OCR
Oxford Cambridge and RSA

F

Tuesday 17 May 2022 – Morning

GCSE (9–1) Combined Science B (Twenty First Century Science)

J260/01 Biology (Foundation Tier)

Time allowed: 1 hour 45 minutes

8999997888895

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

J260001

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

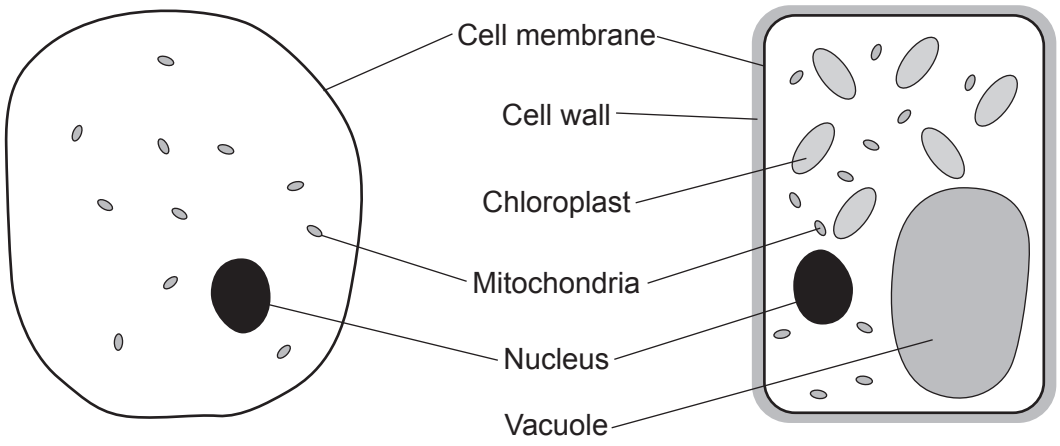
INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **95**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*****).
- This document has **28** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 The diagram shows two cells.



Cell A **Cell B**

(a) State **two** pieces of evidence from the diagram that show that cell **B** is a plant cell.

1 .....

2 .....

[2]

(b) Which structure stores the genetic material in an animal cell?

Put a (ring) around the correct answer.

Cell membrane **Cell wall** **Nucleus** **Vacuole**

[1]

(c) Complete the sentences to describe the genetic material.

Use words from the list.

alleles	**chromosomes**	**DNA**	**helix**	**lipids**	**nucleotides**	**protein**

In a human body cell, the genetic material is stored as 46 structures called

..... .

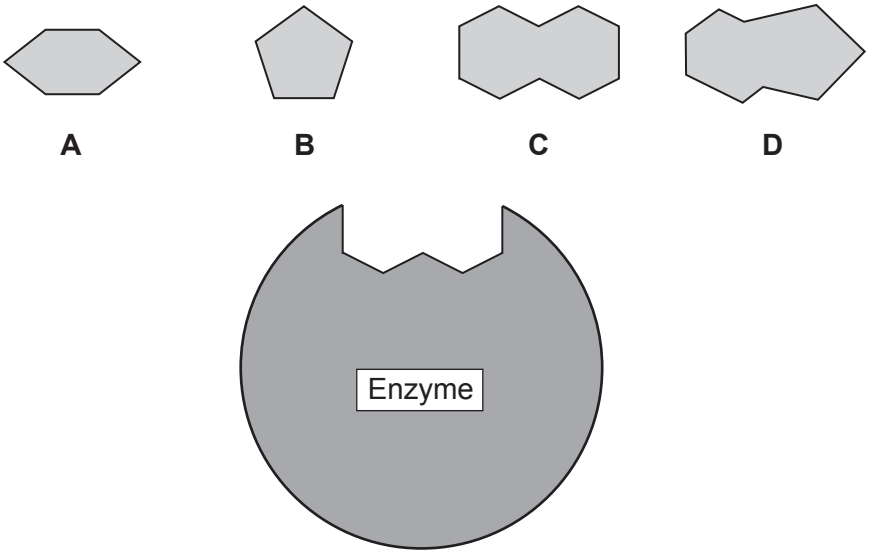
Each of these 46 structures is a long molecule of ..... .

These molecules have a double ..... structure and are polymers made from ..... .

[4]

2 Milk contains a carbohydrate called lactose. Humans have an enzyme that breaks down this carbohydrate into sugars such as glucose.

The diagram shows a model of the enzyme and four carbohydrates, **A**, **B**, **C** and **D**.



(a) Which carbohydrate, **A**, **B**, **C** or **D**, will be broken down by the enzyme?

Explain your answer.

Carbohydrate .....

Explanation .....

.....

.....

.....

..... **[3]**

(b) Organ systems in the body have different roles in what happens to the sugar from the milk we drink.

Draw lines to connect the correct **three** organ system to their **roles**.

Organ system	Role
Circulatory system	Absorbs the sugar into the body.
Digestive system	
	Releases insulin to control blood sugar level.
Gaseous exchange system	
Endocrine system	Transports the sugar around the body in the blood.

[3]

(c) Describe how glucose and oxygen are used by body cells.

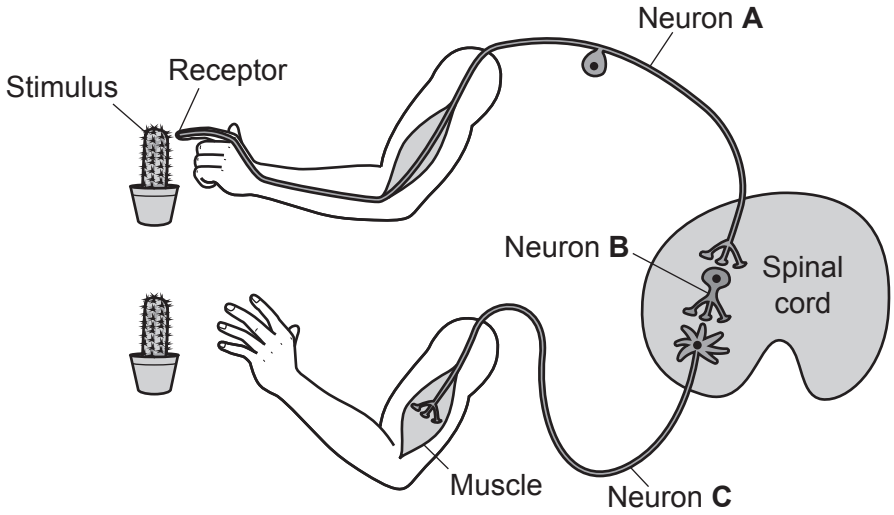
.....

.....

.....

..... **[2]**

3 The diagram shows a reflex arc.



(a) The reflex arc carries a nerve impulse.

Which statement shows the correct order of the neurons that the impulse travels through?

Tick (✓) **one** box.

From **A** to **B** to **C**. ☐

From **A** and **C** to **B**. ☐

From **B** to **A** and **C**. ☐

From **C** to **B** to **A**. ☐

[1]

(b) Draw lines to connect each **neuron** with its correct **name**.

Neuron	Name
A	Motor neuron
B	Relay neuron
C	Sensory neuron

[2]

(c) Reflex actions have a survival advantage.

Suggest **one** advantage of the reflex arc in the diagram.

.....

..... **[1]**

(d) The body's response to a stimulus can also be coordinated by hormones.

Complete the sentences to describe how hormones do this.

Use words from the list.

blood	**effectors**	**glands**	**neurons**	**receptors**

Hormones are secreted by ..... .

Hormones are transported by ..... .

Hormones are detected by ..... , which stimulates a response.

[3]

4 This question is about influenza (flu).

(a) What kind of pathogen causes flu?

Put a (ring) around the correct answer.

Bacteria **Fungus** **Protist** **Virus**

[1]

(b) The flu vaccine contains a dead or inactive flu pathogen.

Explain why it is important that the flu pathogen in the vaccine is dead or inactive.

.....

..... **[1]**

(c) The statements explain how vaccination can help to protect against flu.

The statements are **not** in the correct order.

A Antibodies stick to the flu antigens, labelling them for attack by white blood cells.

B Some white blood cells develop into memory cells.

C The immune system makes antibodies against the flu antigens.

D White blood cells recognise the flu antigens.

E The vaccine is injected.

Write the letters in the boxes to show the correct order of the statements.

[4]

5 The image shows a type of ecosystem called a peatland.

Peatlands have high biodiversity. Many different species live there.

(a) The table shows the mass of carbon contained in peatland soil and in woodland soil.

Type of soil	**Mass of carbon (kg per m^3 of soil)**	**Mass to the nearest 10 kg**
Peatland	178	.....
Woodland	124	.....

(i) Complete the table by writing in the masses rounded to the nearest 10 kg. **[1]**

(ii) Calculate how many times more carbon is contained in peatland soil than in woodland soil.

Number of times more carbon = ... times more **[2]**

(b) Some companies remove large amounts of soil from peatlands to sell in garden centres.

Describe **two** ways in which this could reduce the biodiversity of the peatlands.

1 .....

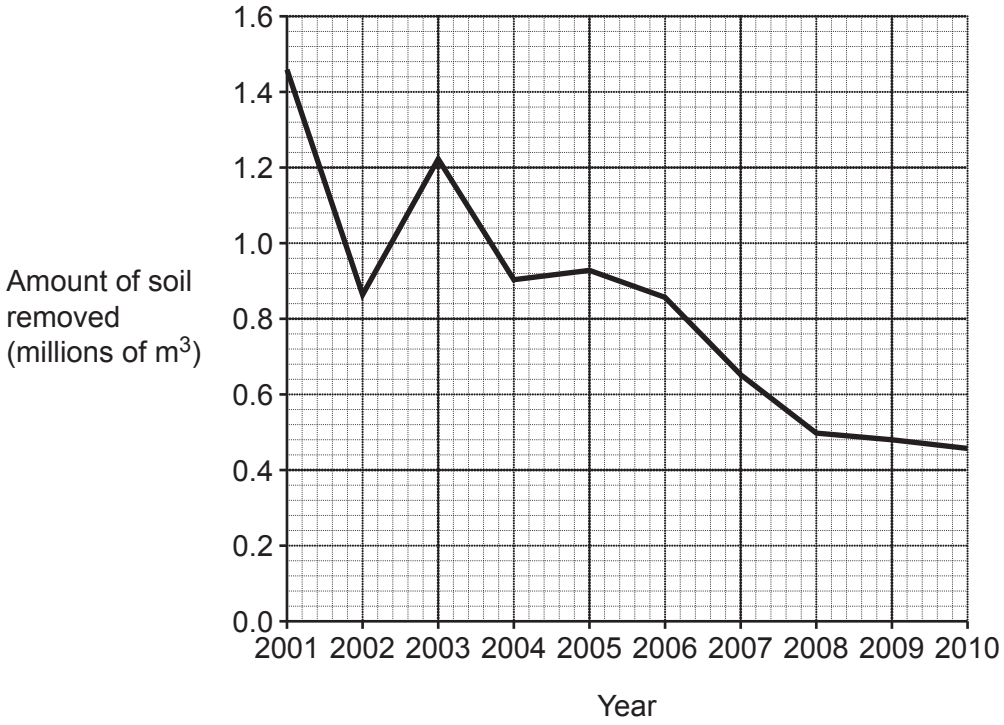
.....

2 .....

.....

[2]

(c) The graph shows the amount of soil removed from peatlands in England over 10 years.



Which conclusion is supported by the data in the graph?

Tick (✓) **one** box.

Soil must have been added to the peatlands between 2002 and 2003. ☐

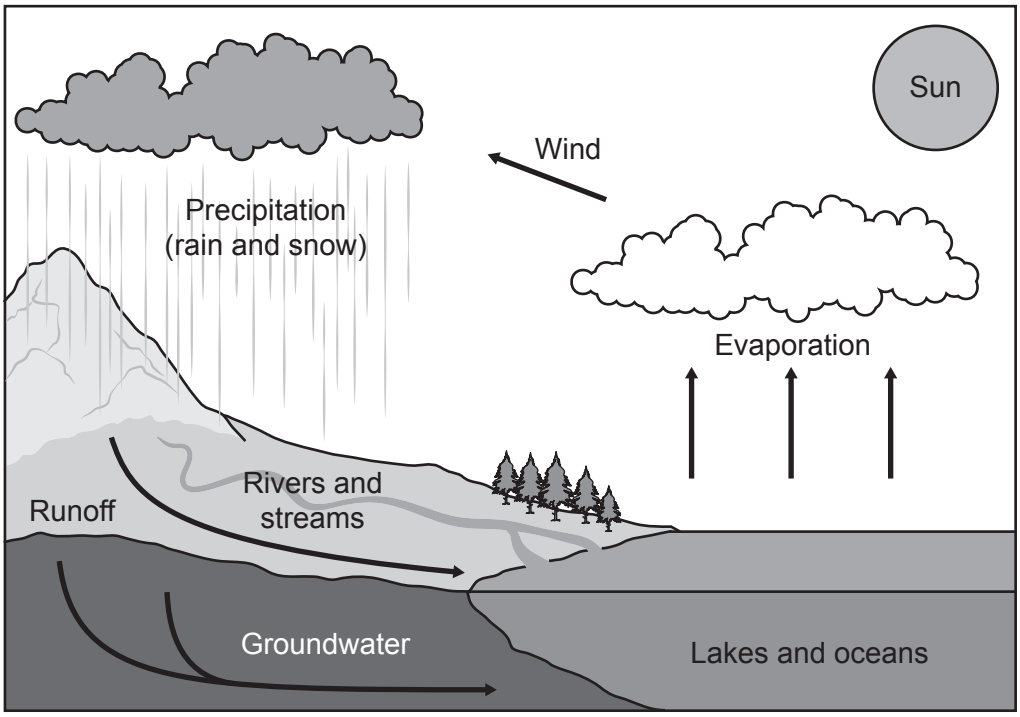
The amount of soil removed was highest in 2003. ☐

The threat to biodiversity in the peatlands decreased each year. ☐

The threat to biodiversity in the peatlands was lowest in 2010. ☐

[1]

6 The diagram shows an incomplete model of the water cycle.



(a)* The diagram does **not** show the roles of plants and animals in the water cycle.

Explain the roles of plants and animals in the water cycle, and why water is needed by plants and animals.

.....

.....

.....

.....

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.....

.....

.....

.....

.....

.....

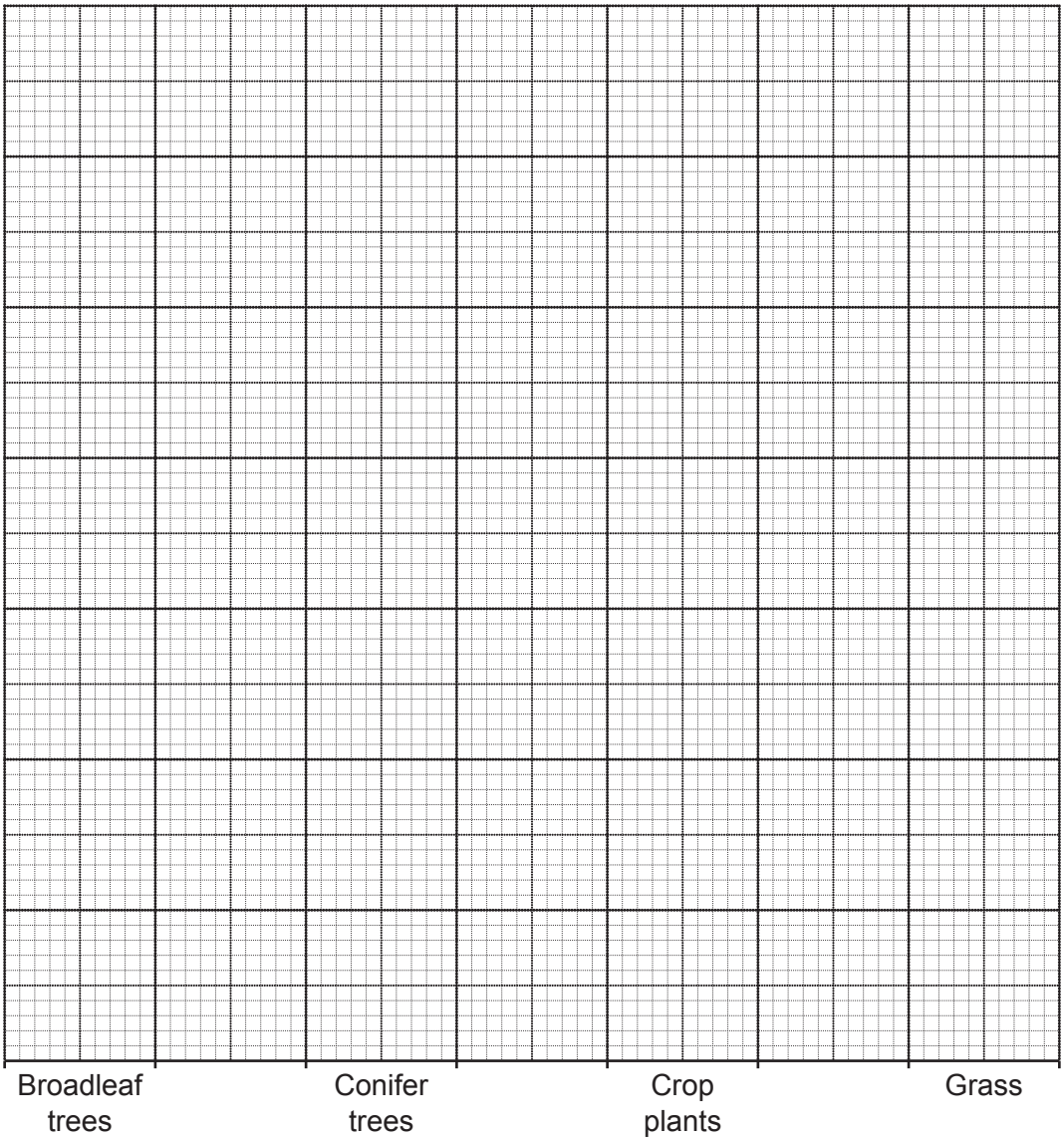
..... **[6]**

(b) Some of the rain that falls on land evaporates.

The table shows how the type of plants growing on the land affects the percentage of rain that evaporates per year.

Type of plants growing on the land	Percentage of rain that evaporates per year (%)
Broadleaf trees	51.0
Conifer trees	67.5
Crop plants	40.0
Grass	50.0

Plot a bar chart of the results from the table on the graph.



[4]

(c) The UK has a target to plant new trees in 300 km^2 of land each year to help manage the water cycle. New trees were planted in 150 km^2 of land in 2020.

Calculate the simplest ratio of planted area : target area in 2020.

Simplest ratio = ... : ..... **[2]**

(d) Water and carbon are both cycled through ecosystems.

Complete the table to show which parts of an ecosystem each substance is cycled through.

Tick (✓) **one** box in each row.

Substance	Cycled only through the abiotic parts	Cycled only through the biotic parts	Cycled through both parts
Water			
Carbon			

[2]

7 Duckweed is a plant that grows in pondwater.

Each duckweed plant is made of one leaf and one root, as shown in **Fig. 7.1**.

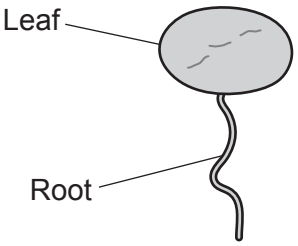


Fig. 7.1

(a) Photosynthesis in the leaf makes food, which allows the plant to reproduce.

Some students want to find out the pH at which duckweed photosynthesises best.

They put 100 duckweed plants in each of four beakers of water. **Fig. 7.2** shows the pH of the water in each beaker.

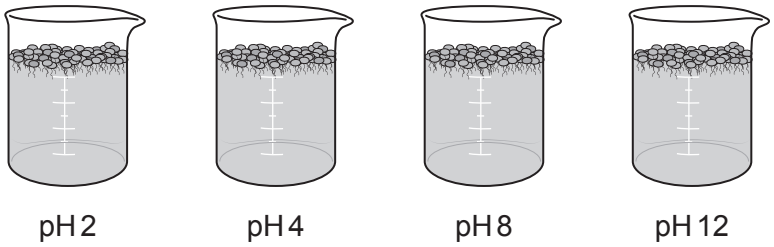


Fig. 7.2

Describe **two** variables that the students should keep the same for each beaker.

1 .....

2 .....

[2]

(b) After seven days the students count the number of living duckweed plants in each beaker.

The table shows their results.

pH	Number of living duckweed plants
2	0
4	110
8	120
12	0

The students conclude that duckweed photosynthesises and reproduces best at pH 8.

They could investigate whether their conclusion is based on an **accurate** result by growing duckweed in two more beakers of water.

What should the pH of the water in these **two** beakers be?

Tick (✓) **two** boxes.

pH 1 ☐

pH 3 ☐

pH 7 ☐

pH 9 ☐

pH 13 ☐

[2]

8 **(a)** The cell cycle has two phases, interphase and mitosis.

The table describes events in the cell cycle.

Complete the table to show if each event occurs in interphase or mitosis.

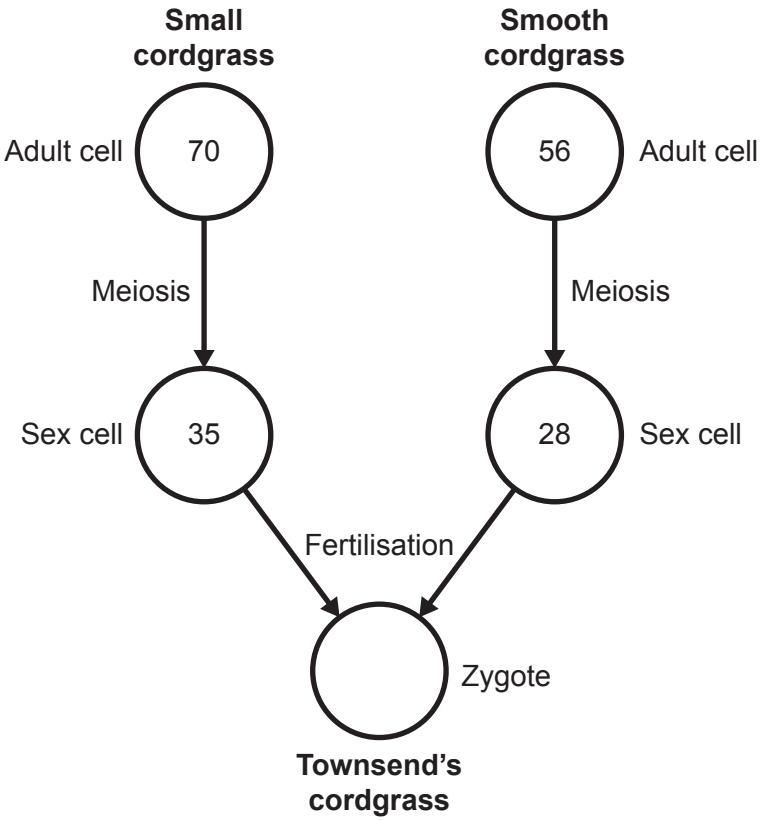
Tick (✓) **one** box in each row.

Event	Interphase	Mitosis
The cell grows larger.		
Chromosomes are copied.		
Chromosomes divide.		
More organelles form.		
The nucleus divides.		

[4]

(b) Two species of a plant called small cordgrass and smooth cordgrass are bred to produce a new species called Townsend's cordgrass.

The diagram shows the number of chromosomes in the cells of small cordgrass and smooth cordgrass.



(i) After meiosis, the number of chromosomes in the cordgrass sex cells is half the number in the adult cells.

Why is this important?

.....

..... **[1]**

(ii) How many chromosomes will be in the Townsend's cordgrass zygote?

Put a (ring) around the correct answer.

28 **35** **56** **63** **70**

[1]

(iii) The zygote will enter the cell cycle to form an adult Townsend's cordgrass plant.

How many chromosomes will each adult cell have?

Put a (ring) around the correct answer.

28 **35** **56** **63** **70**

[1]

(c) Plant roots contain unspecialised cells, and specialised cells such as root hair cells.

Which statement explains how the unspecialised cells in a root become specialised?

Tick (✓) **one** box.

Cell growth becomes uncontrolled. ☐

Genes are turned off and on. ☐

New genes are made. ☐

Proteins are turned off and on. ☐

[1]

(d) Explain why it is important for plants to have specialised root hair cells rather than only unspecialised cells.

.....

..... **[1]**

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9 Diseases such as cardiovascular disease (CVD) are non-communicable.

(a) Define non-communicable.

.....

..... **[1]**

(b) Give **two** causes of non-communicable diseases.

1 .....

.....

2 .....

..... **[2]**

Scientists wanted to investigate the effects of two medicines on the risk of developing CVD.
They did a study for 6 years which involved 12 000 people.
All the people were over the age of 55 and did **not** have CVD.

(c) **(i)** Suggest why only people who did **not** have CVD were involved in the study.

.....

..... **[1]**

(ii) Give **two** reasons why we can have confidence in conclusions drawn from this study.

1 .....

.....

2 .....

..... **[2]**

(iii) Suggest **one** more piece of information that would be useful to know about the people in the study.

.....

..... **[1]**

(iv) Why do the conclusions of this study **not** apply to the whole population?

.....

..... **[1]**

(d) The people in the study were divided into four groups. Each group received a different treatment.

The table shows the results of the study.

Group	Treatment received	Percentage of people in group who developed CVD (%)
A	Placebo	5.0
B	Medicine 1 only	3.8
C	Medicine 2 only	4.6
D	Both medicines	3.6

(i) Describe what a placebo is.

.....

..... **[1]**

(ii) Suggest why a placebo was used.

.....

..... **[1]**

(iii) Which statement best explains why it was ethical to use a placebo in this study?

Tick (✓) **one** box.

Placebos do no harm. ☐

Placebos make people feel involved. ☐

No one in the study was ill with CVD. ☐

There are no treatments for CVD. ☐

[1]

(iv) Suggest **two** conclusions that can be made from the results.

1 .....

.....

2 .....

.....

[2]

(v) Group **C** and group **D** each had 3000 people in them.

Calculate how many **more** people would have developed CVD in group **D** than in group **C**.

Number of people = ... **[2]**

10 Transpiration takes place in plants.

(a) Complete the sentences to describe transpiration.

Put a (ring) around each correct answer.

Water is **absorbed / lost / translocated** through the stomata in a plant's leaves.

This causes **sugars / water / water and sugars** to move up the

meristem / phloem / xylem tissue in the plant's stem.

[3]

(b) **Fig. 10.1** shows one of the stomata from a leaf.

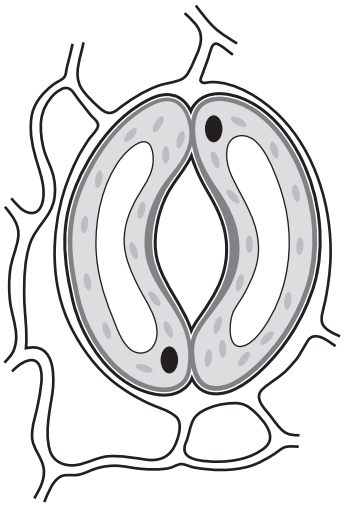

Fig. 10.1

Add **two** labels to **Fig. 10.1**.

Label 1 The pore through which water diffuses.

Label 2 A guard cell.

[1]

(c) Complete the sentences to describe how to set up a light microscope to look at a slide of stomata from a leaf.

Put a (ring) around each correct answer.

First, turn to the **×4 / ×10 / ×20** objective lens.

Use the coarse focus knob to move the objective lens to its **lowest / middle / highest** position.

Then clip the slide onto the **eyepiece / objective lens / stage**.

[2]

(d) Amir sets up a leafy twig in a bubble potometer as shown in **Fig. 10.2**.

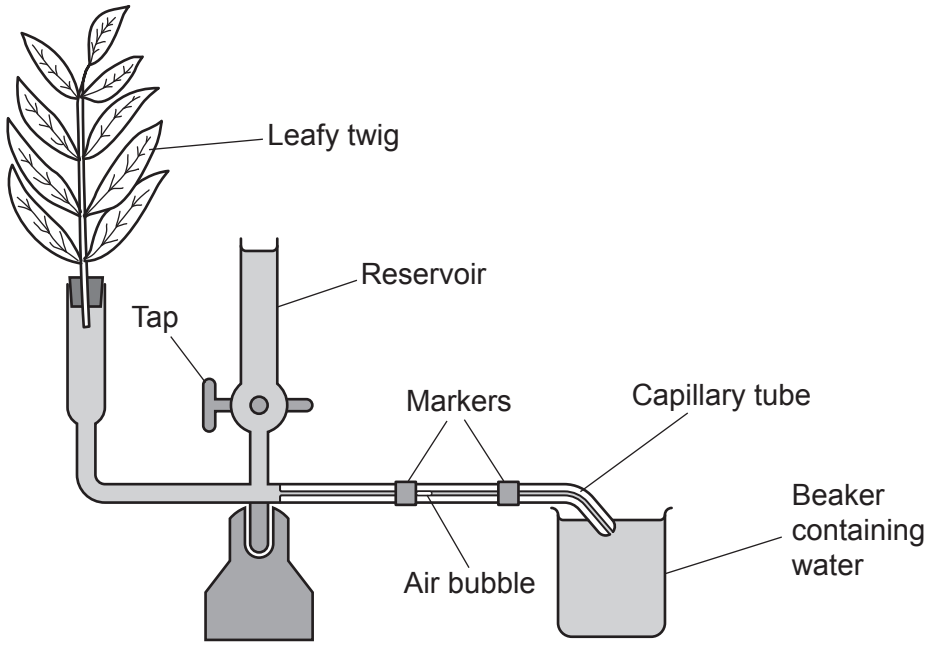

Fig. 10.2

Amir wants to use the bubble potometer to investigate the rate of transpiration in the leafy twig.

(i) Describe the **two** measurements Amir would need to make.

1 .....

2 .....

[2]

(ii) Suggest the purpose of the reservoir **and** tap.

.....

.....

.....

..... **[2]**

(e) Amir investigated the rate of transpiration in the leafy twig in four different experiments.

The table shows Amir's results.

Experiment	Temperature (°C)	Wind speed (m/s)	Light level	Calculated mean rate (mm/s)
A	22	0.1	Dull	1.27
B	22	0.1	No light	0.61
C	20	4.8	Bright	1.54
D	28	0.3	Dull	

Amir has not yet calculated the mean rate for experiment **D**. The results from his three repeats of experiment **D** were 4.55, 4.17 and 0.75 mm/s.

(i) Discuss arguments for and against ignoring the result of 0.75 mm/s for experiment **D**.

For .....

.....

Against .....

.....

[2]

(ii) Amir decides to keep all three results for experiment **D**.

Calculate the mean rate for experiment **D**.

Give your answer to **two** decimal places.

Mean rate = ... mm/s **[3]**

(f) Amir wants to make a conclusion about the effect of light level on the rate of transpiration.

Explain why he can **only** do this by comparing experiments **A** and **B**.

.....

..... **[1]**

11 Plants need to absorb nitrate ions to stay alive.

Complete the sentences to explain why a plant needs oxygen to absorb nitrate ions.

Use words from the list.

active transport	**aerobic**	**anaerobic**	**ATP**	**diffusion**
DNA	**light**	**osmosis**	**oxygen**	**photosynthesis**

The plant uses the process of ..... to absorb nitrate ions.

This process requires energy from molecules of ..... .

Oxygen is needed to make these molecules during ..... cellular respiration.

[3]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).