

7 Fig. 7.1 shows a newly planted oil palm plantation, with a rainforest in the background.

The land on which the oil palms are being grown has been cleared by removing part of the forest.

Fig. 7.1

(a) (i) State the term used to describe the removal of forests.

.....[1]

(ii) Removing rainforests puts some species at risk of extinction.

List **three other** undesirable effects of removing rainforests.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(b) The removal of rainforests has reduced the number of orangutans. Their numbers fell from 315 000 in 1900 to 50 000 in 2014.

(i) Calculate the percentage change in the number of orangutans between 1900 and 2014.

Show your working. Give your answer to the nearest whole number.

.....%
[3]

(ii) Outline **two** ways of conserving the orangutan species.

1 .....

.....

2 .....

.....
[2]

(c) Crop plants such as oil palm plants are often grown as monocultures.

Describe **one** negative impact to the environment of growing plants as monocultures.

.....

.....

.....[1]

[Total: 10]

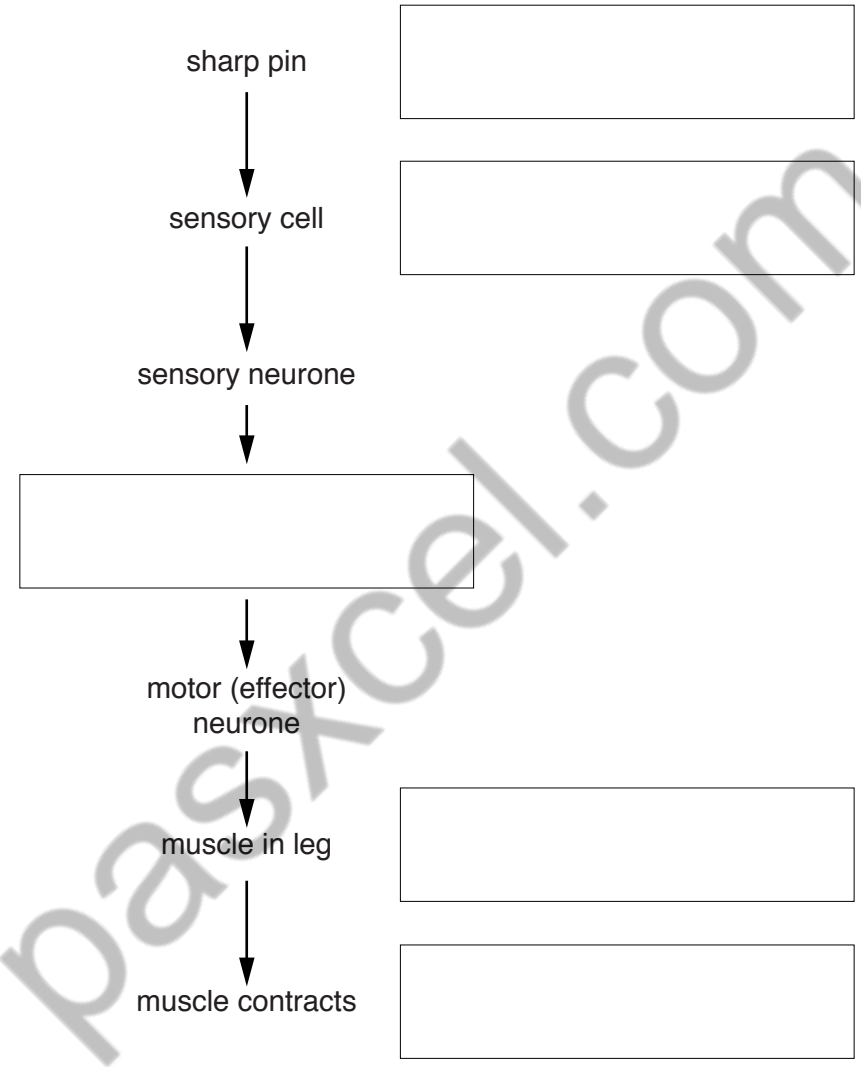
8 A student stood on a sharp pin, causing a nerve impulse to travel along a reflex arc in her nervous system.

Use words from the list to complete the boxes.

Each word may be used once, more than once or not at all.

brain **relay** **neurone** **effector** **receptor**

response **spinal cord** **stimulus**



[5]

[Total: 5]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7774192182

BIOLOGY **0610/41**

Paper 4 Theory (Extended) **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **20** printed pages.

1 **(a)** Fig. 1.1 shows the human heart and the main blood vessels. The functions of the parts of the heart and some of the blood vessels are given in Table 1.1.

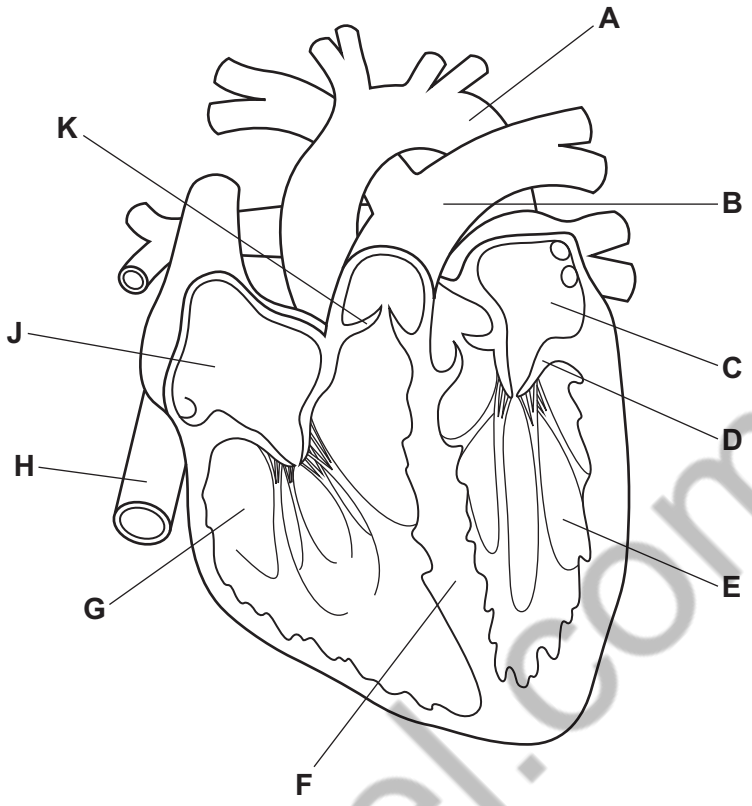


Fig. 1.1

Complete Table 1.1.

One row has been done for you.

Table 1.1

function	letter on Fig. 1.1	name
structure that separates oxygenated and deoxygenated blood		
structure that prevents backflow of blood from ventricle to atrium		
blood vessel that carries oxygenated blood	**A**	aorta
blood vessel that carries deoxygenated blood		
structure that prevents backflow of blood from pulmonary artery to right ventricle		
chamber of the heart that contains oxygenated blood		
chamber of the heart that contains deoxygenated blood		

[6]

(b) A group of students used a heart monitor to record the pulse rate of an athlete during a 5000 metre race. The recordings started just before the race began and ended just after it had finished, as shown in Fig. 1.2.

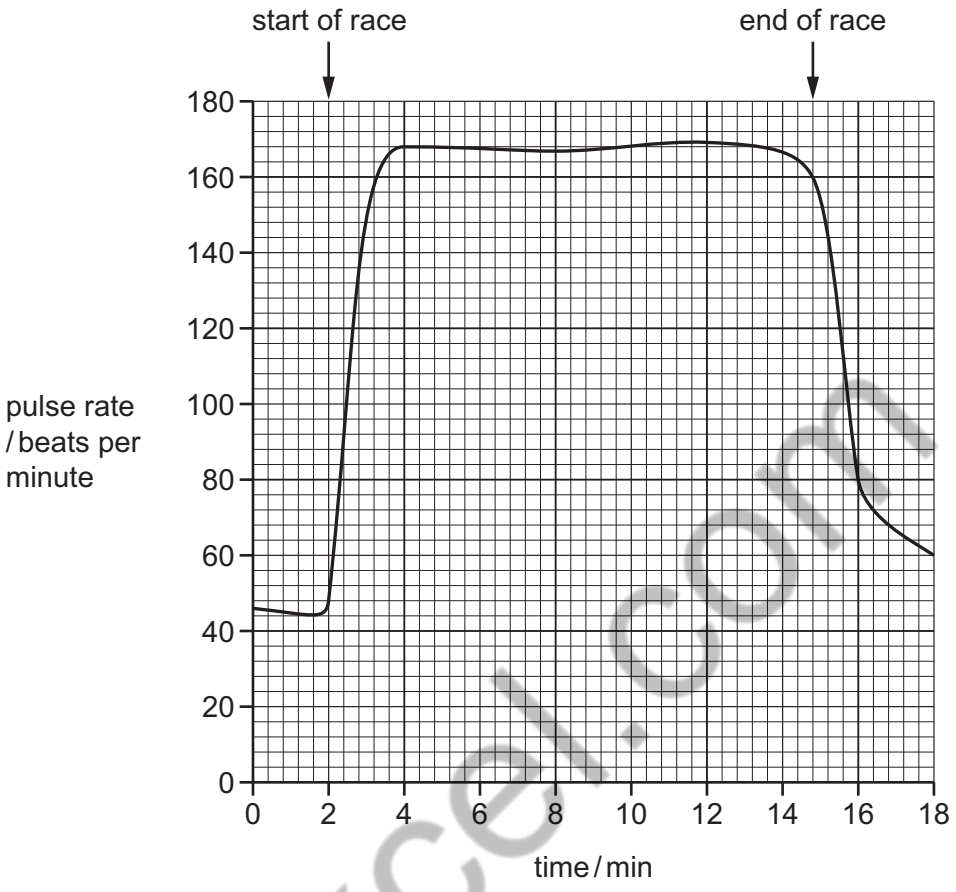


Fig. 1.2

(i) Use data from Fig. 1.2 to describe the effect of exercise on the pulse rate of the athlete.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Explain the change in pulse rate between 2 minutes and 3 minutes after the recordings started.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 13]

2 The nervous system coordinates the responses of animals to changes in their environment.

(a) Fig. 2.1 shows the arrangement of the nervous system in a mammal.

Complete Fig. 2.1 by writing the names of the missing parts of the mammalian nervous system in the boxes.

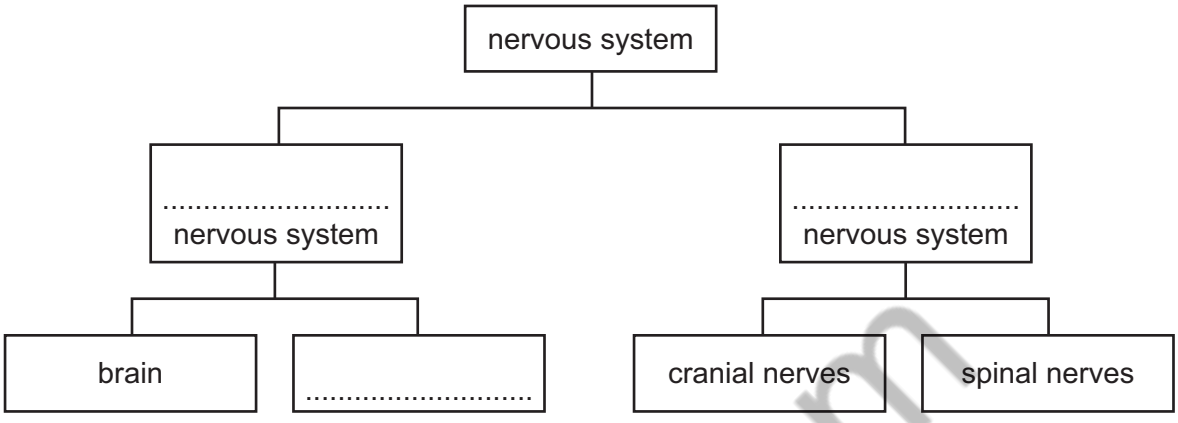


Fig. 2.1

[3]

(b) Fig. 2.2 is a flow chart that shows how an involuntary action is controlled.

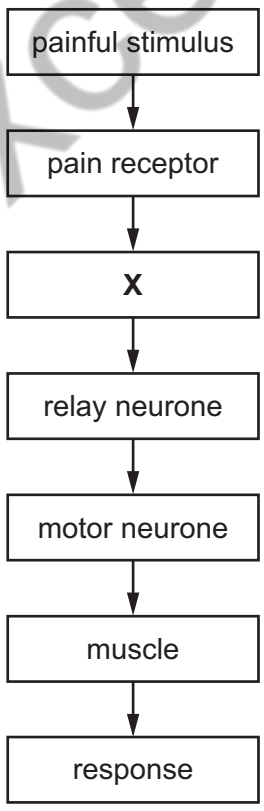


Fig. 2.2

(i) State the structure found at **X**.

..... [1]

(ii) State the type of involuntary action shown by the flow chart.

..... [1]

(iii) State **two** ways in which a voluntary action differs from an involuntary action.

1 .....

.....

2 .....

.....

[2]

(c) Fig. 2.3 shows three pots of seedlings that have been kept in different conditions.

pot **P** pot **Q** pot **R**

Fig. 2.3

(i) State the conditions in which pots **P** and **Q** were kept.

P .....

Q .....

[1]

(ii) State the name of the growth response shown by the seedlings in pot **R**.

..... [2]

(iii) Explain the advantage to the seedlings of this growth response.

.....

.....

.....

.....

..... [2]

(iv) Auxins control the growth responses of seedlings.

Explain how auxins control the growth response of the seedlings in pot **R**.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 16]

3 Catalase is an enzyme that breaks down hydrogen peroxide inside cells. Red blood cells contain catalase.

Some dogs have an inherited condition in which catalase is not produced. This condition is known as acatalasia and it is caused by a mutation in the gene for catalase.

(a) Define the terms *gene* and *gene mutation*.

gene.....

.....

gene mutation.....

.....

[2]

(b) A geneticist was asked to investigate the inheritance of acatalasia in dogs.

The normal allele is represented by **B** and the mutant allele is represented by **b**.

The geneticist made the diagram in Fig. 3.1 to show the inheritance of acatalasia in a family of dogs. The shaded symbols indicate the dogs with acatalasia.

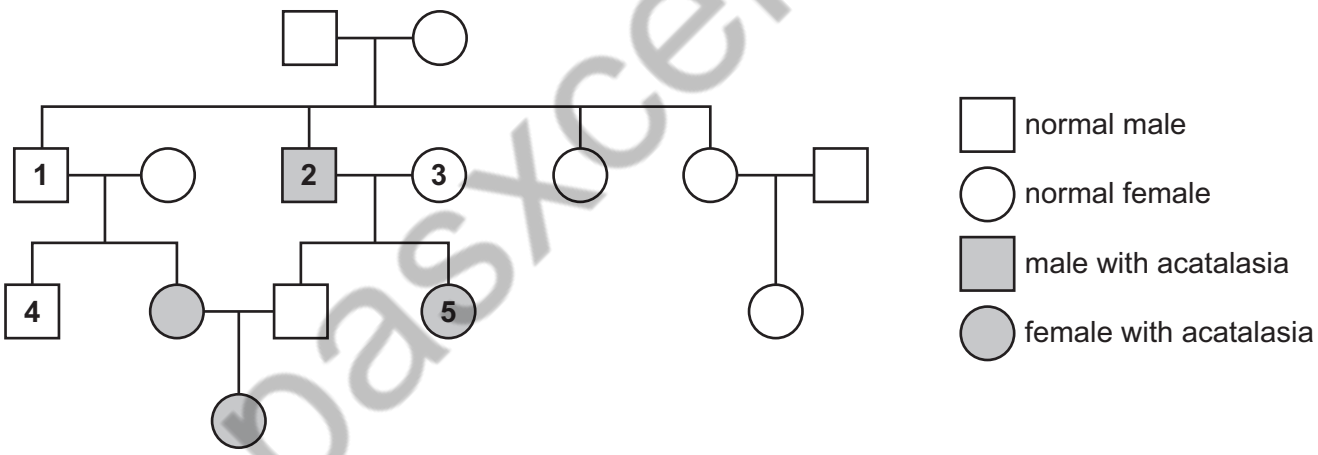


Fig. 3.1

(i) State the genotypes of the dogs identified as **1**, **2** and **3** in Fig. 3.1.

1 .....

2 .....

3 ..... [3]

(ii) The geneticist crossed dog **4** with dog **5**. Approximately half of the offspring had acatalasia and half the offspring did not have acatalasia.

Complete the genetic diagram to show how this is possible.

	dog **4**	dog **5**
parental phenotypes	normal	has acatalasia
parental genotypes	.....	.....
gametes	..... , ...	+ .....

Punnett square

offspring genotypes.....

offspring phenotypes..... [3]

(iii) State the name given to the type of cross that you have completed in **(b)(ii)**.

..... [1]

[Total: 9]

4 *Rhabdostyla* is a single-celled organism that has no cell wall and no chlorophyll.

(a) Gases are exchanged across the cell membrane of *Rhabdostyla*.

Name:

the gas produced by *Rhabdostyla* .....

the process that produces the gas .....

the method of removal of the gas .....

[3]

Rhabdostyla lives in freshwater habitats, such as ponds, lakes and rivers.

Freshwater has a very low concentration of solutes.

Rhabdostyla has a contractile vacuole that fills with water and empties at intervals as shown in Fig. 4.1. The contractile vacuole removes excess water.

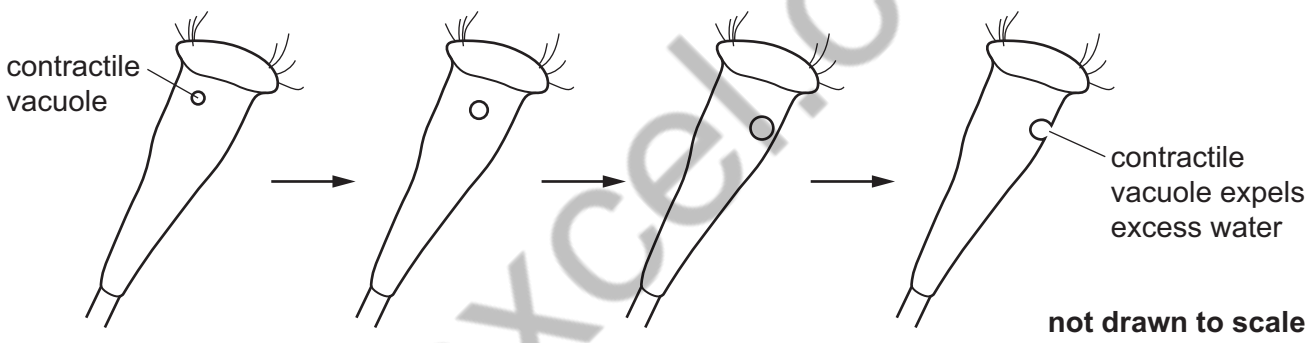


Fig. 4.1

(b) Explain, using the term **water potential**, why *Rhabdostyla* needs to remove excess water.

.....

.....

.....

.....

.....

.....

..... [3]

In an investigation, individual *Rhabdostyla* were placed into different concentrations of sea water. The rate of water excreted by the contractile vacuole of each organism was determined. The results are shown in Fig. 4.2.

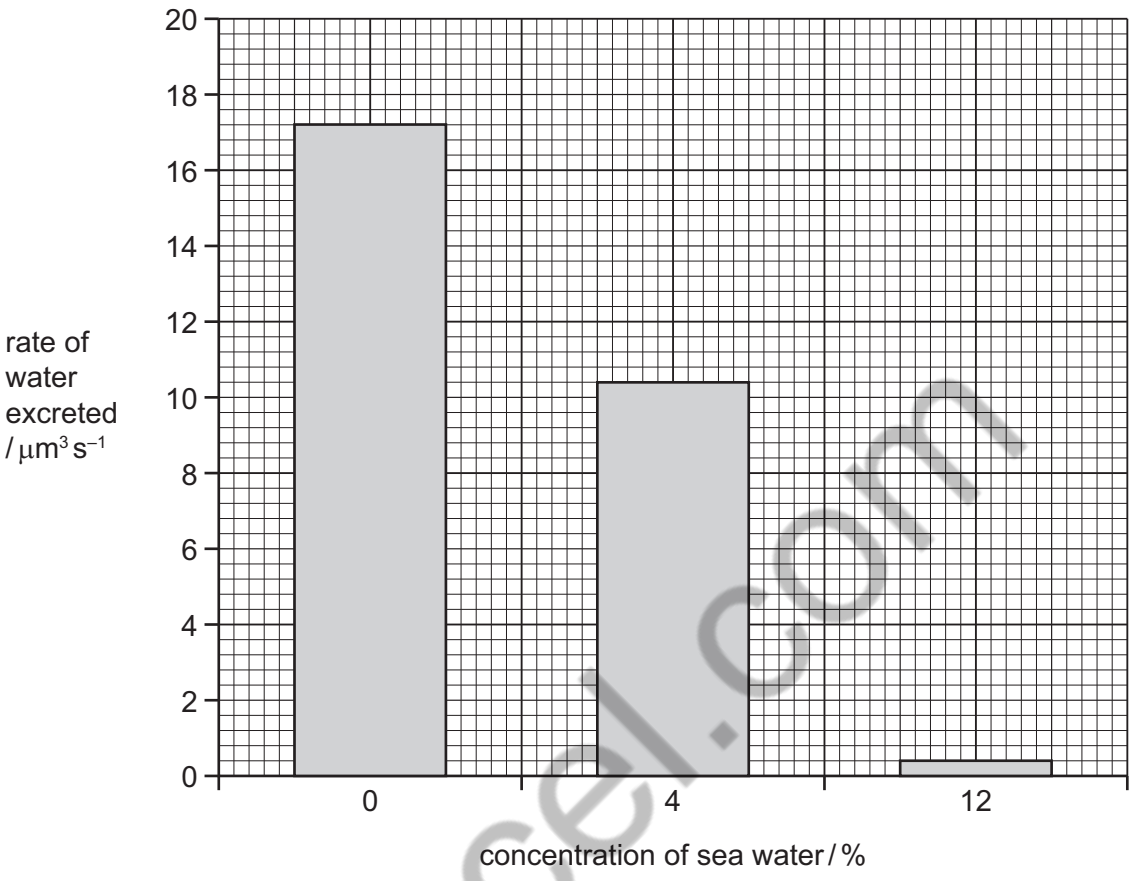


Fig. 4.2

(c) Explain the results shown in Fig. 4.2.

.....

.....

.....

.....

.....

.....

..... [3]

(d) Single-celled organisms with cell walls do not have contractile vacuoles. Suggest why.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 12]

5 A researcher investigated the population growth of fish for fish farming. The researcher stocked a farmer's lake with a small number of these fish and recorded the number of fish over the next five years. The researcher's results showed that the population of fish had increased exponentially.

(a) **(i)** Use the axes to show the **exponential growth** in the population of fish.

Label the axes and draw a suitable curve.

[3]

(ii) Explain why the population of fish increased exponentially.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

Fig. 5.1 shows the total mass of wild fish caught worldwide between 1950 and 2012 and the mass of farmed fish produced worldwide over the same period.

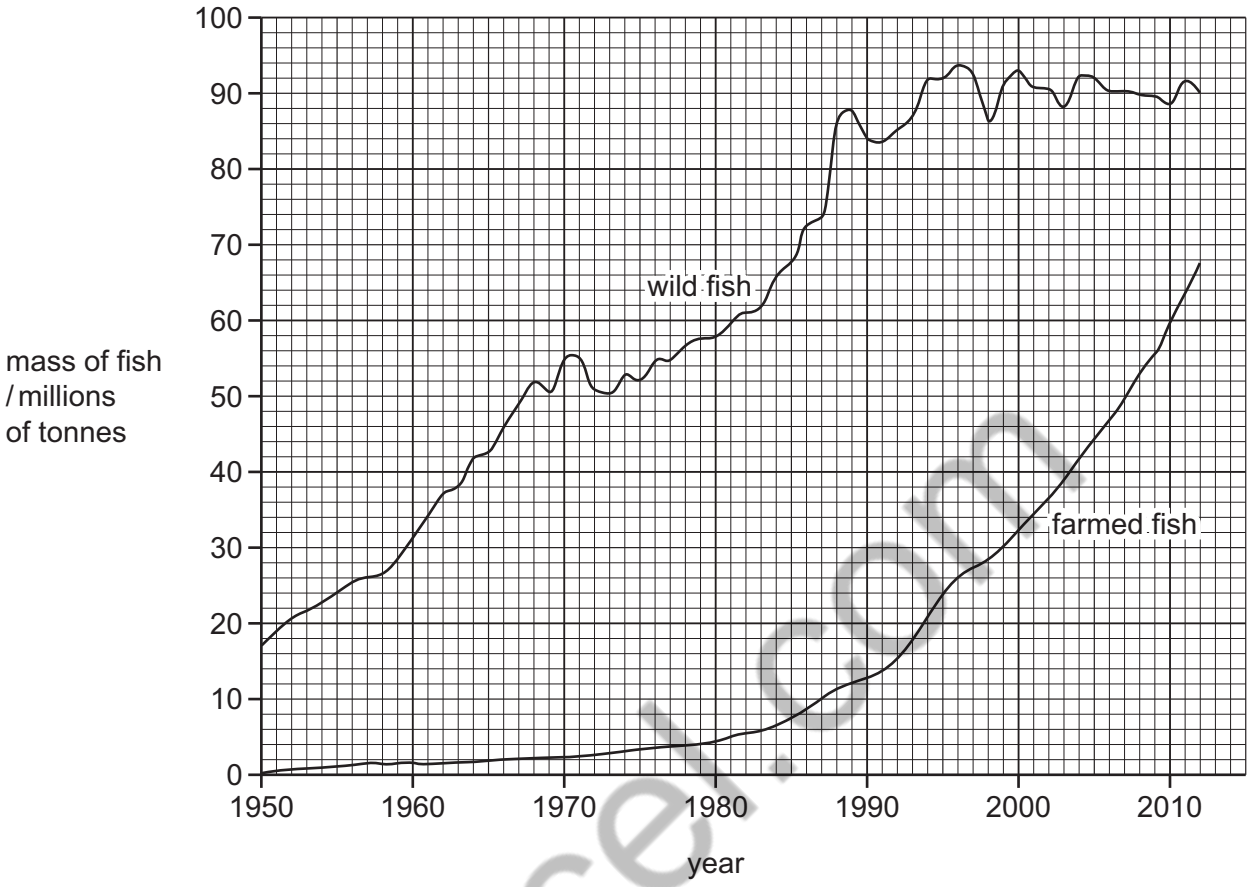


Fig. 5.1

(b) Describe the changes in the mass of **wild fish** caught between 1950 and 2012.

You will gain credit if you use data from Fig. 5.1.

.....

.....

.....

.....

.....

.....

..... [3]

(c) It is predicted that wild fish stocks will decrease and become depleted because of overfishing.

Suggest ways in which governments can try to maintain the stocks of wild fish.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(d) Like fish stocks, forests can be a sustainable resource.

Discuss what is meant by the term *sustainable resource*, using forests as an example.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 19]

6 **(a)** State the balanced chemical equation for photosynthesis.

$$\text{.....} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{.....}$$

[2]

A student investigated the effect of different wavelengths of light on the rate of photosynthesis of the water plant, *Cabomba*.

The student used the apparatus shown in Fig. 6.1.

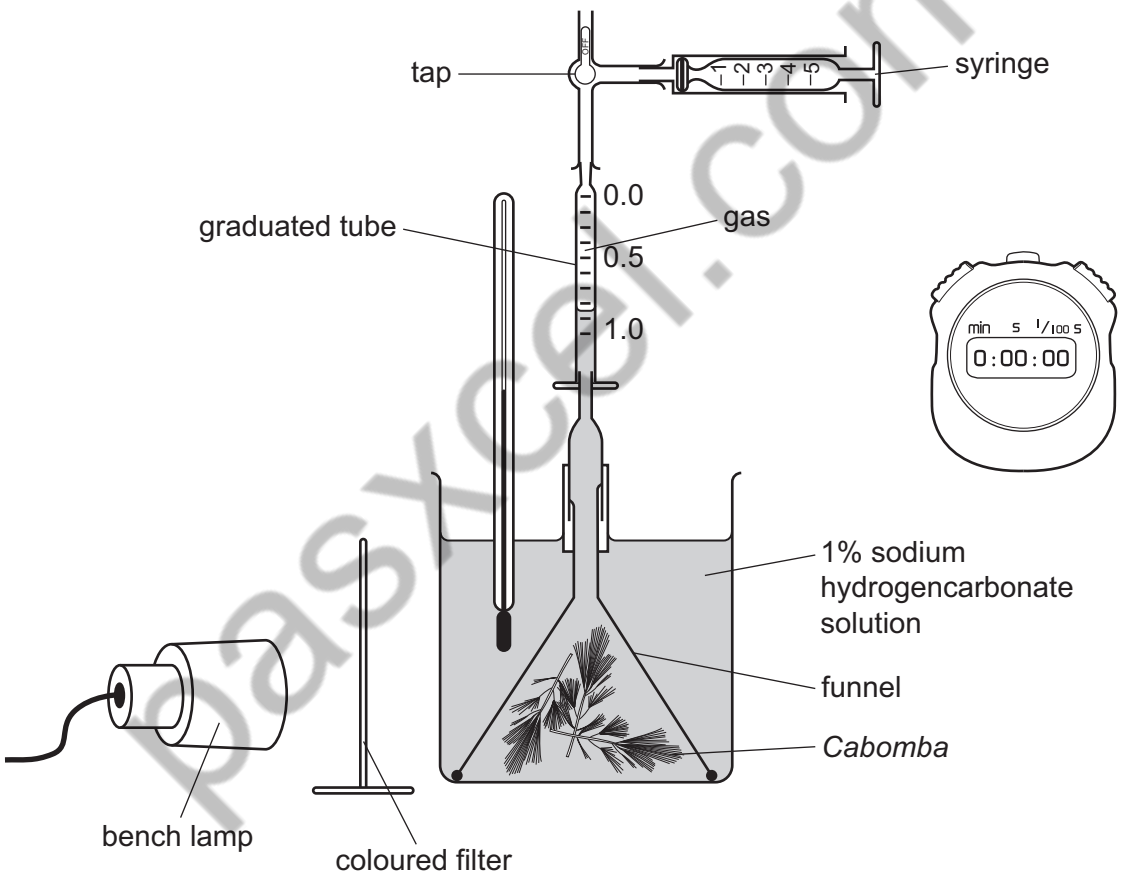


Fig. 6.1

(b) The student collected the gas produced by the plant for five minutes. The results are shown in Table 6.1.

Table 6.1

colour of filter	wavelength of light / nm	volume of gas collected / cm^3
violet	400	0.80
blue	475	0.80
green	550	0.20
yellow	600	0.40
red	675	0.90

Describe the effect of wavelength of light on the rate of photosynthesis as shown in the student's results in Table 6.1.

You will gain credit if you use data from the table.

.....

.....

.....

.....

.....

.....

..... [3]

(c) State how the student would calculate the rates of photosynthesis from the results in Table 6.1.

.....

..... [1]

(d) State why the student:

(i) kept the lamp at the same distance during the investigation,

.....

.....

..... [1]

(ii) used sodium hydrogencarbonate solution.

.....

.....

..... [1]

(e) State **three** uses in a plant of the carbohydrate produced in photosynthesis.

1.....

2.....

3.....

[3]

[Total: 11]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3037277913

BIOLOGY **0610/51**

Paper 5 Practical Test **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **9** printed pages and **3** blank pages.

CAMBRIDGE International Examinations

Read through all the questions on this paper carefully before starting work.

1 Metabolic reactions in cells produce toxic chemicals which can be converted to harmless or less toxic chemicals.

Hydrogen peroxide is broken down using the enzyme catalase which is found in most cells.

Fig. 1.1 shows this reaction.

$$\text{hydrogen peroxide } (2H_2O_2) \xrightarrow{\text{catalase}} \text{water and oxygen } (2H_2O + O_2)$$

Fig. 1.1

You are going to investigate the effect of alcohol (ethanol) on the activity of catalase found in potato.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in question 1 (a)(ii).

You should use the safety equipment provided while you are carrying out the practical work.

The potato pieces in dishes **A** and **B** have both been cut to the same size.

(a) (i) Measure the length, width and height of one of the pieces of potato.

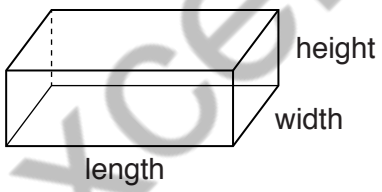


Fig. 1.2

Record your results in Table 1.1.

Table 1.1

length of potato piece /mm	width of potato piece /mm	height of potato piece /mm

[1]

Step 1 Label four test-tubes, **A1**, **A2**, **B1** and **B2**. Add 10 cm^3 of hydrogen peroxide solution to each of the test-tubes.

Step 2 Cut two 30 mm × 10 mm × 2 mm slices from the potato piece in dish **A**.
Leave the slices in dish **A** with the remaining portion of the potato piece.
When cutting, use a white tile and cut away from your hand.

Step 3 Cut two 30 mm × 10 mm × 2 mm slices from the potato piece in dish **B**.
Leave the slices in dish **B** with the remaining portion of the potato piece.
When cutting, use a white tile and cut away from your hand.

Step 4 Place the free end of the delivery tube into the large test-tube of water.

Step 5 Use forceps to remove one of the 30 mm × 10 mm × 2 mm slices of potato from dish **A** and put the slice into the hydrogen peroxide solution in test-tube **A1**.

Step 6 **Immediately** place the rubber bung containing the delivery tube into test-tube **A1**, as shown in Fig. 1.3. Make sure it fits tightly. Start the timer.

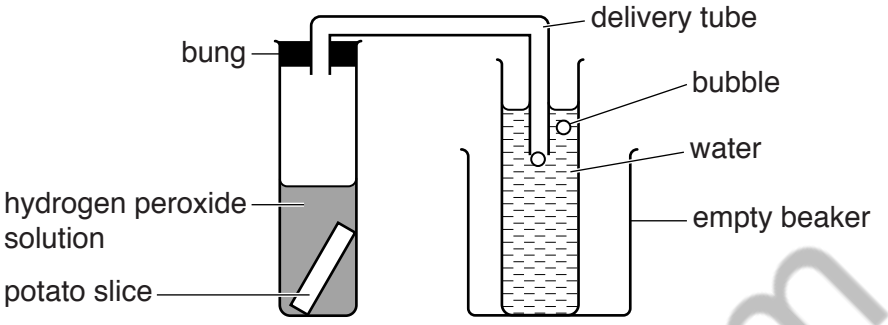


Fig. 1.3

Step 7 Count the number of bubbles released from the delivery tube for 3 minutes. Record your observations in your results table in question **1 (a)(ii)**.

Step 8 Repeat steps **4** to **7** for the second 30 mm × 10 mm × 2 mm slice of potato from dish **A** and use test-tube **A2**.

Step 9 Repeat steps **4** to **8** for the 30 mm × 10 mm × 2 mm slices of potato from dish **B** and use test-tubes **B1** and **B2**.

(ii) Prepare a table to record your results.
Your table should show:

- the numbers of bubbles produced by each slice of potato in 3 minutes
- the mean number of bubbles produced by the potato piece from each of dishes **A** and **B**.

Record your results in your table as you carry out the practical work.

[6]

[Turn over

(b) Explain why the bung of the delivery tube must fit tightly into the test-tube.

.....

.....

.....[2]

(c) The potato pieces that you used were soaked in different concentrations of alcohol for 24 hours.

- The potato piece in dish **A** had been soaked in 20% alcohol.
- The potato piece in dish **B** had been soaked in 2% alcohol.

(i) Suggest the relationship between the number of bubbles and the activity of catalase.

.....

.....

.....[1]

(ii) Compare the activity of catalase in the potato pieces from dish **A** and dish **B**.

.....

.....

.....[1]

(iii) Predict the number of bubbles that would be produced in 3 minutes if a piece of potato was soaked in 50% alcohol before being placed in hydrogen peroxide solution.

.....[1]

(d) (i) State **one** variable that you controlled in this investigation.

Describe how this variable was controlled.

variable .....

how it was controlled .....

.....

.....

[2]

(ii) The method you used to measure the oxygen gas produced is a source of error.

State **one** reason why this method is a source of error.

.....

.....

Suggest how to improve the method to minimise this error.

.....

.....

.....

[2]

(iii) Identify **one** other source of error. State why this is a source of error.

source of error .....

.....

reason .....

.....

.....

[2]

(iv) Describe a control experiment that you could carry out for this investigation. **Do not carry out this experiment**.

.....

.....

.....

.....

.....[2]

(v) Predict the result you would expect from the control experiment described in **(iv)**.

.....

.....[1]

(e) State one safety precaution required when ethanol is used in an investigation.

.....

.....

.....[1]

(f) In an investigation into the effects of alcohol on the nervous system, people were asked to carry out a test on their reaction time.

The person being tested looked at a coloured block on a computer screen.
As soon as the colour changed they pressed a button.
The time taken to press the button was recorded by the computer.
This was their reaction time.

Twenty people were tested before and after consuming a drink containing the same concentration of alcohol.

Table 1.2 shows the results of this investigation.

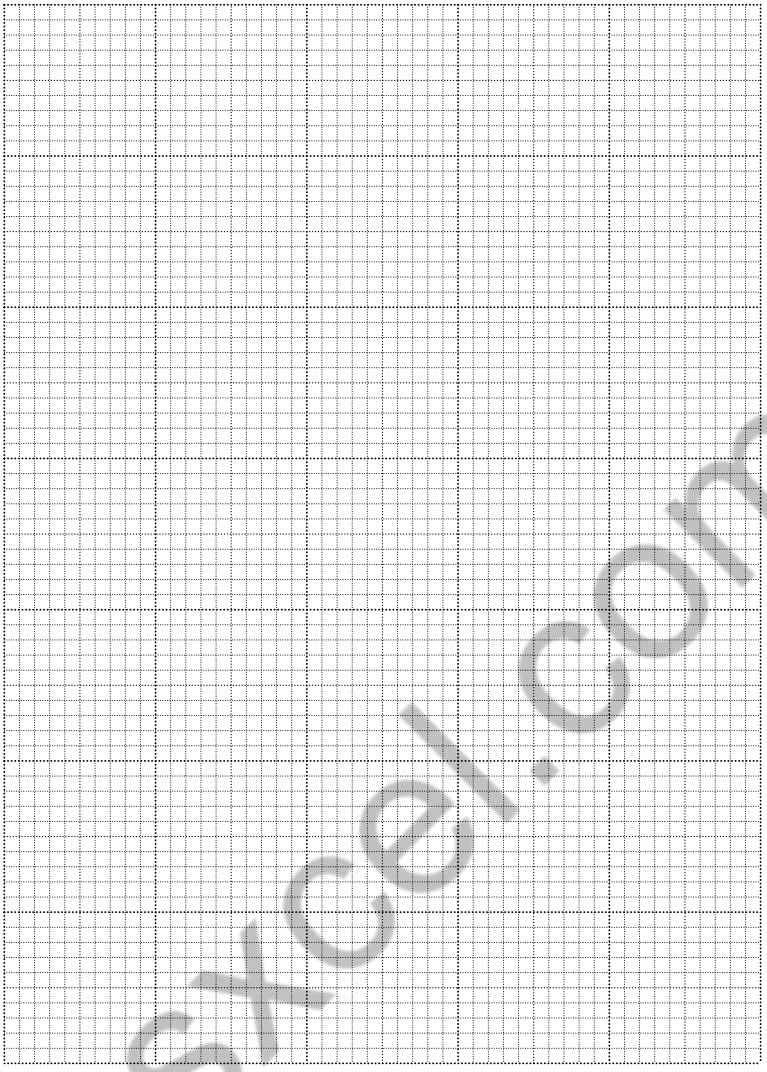
Table 1.2

test person	reaction time before consuming alcohol / milliseconds	reaction time after consuming alcohol / milliseconds
1	272	322
2	310	350
3	225	270
4	243	290
5	240	308
6	264	315
7	201	238
8	262	300
9	225	252
10	235	278
11	225	253
12	247	271
13	226	266
14	194	220
15	206	239
16	309	340
17	223	261
18	243	286
19	270	316
20	180	225
mean	240	

(i) Calculate the mean for the reaction time after consuming alcohol.

Write your answer in Table 1.2. [1]

(ii) Plot a bar chart to show the **mean** reaction time of the people tested before and after consuming alcohol.



[3]

(iii) The range of reaction times recorded before consuming alcohol is 180–310 milliseconds.

Use Table 1.2 to identify the range of reaction times recorded after consuming alcohol.

..... milliseconds [1]

[Total: 27]

2 Fig. 2.1 is a photograph of a cross-section of a vascular bundle in a leaf.
Line **AB** shows the length of the vascular bundle.

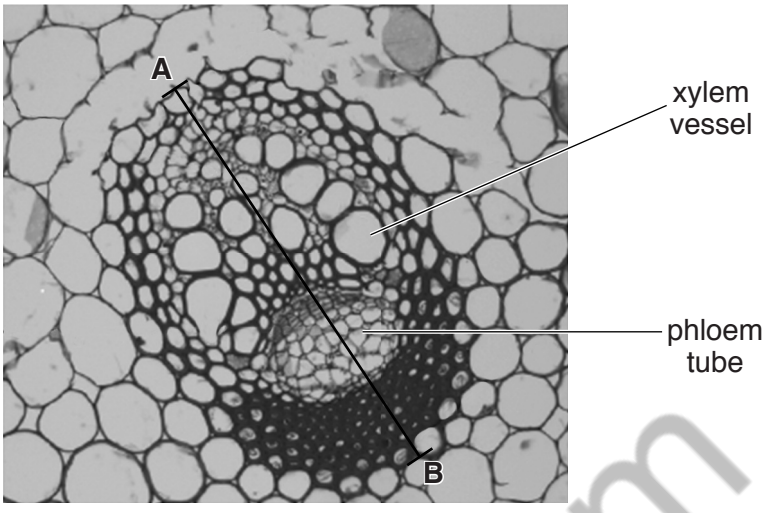


Fig. 2.1

(a) (i) Make a large drawing to show the different regions of the vascular bundle shown in Fig. 2.1.
Do **not** draw any individual cells.
Identify and label on your drawing the position of the xylem vessel as shown in Fig. 2.1.

[5]

(ii) Measure the length of line **AB** as shown on Fig. 2.1. **Include the unit.**

Length of **AB** .....

Mark on your drawing a line in the same position as **AB**.

Measure the line you have drawn.

Length of line on drawing .....

$$\text{magnification} = \frac{\text{length of line on drawing}}{\text{length of } \mathbf{AB}}$$

Calculate the magnification of your drawing using the information above and your answers.

Show your working.

magnification .....
[3]

(iii) State **one** way **visible** in Fig. 2.1 in which the xylem vessel is different from the phloem tube.

.....

.....

.....[1]

(b) The walls of xylem vessels are supported by a chemical called lignin, which can be stained by a red dye. This makes the xylem vessel walls easily seen when using a microscope.

Use this information to plan how you could find the position of the vascular bundles in a stem.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 13]

BLANK PAGE

BLANK PAGE

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

1752245066

BIOLOGY **0610/61**

Paper 6 Alternative to Practical **May/June 2016**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **10** printed pages and **2** blank pages.

BLANK PAGE

1 Metabolic reactions in cells produce toxic chemicals which can be converted to harmless or less toxic chemicals.

Hydrogen peroxide is broken down using the enzyme catalase which is found in most cells.

Fig. 1.1 shows this reaction.

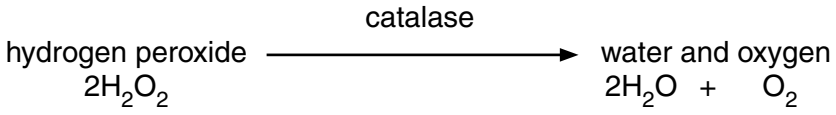


Fig. 1.1

A student investigated the effect of alcohol (ethanol) on the activity of catalase found in potato, using three pieces of potato cut to the same size.

Fig. 1.2 shows these pieces of potato.

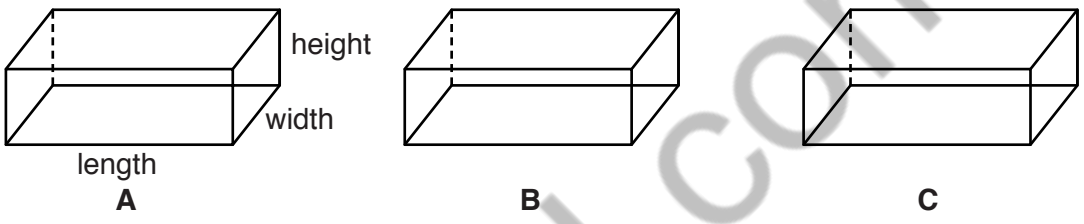


Fig. 1.2

(a) (i) Measure the length, width and height of one of these pieces of potato.

Record your results in Table 1.1.

Table 1.1

length of potato piece /mm	width of potato piece /mm	height of potato piece /mm

[1]

Step 1 The student labelled six test-tubes, **1**, **2**, **3**, **4**, **5**, and **6** and used a syringe to add 10 cm^3 of hydrogen peroxide solution to each of the test-tubes.

Step 2 They cut potato piece **A** to obtain two slices of similar size.

Step 3 The student placed the free end of a delivery tube into a large test-tube containing water.

Step 4 They placed one of the slices of potato piece **A** into the hydrogen peroxide solution in test-tube **1**.

Step 5 The student immediately placed the rubber bung attached to the delivery tube into test-tube **1** and pushed it in as tightly as possible, as shown in Fig. 1.3.

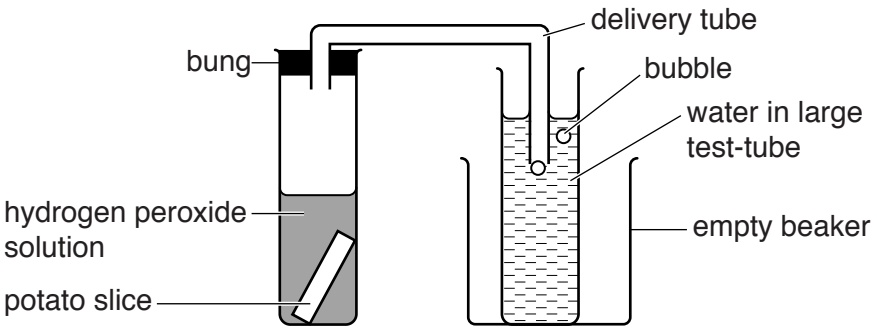


Fig. 1.3

Step 6 They counted the number of bubbles released from the delivery tube in 3 minutes.

Step 7 The student repeated steps **4–6** for the second slice of potato piece **A** using test-tube **2**.

Step 8 They repeated steps **2–7** for potato piece **B** using test-tubes **3** and **4**.

Step 9 They repeated steps **2–7** for potato piece **C** using test-tubes **5** and **6**.

The student used a tally to count the number of bubbles.

Fig. 1.4 shows their tally count.

A1	𝍸	**A2**	III
B1	𝍸 𝍸 𝍸 III	**B2**	𝍸 𝍸 I
C1	𝍸 𝍸 II	**C2**	𝍸 𝍸

Fig. 1.4

(ii) Prepare a table to record the student's results.
Your table should show:

- the numbers of bubbles produced by each slice of potato in 3 minutes
- the mean number of bubbles produced by each of potato piece **A**, **B** and **C**.

Complete your table using the results from Fig. 1.4.

[5]

(b) (i) Suggest why the free end of the delivery tube was placed in the water before adding the potato slice to the hydrogen peroxide solution and connecting the test-tube to the bung of the delivery tube.

.....

.....

.....[1]

(ii) Explain why the bung of the delivery tube must fit tightly into the test-tube.

.....

.....

.....[2]

(c) The pieces of potato that the student used in their investigation were soaked in different concentrations of alcohol for 24 hours.

- Potato piece **A** was soaked in 20% alcohol.
- Potato piece **B** was soaked in 2% alcohol.
- Potato piece **C** was soaked in 10% alcohol.

(i) Suggest the relationship between the number of bubbles and the activity of catalase.

.....

.....

.....[1]

(ii) Compare the activity of catalase in the potato pieces **A**, **B** and **C**.

.....

.....

.....[1]

(iii) Predict the number of bubbles that would be produced in 3 minutes if a piece of potato was soaked in 50% alcohol before being placed in hydrogen peroxide solution.

.....[1]

(d) (i) State **one** variable that has been controlled in the student's investigation.

Describe how this variable was controlled.

variable .....

how it was controlled .....

.....

.....

[2]

(ii) The method of measuring the oxygen gas produced is a source of error.

State **one** reason why this method is a source of error.

.....

.....

Suggest how to improve the method to minimise this error.

.....

.....

.....

[2]

(iii) Identify the source of error in step **2**. State why this is a source of error.

source of error .....

.....

reason .....

.....

.....

[2]

(iv) Describe a control experiment that the student could carry out for this investigation.

.....

.....

.....

.....

.....[2]

(v) Predict the result expected from the control experiment described in **(iv)**.

.....

.....[1]

(e) State one safety precaution required when ethanol is used in an investigation.

.....

.....

.....[1]

(f) In an investigation into the effects of alcohol on the nervous system, people were asked to carry out a test on their reaction time.

The person being tested looked at a coloured block on a computer screen.
As soon as the colour changed they pressed a button.
The time taken to press the button was recorded by the computer.
This was their reaction time.

Twenty people were tested before and after consuming a drink containing the same concentration of alcohol.

Table 1.2 shows the results of this investigation.

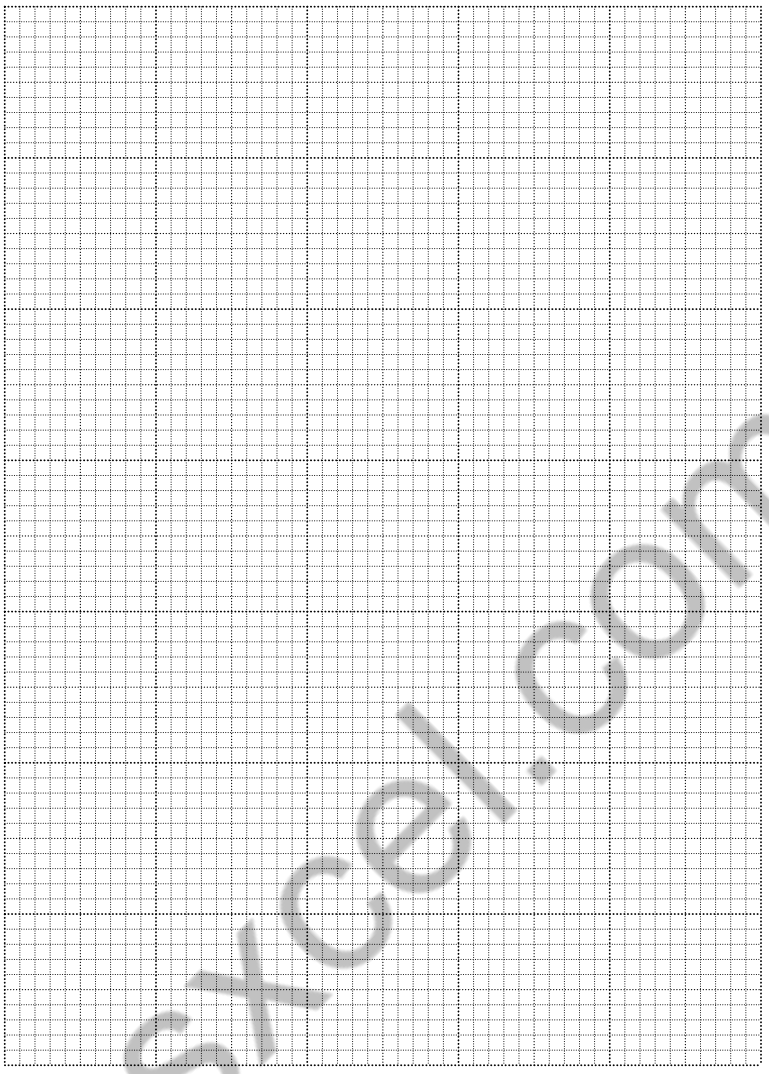
Table 1.2

test person	reaction time before consuming alcohol / milliseconds	reaction time after consuming alcohol / milliseconds
1	272	322
2	310	350
3	225	270
4	243	290
5	240	308
6	264	315
7	201	238
8	262	300
9	225	252
10	235	278
11	225	253
12	247	271
13	226	266
14	194	220
15	206	239
16	309	340
17	223	261
18	243	286
19	270	316
20	180	225
mean	240	

(i) Calculate the mean for the reaction time after consuming alcohol.

Write your answer in Table 1.2. [1]

(ii) Plot a bar chart to show the **mean** reaction time of the people tested before and after consuming alcohol.



[3]

(iii) The range of reaction times recorded before consuming alcohol is 180–310 milliseconds.

Use Table 1.2 to identify the range of reaction times recorded after consuming alcohol.

..... milliseconds [1]

[Total: 27]

2 Fig. 2.1 is a photograph of a cross-section of a vascular bundle in a leaf.
Line **AB** shows the length of the vascular bundle.

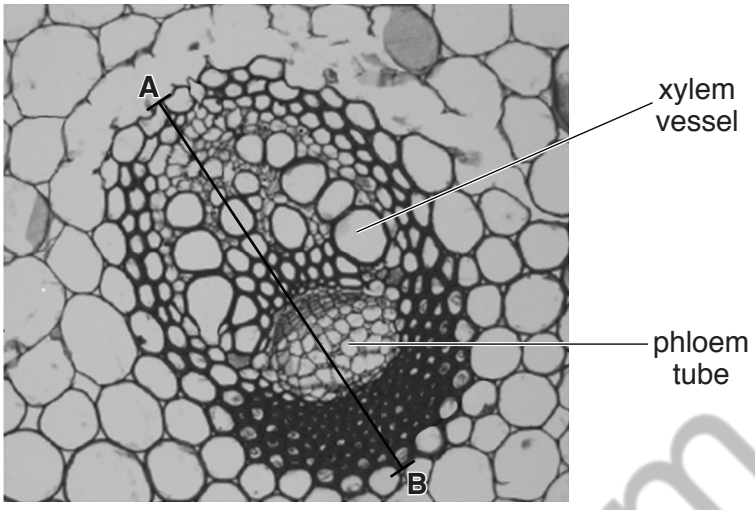


Fig. 2.1

(a) (i) Make a large drawing to show the different regions of the vascular bundle shown in Fig. 2.1.
Do **not** draw any individual cells.
Identify and label on your drawing the position of the xylem vessel as shown in Fig. 2.1.

[5]

(ii) Measure the length of line **AB** as shown on Fig. 2.1. **Include the unit**.

Length of **AB** .....

Mark on your drawing a line in the same position as **AB**.

Measure the line you have drawn.

Length of line on drawing .....

$$\text{magnification} = \frac{\text{length of line on drawing}}{\text{length of } \mathbf{AB}}$$

Calculate the magnification of your drawing using the information above and your answers.

Show your working.

magnification .....
[3]

(iii) State **one** way **visible** in Fig. 2.1 in which the xylem vessel is different from the phloem tube.

.....

.....

.....[1]

(b) The walls of xylem vessels are supported by a chemical called lignin, which can be stained by a red dye. This makes the xylem vessel walls easily seen when using a microscope.

Use this information to plan how you could find the position of the vascular bundles in a stem.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 13]

BLANK PAGE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/11**

Paper 1 Multiple Choice (Core) **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Question Number	*Key*	*Question Number*	*Key*
1	**C**	21	**C**
2	**C**	22	**D**
3	**C**	23	**C**
4	**B**	24	**C**
5	**B**	25	**C**
6	**C**	26	**D**
7	**B**	27	**D**
8	**A**	28	**C**
9	**C**	29	**B**
10	**A**	30	**A**
11	**C**	31	**B**
12	**C**	32	**C**
13	**B**	33	**A**
14	**D**	34	**D**
15	**C**	35	**D**
16	**B**	36	**C**
17	**B**	37	**B**
18	**A**	38	**C**
19	**C**	39	**B**
20	**B**	40	**A**

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/21**

Paper 2 Multiple Choice (Extended) **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Question Number	*Key*	*Question Number*	*Key*
1	**C**	21	**D**
2	**C**	22	**D**
3	**C**	23	**C**
4	**B**	24	**B**
5	**B**	25	**D**
6	**B**	26	**B**
7	**B**	27	**B**
8	**B**	28	**B**
9	**C**	29	**C**
10	**A**	30	**B**
11	**C**	31	**B**
12	**B**	32	**A**
13	**D**	33	**B**
14	**A**	34	**D**
15	**C**	35	**C**
16	**B**	36	**B**
17	**A**	37	**D**
18	**A**	38	**B**
19	**A**	39	**A**
20	**D**	40	**A**

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/32**

Paper 3 Theory (Core) **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

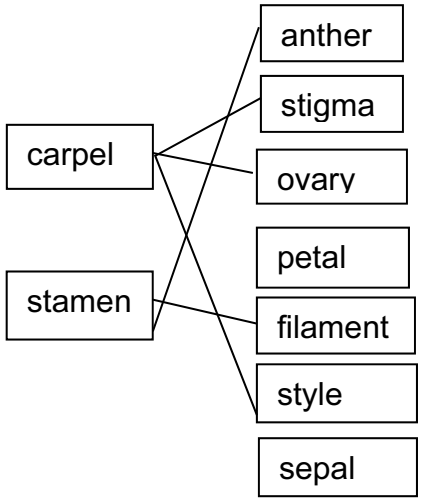
Abbreviations used in the Mark Scheme:

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Mark scheme	Mark	Guidance
1 (a) (i)	ref. to vertebral column / backbone ; skull ;	[max. 1]	
(ii)	dry skin ; ref. to scales ; eggs with, dry shell / leathery shell ;	[max. 2]	
(iii)	no limbs / legs ;	[1]	
(b) (i)	<u>amphibian ;</u>	[1]	
(ii)	smooth skin / no scales ; gas exchange using skin ; spend part of life (cycle) in water and land/ AW ; ref. to metamorphic life cycle / AW ;	[max. 2]	

Question	Mark scheme	Mark	Guidance
(c)	better survival of egg ; fewer eggs need to be produced ; less risk of predation ; maintains suitable temperature ; reduces risk of disease AW ; protected from external environment ;	[max. 2]	
		[Total: 9]	
2 (a)	precipitation ;	[1]	
(b) (i)	transpiration / evaporation ;	[1]	
(ii)	excretion ;	[1]	
(c) (i)	herbivore / primary consumer ;	[1]	**I** consumer unqualified.
(ii)	disease-causing organism ;	[1]	

Question	Mark scheme	Mark	Guidance
(d)	water recycled AW ; fish waste used as fertiliser ; don't need to buy, water / fertiliser / compost soil ; better land use / can use brown field site / land not suitable for traditional farming ; farmland can be used for other crops ; no heating costs / glasshouse is self-heating / AW ; *idea of* two crops for one lot of resources ;	[max. 3]	
(e) (i)	(resource) produced as rapidly as it is removed; from the environment; so it does not run out;	[max 2]	
(ii)	no fish removed from the wild / AW ; could be used to add fish to wild / AW ; *idea of* no predators ;	[max 1]	
		[Total: 11]	

Question	Mark scheme	Mark	Guidance
3 (a)	 ;;;;	[4]	4 or 5 lines correct for 4 marks 3 lines correct for 3 marks 2 lines correct for 2 marks 1 lines correct for 1 mark

Question	Mark scheme	Mark	Guidance
(b)	sperm swim through cervix / uterus ; ref. to sperm moving to / zygote passing through (after fertilisation), oviduct ; to egg (cell) / ovum ; ref. to enzymes in sperm (head) ; ref. to fertilisation / nuclei (of sperm and egg) fuse ; to form a zygote ; jelly coat changes (to prevent entry of more sperm) ; ref. to cell division / mitosis ; ref. to embryo is a ball of cells ; (embryo) implants into uterus wall ;	[max 4]	
(c)	(takes place as) part of sexual reproduction ; (products) genetically different ; formation of, gametes / sex cells / eggs and sperm ; four (daughter) cells produced ; AVP ;	[max 2]	**A** results in half the number of chromosomes / formation of haploid nuclei **A** has two divisions
		[Total: 10]	

Question	Mark scheme	Mark	Guidance
4 (a) (i)	A cell wall ; B nucleus ; C vacuole ;	[3]	
(ii)	glucose / simple sugars ;	[1]	
(iii)	absorbs water ; absorbs mineral, salts / ions ;	[2]	
(iv)	provides large surface (area) ;	[1]	
(b)	1. (name) chloroplast(s) ; 2. contain chlorophyll ; 3. ref. to photosynthesis ; 4. absorb / traps / uses, energy / light ; 5. to produce glucose for the plant / AW ;	[max 3]	
		[Total: 10]	
5 (a) (i)	25–34	[1]	
(ii)	increases (with age) ; plateaus between 45–64 ; then falls (at / after 65) ;	[max 2]	

Question	Mark scheme	Mark	Guidance
(iii)	higher risk for men ; men twice as high as women / 40% for men and 20% for women / difference is 20% ;	[2]	
(b)	diet qualified ; stress ; smoking / tobacco ; genetic predisposition ; AVP ;	[max 3]	**R** age / gender qualification must be a factor that leads to CHD **A** obesity
(c)	**F** ;	[1]	
(d) (i)	listening to (heart sounds) ;	[1]	
(ii)	prevents blood flowing backwards / AW ;	[1]	
(iii)	8 (times) ;	[1]	
(iv)	$8 \times 6 =$ 48 ;;	[2]	
(v)	*idea of* heart beats / pulse rate faster, more frequent / more peaks / peaks closer together;	[1]	
		[Total: 15]	

<table>
<tr><th>Question</th><th>Mark scheme</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>6 (a)</td><td>Change the genetic material (of an organism) ;
By removing / changing / inserting (individual) genes ;
From one organism / species to another ;</td><td>[max 2]</td><td></td></tr>
<tr><td>(b) (i)</td><td>rapid reproduction ;
can make complex molecules ;
cheaper to produce ;
ref. to no ethical issues ;</td><td>[max 2]</td><td></td></tr>
<tr><td>(ii)</td><td><table><tr><th>statement</th><th>uses genetic engineering?</th></tr><tr><td>producing fruit juice using pectinase</td><td></td></tr><tr><td>introducing genes into crop plants to provide additional vitamins</td><td>✓ ;</td></tr><tr><td>selective breeding to produce organisms with desirable features</td><td></td></tr><tr><td>placing a section of DNA into bacteria to produce human insulin</td><td>✓ ;</td></tr><tr><td>using yeast to produce ethanol</td><td></td></tr><tr><td>the use of contraceptive implants in birth control</td><td></td></tr></table></td><td>[2]</td><td>3 ticks–deduct 1 mark
4, 5 or 6 ticks = 0 marks</td></tr>
</table>

Question	Mark scheme	Mark	Guidance
(c) (i)	to kill weeds; to reduce competition, with weeds / for resources; to increase crop yield;	[max 2]	
(ii)	(the weeds) kills them AW ; (the crop plants)no effect / does not kill them ;	[2]	
		[Total: 10]	
7 (a) (i)	deforestation;	[1]	
(ii)	habitat destruction / AW ; disruption of food chain ; soil erosion / loss of soil / AW ; flooding ; increase in CO_2 in the atmosphere / less CO_2 absorbed / photosynthesis, by trees / ref. to global warming ;	[max 3]	**I** refs to extinction **A** idea of landslides **R** refs. to ozone
(b) (i)	84% ;;;	[3]	correct working $\frac{315\,000 - 50\,000}{315\,000} \times 100$ or $\frac{265\,000}{315\,000} \times 100$

Question	Mark scheme	Mark	Guidance
(ii)	monitoring species; protection of species; monitoring habitat; protection / replenishment, of habitat; ref. to food source; keeping in, zoos / reserves; captive breeding programme; education programme; ecotourism;	[max 2]	**A** no poaching / no pet trade / by legislation
(c)	loss of biodiversity; less resistance to diseases / pests;	[max 1]	
		[Total: 10]	

Question	Mark scheme	Mark	Guidance
8	stimulus; receptor; relay / relay neurone; effector; response;	[5]	
		[Total: 5]	

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/41**

Paper 4 Theory (Extended) **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Abbreviations used in the Mark Scheme:

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1 (a)</td><td>
<table>
<tr><th>function</th><th>letter on Fig. 1.1</th><th>name</th></tr>
<tr><td>structure that separates oxygenated and deoxygenated blood</td><td>F</td><td>septum ;</td></tr>
<tr><td>structure that prevents backflow of blood from ventricle to atrium</td><td>D</td><td>bicuspid / mitral / atrioventricular, valve ;</td></tr>
<tr><td>blood vessel that carries oxygenated blood</td><td>A</td><td>aorta</td></tr>
<tr><td>blood vessel that carries deoxygenated blood</td><td>B

H</td><td>pulmonary artery

vena cava ;</td></tr>
<tr><td>structure that prevents backflow of blood from pulmonary artery to right ventricle</td><td>K</td><td>semilunar valve ;</td></tr>
<tr><td>chamber of the heart that contains oxygenated blood</td><td>C
E</td><td>left atrium
left ventricle ;</td></tr>
<tr><td>chamber of the heart that pumps deoxygenated blood</td><td>J
G</td><td>right atrium
right ventricle ;</td></tr>
</table>
</td><td>[6]</td><td>A ‘AV valve’
R right atrioventricular valve</td></tr>
<tr><td>(b) (i)</td><td>pulse rate increases and remains constant ;
immediate / sudden / steep / rapid / AW, increase in pulse rate ;
increases from 44–48 bpm to 164–170 bpm ;

maximum / 164–170 bpm, at, 4 min(utes) / 2 min(utes) after race starts ;</td><td>[max 3]</td><td>units must be used
R exponential
increases by 120–126 bpm / by 3.5 to 4 times
or approx. 4</td></tr>
</table>

Question	Answer	Mark	Guidance
(ii)	adrenaline stimulates increase in, heart / pulse, rate ; increase in blood, carbon dioxide (concentration) / acidity, detected ; nerves stimulate heart to beat faster ; ref to muscle contraction / AW ; muscles require more energy / muscles are doing more work ; (rate of aerobic) respiration increases ; increase demand for, oxygen / glucose ; ref to removal of, carbon dioxide / lactic acid / heat ; more, blood / carbon dioxide, to lungs (per unit time) ; more, blood / oxygen / glucose, to muscles ; AVP ; e.g. ref to ATP / vasodilation in muscles	[max 4]	**A** decrease in pH 'more' / 'increases', is only needed once **R** 'produce energy' once only
		[Total: 13]	
2 (a)	central (nervous system) ; peripheral (nervous system) ; spinal cord ;	[3]	**R** spine
(b) (i)	sensory neurone ;	[1]	**A** afferent neurone **R** sensory nerve
(ii)	simple reflex / reflex ;	[1]	**A** reflex arc
(iii)	slower / takes more time ; needs thought / uses (higher centres of) the brain / conscious control ; learnt / not inherited / not innate / needs training / AW ; not automatic ; response is not always the same to the stimulus ;	[max 2]	

Question	Answer	Mark	Guidance
(c) (i)	*either* **pot P** – (uniform) light AND **pot Q** – no light / dark / covered (up) **;** *or* **pot P** – (uniform) with / plus, magnesium AND **pot Q** – no magnesium **;**	[1]	**A** pot P has all nutrients
(ii)	positive **;** (photo)tropism / (photo)tropic **;**	[2]	**R** (photo)trophic / geotropic / gravitropic
(iii)	*idea that* leaves / seedlings / plants / chloroplasts, get more light **;** more (light) energy, absorbed / trapped / AW **;** more photosynthesis **;** more, growth / biomass / glucose / starch / AW **;**	[max 2]	'more' is only required once
(iv)	(auxins) made / produced, in (shoot), tip / apex **;** pass / move / diffuse / spread (down the stem) **;** auxins collect in the side, in the dark / away from light **;** greater (cell) elongation on side in the dark **;** AVP **;** e.g. absorption of water (by osmosis) / stretching of cell walls / phototropin(s) / plants detect *or* sense light / ref to turgor pressure	[max 4]	**I** 'found, in / on' **A** 'dark / shaded, side' **I** comments about roots
		[Total: 16]	
3 (a)	*gene* a length of DNA that codes for a protein **;** *gene mutation* a change in base sequence of DNA **;**	[2]	**R** chromosome / molecule of / genome
(b) (i)	1 **Bb** **;** 2 **bb** **;** 3 **Bb** **;**	[3]	

Question	Answer	Mark	Guidance
(ii)	(Bb x bb) **B** , **b** + **b** , (**b**) ; *offspring genotypes* **Bb** and **bb** ; **A** heterozygous and homozygous recessive *offspring phenotypes* normal / carrier and acatalasia ;	[3]	<table><tr><td colspan="2"></td><td colspan="2">male gametes</td></tr><tr><td colspan="2"></td><td>**B**</td><td>**b**</td></tr><tr><td rowspan="2">female gametes</td><td>**b**</td><td>**Bb**</td><td>**bb**</td></tr><tr><td>(**b**)</td><td>(**Bb**)</td><td>(**bb**)</td></tr></table>
(iii)	test (cross) ;	[1]	
		[Total: 9]	
4 (a)	carbon dioxide / CO_2 ; (aerobic) respiration ; (simple) diffusion ;	[3]	**A** excretion **I** gas exchange
(b)	water enters by <u>osmosis</u> ; down a <u>water potential</u> gradient / high(er) to low(er) <u>water potential</u> ; through partially permeable membrane ; needs to remove water to prevent bursting ;	[max 3]	**R** water concentration **A** semi- / selectively / differentially
(c)	as concentration of sea water increases the removal of water decreases ; as concentration of sea water increases the water potential gradient decreases ; therefore less water enters at higher concentrations of sea water ; less excess water ;	[max 3]	**A** 0% to 12%

Question	Answer	Mark	Guidance
(d)	cell walls, inelastic / do not stretch / rigid / inflexible / keep shape of cell ; cells, are turgid / have high turgor pressure ; resist any increase in, volume / pressure ; these cells do not absorb excess water ; the cells will not burst ;	[max 3]	**I** strong / tough / don't break **A** (very) little water enters
		[Total: 12]	
5 (a) (i)	vertical axis – numbers / population ; horizontal axis – time / years ; curve showing exponential increase / log phase ;	[3]	**I** lag phase / curve starting at origin
(ii)	*idea that* 'birth' / reproduction / breeding, rate is greater than death rate ; no limiting factors ; no/little, competition ; plenty, of food / nutrients / space / mates / oxygen / resources ; no / few, predators ; no / few, parasites / pathogens / disease ; AVP ; e.g. no / little, pollution / waste products / toxins	[max 4]	**I** definitions of exponential growth
(b)	*between 1950 and 2012* mass of fish caught increased and levels off ; 17 to 90 million tonnes / increase = 73 million tonnes ; fluctuations / increases and decreases / described ; e.g. around 1970 / any time after 1990 ; maximum catch, 94 million tonnes / in 1996 ; steep increase between, 1950–1970 / 1973–1989 ;	[max 3]	*units must be used at least once* **A** 16 to 18 / increase of 72 to 74 mp4 cannot be awarded without mp3

Question	Answer	Mark	Guidance
(c)	*answers can refer to seas, lakes and / or rivers*		
	international, agreements / treaties ;		**A** set maximum mass / number / amount / quantity
	quotas / permits / licenses ;		**A** 'ban unauthorised fishing'
	fines / sanctions, for, overfishing / illegal / unauthorised, fishing ; fishery protection vessels / wardens / patrols / AW ;		**A** consequences other than fines
	restrictions on times when fishing can occur ;		**A** not in breeding season
	exclusion zones / nursery zones / 'no take' zones / reserves ;		**A** descriptions or examples
	total ban for some species ;		**A** named examples
	regulations on method of fishing ; e.g. mesh size of nets / ban nets / use of lines instead / size of fishing vessel / 'fishing effort'		**I** ban on all wild fish
	education / raise awareness / any example ;		
	monitoring fish stocks ;		
	captive breeding (of wild fish) ; re-stocking (of wild stocks) ;		
	encourage farmed fish ; e.g. provide subsidies		
	AVP ; e.g. tax on wild fish / increase the cost of wild fish	[max 6]	

Question	Answer	Mark	Guidance
(d)	*definition of sustainable resource* renewable / self-renewing / regenerates / described ; e.g. produced as rapidly as it is removed resource, does not / will not, run out / become exhausted ; replanting / reseeding / regrowing ; AVP ; e.g. pollarding / coppicing / leaving mature trees	[max 3]	**I** reused / recycled
		[Total: 19]	
6 (a)	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$;;	[2]	one mark for the correct chemical formulae one mark for balancing the equation correctly **R** word equation
(b)	as <u>wavelength</u> increases, rate (of photosynthesis) decreases and increases ; high rates in, blue and violet and red / 400–475 nm and 675 nm ; low(est) rate in, green and yellow / 550–600 nm ; *either* maximum rate = 0.9 cm^3, at 675 nm / red *or* minimum rate = 0.2 cm^3, at 550 nm / green ;	[max 3]	units must be used once in the answer **A** volume of gas for rate
(c)	divide the volumes by, five (minutes) / time ;	[1]	

Question	Answer	Mark	Guidance
(d) (i)	to keep the light intensity the same ;	[1]	**R** temperature **I** 'fair test' **A** 'control light intensity' / 'light intensity is a control(led) variable'
(ii)	to provide carbon dioxide / so carbon dioxide is not a limiting factor / so the only limiting factor is wavelength ;	[1]	
(e)	for, respiration / energy ; converted to sucrose ; used to make, nectar / fruits ; used to make, cellulose / lignin ; used in cell walls ; used to make, starch / oils / fats ; storage ; used to make, amino acids ; used to make, chlorophyll ;	[max 3]	**I** protein synthesis / growth / active transport **R** produces energy **I** 'makes food', but **A** 'stores food' for 1 mark
		[Total: 11]	

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/51**

Paper 5 Practical Test **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Abbreviations used in the Mark Scheme:

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Mark scheme	Mark	Guidance
1 (a) (i)	length 30 (mm), width 10 (mm), height 10 (mm) ;	[1]	Check Supervisor's report and candidates for variation **A** cm if clearly shown
(ii)	1. table drawn to show rows / at least 3 columns ; 2. table drawn with room for at least 4 bubble readings ; 3 appropriate column headings with units: (number of) bubbles per (or in) 3 minutes / min or (number of) bubbles / minute or min **+** potato / piece of potato / stick / piece / AW slice / stick and 1 or 2 / mean / average (number of bubbles per 3 min or per 1 min) ; 4. four numbers for bubbles recorded ; *even if all are 0 bubbles; but not tally chart alone without number of bubbles.* 5. mean calculated for each potato piece A and B ; *allow ½ of a bubble 14.5.* 6. mean for A and B are different (expect A < B) ;	[6]	Check supervisor's report
(b)	prevents leakage of oxygen / all oxygen collected ; increases accuracy / results will be comparable / consistent / reliable / valid / AW; allow a pressure to build up / bubbles to form ;	max [2]	**A** gas / air / bubbles **I** loose bung could come out / no gas from outside enters the tube **I** fair test comments

<table>
<tr><th>Question</th><th>Mark scheme</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>(c) (i)</td><td>catalase produces more bubbles when it is active / ora;

the lower the percentage of alcohol (used for soaking) the more bubbles are produced / AW / ora;

the higher the percentage of alcohol used the lower the activity of the catalase / ora ;</td><td>[max 1]</td><td>A as number of bubbles increases the activity of the catalase increases

need not refer to catalase (more bubbles means more activity)
A concentration of alcohol.</td></tr>
<tr><td>(ii)</td><td>B has more catalase activity / bubbles, A has less activity / bubbles ;</td><td>[1]</td><td>I restatement of results (number of bubbles from each piece of potato)</td></tr>
<tr><td>(iii)</td><td>number showing same trend as candidates results ;</td><td>[1]</td><td></td></tr>
<tr><td>(d) (i)</td><td><table>
<tr><th>variable</th><th>controlled by</th></tr>
<tr><td>hydrogen peroxide volume / concentration.</td><td>for each potato piece: measured 10 cm^3 or used same strength / volume solution;</td></tr>
<tr><td>potato;</td><td>same dimensions used for each piece / / 30 mm × 5 mm × 10 mm or pieces cut from same potato / type of potato / surface area ;</td></tr>
<tr><td>time ;</td><td>for bubble counting – keep the same time e.g. counted for 3 min for each piece / soaking for same time e.g. 24 hours;</td></tr>
</table></td><td>1 + 1

[max 2]</td><td>variable must match control given

‘Same time’ needs qualification.</td></tr>
</table>

<table>
<tr><th>Question</th><th>Mark scheme</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>(ii)</td><td>
<table>
<tr><td>source of error</td><td>method of reducing error</td></tr>
<tr><td>bubbles are all different sizes;</td><td>measure the volume
use a gas syringe / collect in a measuring cylinder / AVP;</td></tr>
<tr><td>bubbles difficult to count ;</td><td>use a (tally) counter /
method of collecting the gas / measure the volume /
use 2 people / repeat for reliability / AW;</td></tr>
<tr><td>setting up and starting time;</td><td>use 2 people;</td></tr>
</table>
</td><td>1 + 1

[max 2]</td><td>method must match the error. 1 mark for error, 1 mark for method.

.</td></tr>
<tr><td>(iii)</td><td>
<table>
<tr><td>source of error</td><td>reason</td></tr>
<tr><td>size of potato / surface area / type / freshness ;</td><td>may not be equal so affect rate of activity;</td></tr>
<tr><td>temperature different;</td><td>affects enzyme activity / AW</td></tr>
<tr><td>temperature;</td><td>different temperature affect activity / AW;</td></tr>
<tr><td>carry out more repeats / trials;</td><td>identify anomalous results / AW;</td></tr>
</table>
</td><td>[2]</td><td>method must match the error. 1 mark for error, 1 mark for reason.

R reference to bubbles already in (d)(ii) or (b) loose bung.</td></tr>
</table>

Question	Mark scheme	Mark	Guidance
(iv)	use exactly the same procedure / do the same / repeat / AW / or description of original method; except soak potato in water (and not ethanol) / use 0% alcohol / without alcohol / use untreated potato / AW;	[2]	**I** use boiled potato / boiled catalase / repeat without potato / use water instead of hydrogen peroxide / use liver or yeast / use glass beads
(v)	same or greater number of bubbles than in **B** /2% quoted results ;	[1]	
(e)	keep away from flames / heat source ; wear goggles / safety glasses: wear gloves; wear lab coat; use tongs / AW;	[max 1]	**A** use a water bath when heating ethanol
(f) (i)	<u>280</u> **;**	[1]	
(ii)	**A** axes labelled even scale; **P** **both** plots accurate ±½ small square ; **C** columns not touching of same width columns at least half the grid on y-axis;	[3]	y-axis: (mean) reaction time / ms x-axis: before drinking alcohol and after drinking alcohol / before and after / or key given x-axis labels approximately under each bar **R** superimposed columns
(iii)	220 – 350 (milliseconds) ;	[1]	
		[Total: 27]	

Question	Mark scheme	Mark	Guidance
2 (a) (i)	Outlines – all lines single, clear and unbroken ; Size – occupies at least half of the space provided ; Detail – oval shape + phloem + 1 other area ; two other areas shown ; Label – line to correct area on drawing to show position of xylem (vessel) and line labelled “xylem”	[5]	
(ii)	measurement of AB = 58 mm; line on their drawing and length measured with correct unit ; correct magnification calculation;	[3]	± 1 mm **A** cm / μm **I** other units ± 1 mm **R** if no line drawn or position not indicated / line in incorrect position **R** if units given ecf if measurement(s) above are incorrect
(iii)	(xylem) walls thick(er) / large (er) / wide(er); (xylem vessels) round(er) ; (xylem) has large(r) cross section area / big(ger) ;	[max 1]	

Question	Mark scheme	Mark	Guidance
(b)	1 use of any suitable plant material; 2 put stem / material chosen in (red) dye / add dye to cut (stem) surface; 3 time for absorption of dye; 4 cut (sections) of stem or material chosen; 5 (red stained xylem) will indicate position of vascular bundle	[max 4]	**I** stain it red **I** xylem alone
		[Total: 13]	

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY **0610/61**

Paper 6 Alternative to Practical **May/June 2016**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Abbreviations used in the Mark Scheme:

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Mark scheme	Mark	Guidance
1 (a) (i)	*length:* 30 (mm) *width:* 10 (mm) *height:* 10 (mm) ;	[1]	all correct for 1 mark
(ii)	1 table drawn with rows or columns ; 2 table drawn with cells for at least 6 bubble readings and 3 means; 3 appropriate column headings with units (number of) bubbles per (or in) 3 minutes / min or (number of) bubbles / minute or min **+** potato / piece of potato / piece / tube **+** slice / stick and 1 or 2 **+** mean / average (number of bubbles per 3 min (or per 1 min) ; 4 correct tally results recorded ; 5 correct mean / average calculated for each potato piece ;	[5]	**I** graphs **R** if units given in cells instead of header

Question	Mark scheme	Mark	Guidance
(b) (i)	prevents leakage of oxygen / all oxygen collected; can observe reaction / bubbles as soon as it starts / AW;	[max 1]	**A** gas / air / bubbles **I** no air / oxygen can enter tube **I** "quicker" unqualified for mp 2
(ii)	prevents leakage of oxygen / all oxygen collected ; increases accuracy / results will be comparable / consistent / reliable / valid; allow a pressure to build up / bubbles to form;	[max 2]	**A** gas / air / bubbles **I** loose bung could come out / no gas from outside enters the tube **I** fair test comments
(c) (i)	catalase produces more bubbles when it is active / **ora**; the lower the percentage of alcohol (used for soaking) the more bubbles are produced / AW / **ora**; the higher the percentage of alcohol used the lower the activity of the catalase / **ora**;	[max 1]	**A** as number of bubbles increases the activity of the catalase increases / positive correlation need not refer to catalase (more bubbles means more activity)
(ii)	**B** has more catalase activity / bubbles, **A** has least activity / bubbles;	[1]	**I** restatement of results (number of bubbles from each piece of potato) **A** B more, C medium and A fewer bubbles / AW
(iii)	number 4 or less than 4 ;	[1]	**A** no bubbles / none / zero

<table>
<tr><th>Question</th><th>Mark scheme</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>(d) (i)</td><td>
<table>
<tr><th>variable</th><th>controlled by</th></tr>
<tr><td>hydrogen peroxide (volume / concentration).</td><td>measured 10 cm^3 or used same strength solution;</td></tr>
<tr><td>potato (size / length / volume / surface area / type of potato sample of potato);</td><td>same dimensions used for each piece / / 30 mm × 5 mm × 10 mm or pieces cut from same potato / type of potato;</td></tr>
<tr><td>time for measuring bubbles ;</td><td>counted for 3 min for each piece</td></tr>
<tr><td>time of soaking in alcohol;</td><td>same time / 24 hours for each piece;</td></tr>
</table>
</td><td>1 + 1

[max 2]</td><td>variable must match control given</td></tr>
<tr><td>(ii)</td><td>
<table>
<tr><th>source of error</th><th>method of reducing error</th></tr>
<tr><td>bubbles are all different sizes;</td><td>measure the volume use a gas syringe / collect in a measuring cylinder / AVP;</td></tr>
<tr><td>bubbles difficult to count ;</td><td>use a (tally) counter / method of collecting the gas / measure the volume / use 2 people / repeat for reliability / AW;</td></tr>
<tr><td>setting up and starting time;</td><td>use 2 people;</td></tr>
</table>
</td><td>1 + 1

[max 2]</td><td>method must match the error. 1 mark for error, 1 mark for method.</td></tr>
</table>

Question	Mark scheme	Mark	Guidance
(iii)	size / mass / volume / of the slices or type / age of potato, may not be equal ; surface area is different / quantity of available catalase is different / AW ;	[2]	
(iv)	use exactly the same procedure / do the same / repeat / AW / or description of original method; except soak potato in water (and not ethanol) / use 0% alcohol / without alcohol / use untreated potato / AW;	[2]	**I** use boiled potato / boiled catalase / repeat without potato / use water instead of hydrogen peroxide / use liver or yeast / use glass beads
(v)	same or greater number of bubbles than 2% alcohol / **B /** figures quoted (11–18) (mean of 14.5+)/more bubbles as more gas produced / most number of bubbles;	[1]	
(e)	keep away from flames / heat source ; wear goggles / safety glasses: wear gloves; wear lab coat; use tongs / AW;	[max 1]	**A** use a water bath when heating ethanol
(f) (i)	280;	[1]	

Question	Mark scheme	Mark	Guidance
(ii)	**A** axes labelled even scale; **P** **both** plots accurate ±½ small square ; **C** columns not touching of same width columns at least half the grid on y-axis;	[3]	y-axis: (mean) reaction time / ms x-axis: before drinking alcohol and after drinking alcohol / before and after / or key given x-axis labels approximately under each bar **R** superimposed columns
(iii)	220–350 (milliseconds) ;	[1]	
		[Total: 27]	
2 (a) (i)	Outlines – all lines single, clear and unbroken ; Size – occupies at least half of the space provided ; Detail – oval shape + phloem + 1 other area ; two other areas shown ; Label – line to correct area on drawing to show position of xylem (vessel) and line labelled “xylem”	[5]	

Question	Mark scheme	Mark	Guidance
(ii)	measurement of AB = 58 mm; line on their drawing and length measured with correct unit ; correct magnification calculation;	[3]	± 1 mm **A** cm / μm **I** other units ± 1 mm **R** if no line drawn or position not indicated / line in incorrect position **R** if units given ecf if measurement(s) above are incorrect
(iii)	(xylem) walls thick(er) / large (er) / wide(er); (xylem vessels) round(er) ; (xylem) has large(r) cross section area / big(ger) ;	[max 1]	
(b)	1 use of any suitable plant material; 2 put stem / material chosen in (red) dye / add dye to cut (stem) surface; 3 time for absorption of dye; 4 cut (sections) of stem or material chosen; 5 (red stained xylem) will indicate position of vascular bundle	[max 4]	**I** stain it red **I** xylem alone
		[Total: 13]	