OCR
Oxford Cambridge and RSA

F

Monday 15 November 2021 – Morning

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

J260/01 Biology (Foundation Tier)

Time allowed: 1 hour 45 minutes

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

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

J260 01

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 Our bodies work constantly to keep our internal environment the same.

(a) What is this process called?

Tick (✓) **one** box.

Homeostasis ☐

Homozygous ☐

Homologous ☐

Hormonal ☐

[1]

(b) The human body maintains an internal temperature of around 37 °C.

Why is it important that this temperature is maintained?

Tick (✓) **one** box.

Enzymes in the human body only work at 37 °C. ☐

Enzymes in the human body stop working at 37 °C. ☐

Enzymes in the human body work best at 37 °C. ☐

Enzymes in the human body work too quickly above 37 °C. ☐

[1]

(c) Diabetes is a disease that affects our body's ability to keep blood sugar concentration constant. There are two main types of diabetes, Type 1 and Type 2.

Complete the table by deciding if each statement is correct for **Type 1 diabetes only**, **Type 2 diabetes only** or **both** types of diabetes.

Tick (✓) **one** box in each row.

Statement	Type 1 diabetes only	Type 2 diabetes only	Both types of diabetes
The body no longer responds to insulin produced.			
Treated using a combination of diet and exercise.			
Can be treated with insulin injections.			
Diet should not contain too much sugar.			
The pancreas stops producing insulin.			

[5]

(d) Complete the sentences to describe how insulin controls blood sugar level.

Put a (ring) around the correct answers.

Eating a sugary food **increases** / **decreases** blood sugar level.

The change in blood sugar level causes an **increase** / **decrease** in the amount of insulin released from the pancreas.

The change in insulin level **increases** / **decreases** the absorption of blood sugar by cells.

[2]

2 Ben has cardiovascular disease and is at risk of having a heart attack.

(a) Here are five items of information about Ben:

A Ben is 67 years old.
B Ben walks his dog twice a day.
C Ben smokes 20 cigarettes a day.
D Both of Ben's parents had a heart attack when they were in their 60s.
E Ben is not overweight.

(i) Which **two** items of information about risk can Ben **not** change?

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

(ii) Which **two** items of information help to **reduce** Ben's chances of a heart attack?

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

(b) Cardiovascular disease can damage the heart.

Complete each sentence about how damage to heart muscle cells affects the circulation of blood.

Use the words.

You can use each word once, more than once, or not at all.

less **more** **the same**

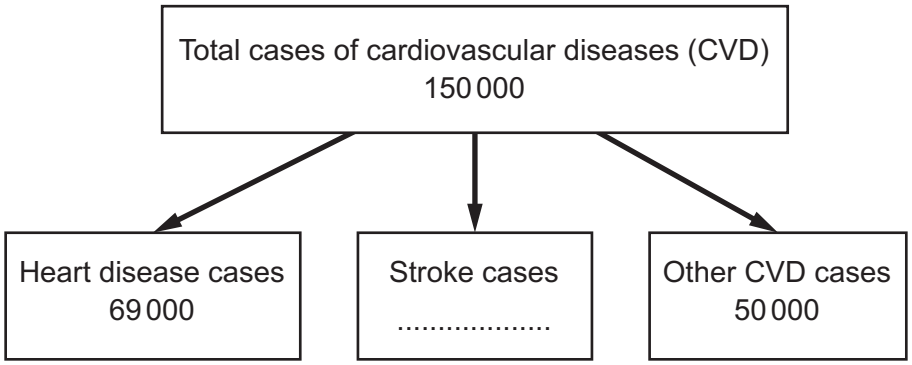
After heart muscle cells are damaged, the strength of the muscle contraction is

.....

This means the blood pressure is .....

So, the volume of blood supplied to the body with each contraction is .....
[2]

(c) The diagram shows data on the number of people with cardiovascular disease (CVD).



(i) Of the total number of cases of cardiovascular disease, how many cases were from stroke?

Stroke cases = ... **[2]**

(ii) Calculate the percentage of cardiovascular disease cases that were caused by heart disease.

Percentage = ... % **[2]**

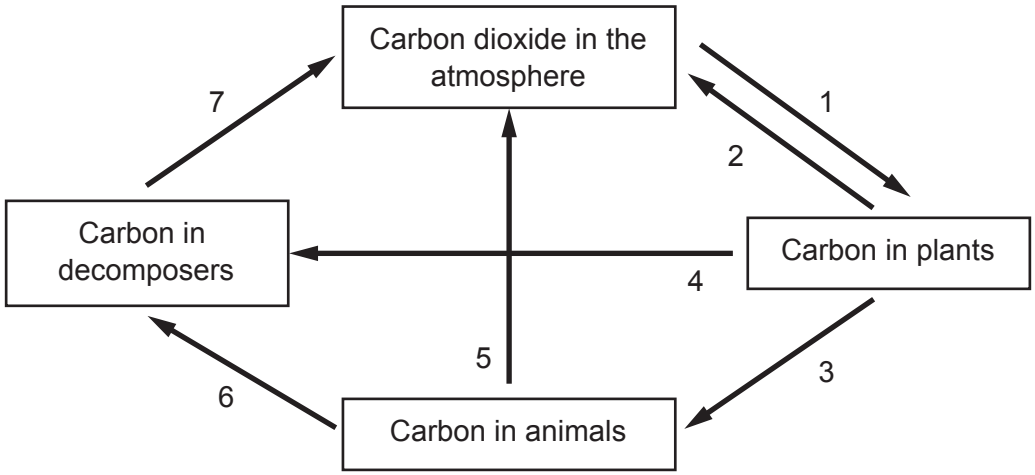
(iii) 1 person every 3 minutes is diagnosed with CVD.

Calculate how many diagnosed cases there would be in **one** day.

Diagnosed cases = ... **[2]**

3 The diagram shows a model of the carbon cycle.

The numbered arrows show the movement of carbon in the carbon cycle.



(a) (i) Write down the number which represents photosynthesis.

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

(ii) Write down a number which represents respiration.

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

(b) Fungi are decomposers which secrete enzymes.

How do **enzymes** help fungi to absorb food molecules?

.....

.....

.....

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

(c) One estimate for the total global biomass is 550.0 billion tonnes.

Some scientists estimate that 25% of the total global biomass is fungi.

Calculate how many billion tonnes of fungi there are globally, using these estimates.

Fungi = ... billion tonnes **[2]**

4 Blow fly larvae have reflex responses to light. A student is investigating this reflex, as shown in **Fig. 4.1**.

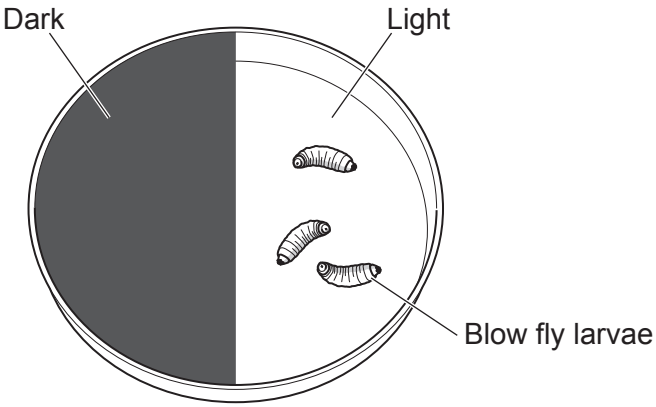


Fig. 4.1

(a) (i) The student is given a method for their investigation, but it is **not** in the correct order.

Method

1. After two minutes count the number of larvae visible.

2. Put on the disposable gloves.

3. Put the lid on the Petri dish.

4. Take the lid off the Petri dish.

5. Turn on the lamp and start the stop clock.

6. Use the tweezers to transfer 10 larvae to the Petri dish.

Write the numbers in the correct order. The first one has been done for you.

2					

[4]

(ii) Some Petri dishes are glass.

Why is it safer to use a plastic Petri dish?

.....

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

(iii) The student notices the lamp gets hot.

Which explanation is correct for how heat could affect the results of the investigation?

Tick (✓) **one** box.

The heat is a waste of energy. ☐

The heat could damage the Petri dish. ☐

The larvae could respond to the heat. ☐

The student could get hurt. ☐

[1]

(b) The blow fly larvae's eyes (receptors) are linked by the nervous system to its muscles (effectors).

The list shows three other parts of the nervous system.

Motor neuron **Relay neuron** **Sensory neuron**

Add the **three** parts to **Fig. 4.2** to show their correct order within the nervous system of blow fly larvae.

Fig. 4.2

[2]

(c) **Fig. 4.3** shows the structure of a synapse.

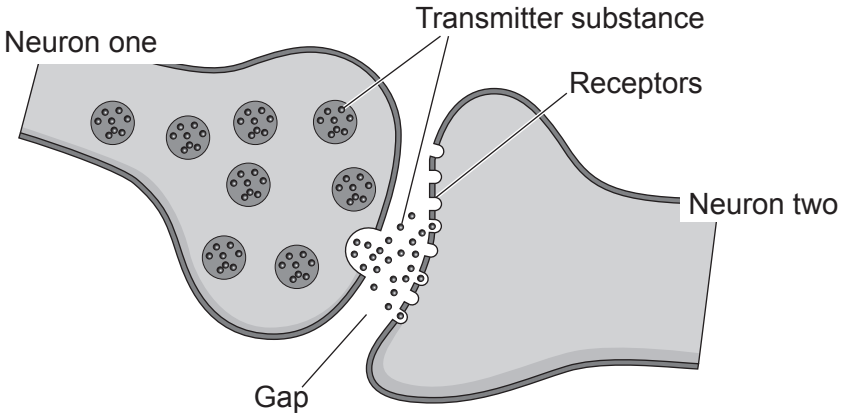


Fig. 4.3

Complete each sentence about how a synapse works.

Use the words.

You can use each word once, more than once, or not at all.

enzymes **diffuse** **receptors** **active site** **impulse**

Neuron one has transmitter substances which are released into the gap.

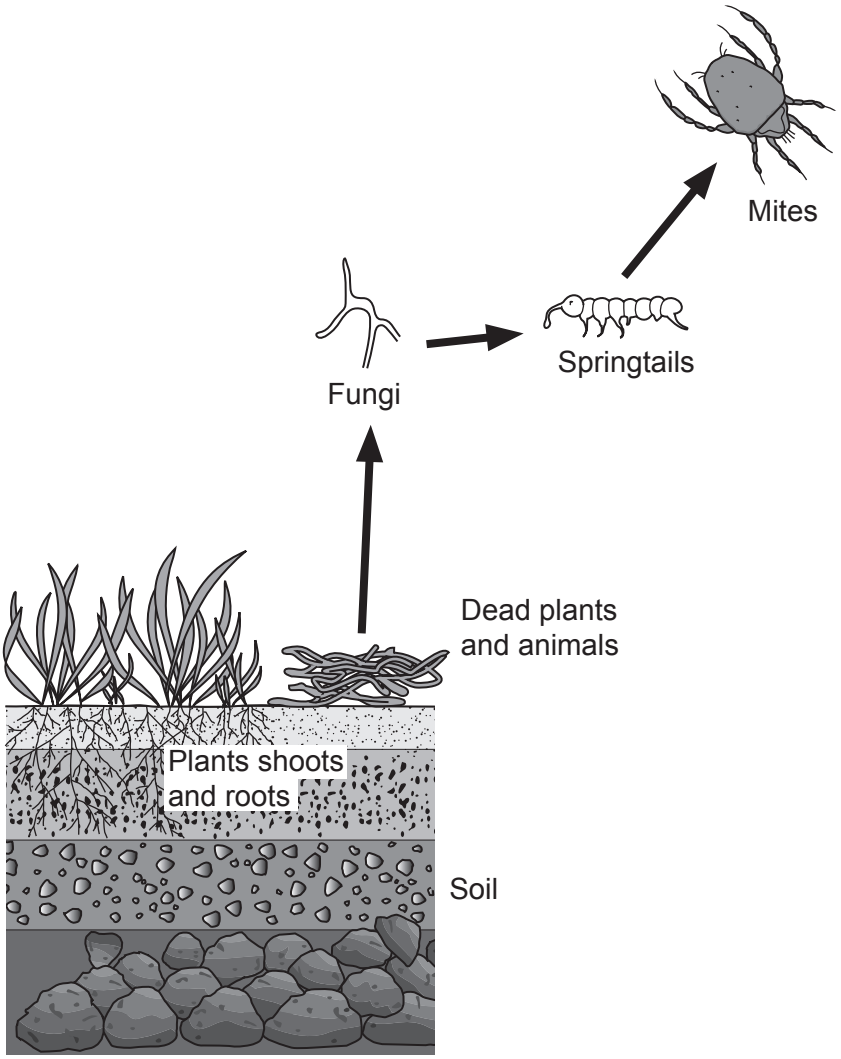
The transmitter substances ..... across the gap and bind to the

..... on neuron two. This stimulates neuron two.

[2]

5 The soil is an example of an ecosystem.

The diagram shows a food chain within this ecosystem.



(a) From the diagram, write down:

(i) A producer.

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

(ii) A consumer.

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

(iii) An abiotic component.

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

(b) Scientists use technical terms to describe different levels of organisation within an ecosystem.

Draw lines to connect each **technical term** to its correct **description**.

Technical term	Description
Ecosystem	All the species present.
Community	The number of individuals in a single species.
Population	All the species and all the abiotic components.

[2]

(c) A scientist put soil in six containers. They added:

- 60 springtails and 3 mites to three of the containers
- **and**
- 60 springtails and 15 mites to the other three containers.

After 8 weeks they counted the number of mites in each container. The table shows their results.

	Number of mites after 8 weeks			
Number of mites added	**Test 1**	**Test 2**	**Test 3**	**Mean**
3	8	7	9	
15	6	12	9	

(i) Calculate the mean number of mites after 8 weeks, when 15 mites were added.

Mean = ... **[2]**

(ii) When 3 mites were added the number of mites increased after 8 weeks.
When 15 mites were added the number of mites decreased after 8 weeks.

Explain why.

Use ideas about predators and prey in your answer.

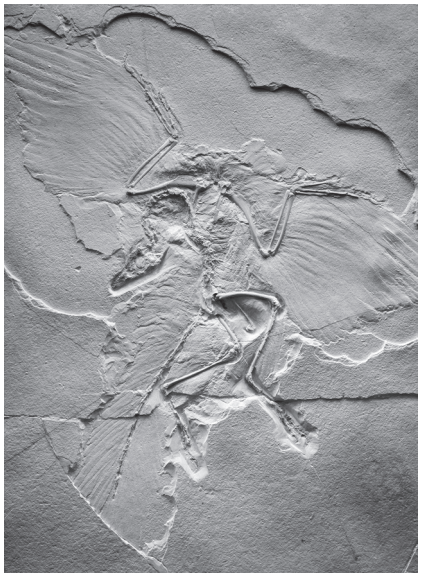
.....

.....

.....

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

6 The drawing shows an *Archaeopteryx* fossil.



Archaeopteryx lived at the same time as therapod dinosaurs.

Archaeopteryx fossils have features in common with therapod dinosaurs and modern birds. Some common features are shown in the table.

Feature	Therapod dinosaurs	*Archaeopteryx* fossils	Modern birds
Beak		✓	✓
Feathers		✓	✓
Long bony tail	✓	✓	
Teeth	✓	✓	
Wing		✓	✓

(a) How many features do therapod dinosaurs and *Archaeopteryx* fossils have in common?

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

(b) **(i)** Suggest why some scientists think *Archaeopteryx* was the first modern bird.

Use information from the table to support your answer.

.....

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

(ii) Suggest why other scientists looking at the same evidence disagree.

.....

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

(c) Fossils are used as evidence of evolution. Scientists collect fossils to show how a species has changed over time.

What are the limitations of using fossils as evidence of evolution of a species?

Tick (✓) **one** box.

Fossils are very old. ☐

It is easy to break fossils. ☐

There are periods of time for which we have no fossils. ☐

[1]

(d) Name **one** modern source of evidence used to help classify organisms.

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

7 In 2016 a scientist collected a sample of mosquitoes which were found in underground tunnels in London. She found that underground mosquitoes were different to mosquitoes found above ground.

Underground mosquitoes feed on mammals and do not hibernate, but those that live above ground feed on birds and hibernate in the winter. The two groups of mosquitoes can no longer breed with each other.

(a) Which piece of evidence shows that the two groups of mosquitoes are different species?

Tick (✓) **one** box.

Underground mosquitoes bite mammals. ☐

Underground mosquitoes can no longer breed with above-ground mosquitoes. ☐

Underground mosquitoes do not hibernate. ☐

Underground mosquitoes have been sealed under-ground for over 100 years. ☐

[1]

(b) The statements describe the steps in natural selection that caused underground mosquitoes to evolve. The statements are **not** in the correct order.

Write a number from **1–5** in each box to give the correct order for the steps in natural selection.

One has been done for you.

	The individual mosquitoes trapped underground had different characteristics.
	Mosquitoes that could feed on mammals were more likely to survive.
2	There was a limited supply of food types underground, so the trapped mosquitoes had to compete.
	Over a long period of time the characteristics of the underground mosquito population changed.
	The mosquitoes that survived could breed and pass on their alleles.

[3]

8 Cystic Fibrosis is a genetic condition. It is caused by a mutation in a gene.

(a) The alleles for the mutated gene are:
F = dominant allele
f = recessive allele.

The genotype of a person who has cystic fibrosis is **ff**.

Write down the **two** possible genotypes of people that do not have cystic fibrosis.

1 .....

2 .....
[2]

(b) Complete each sentence about mutations.

Use the words.

You can use each word once, more than once, or not at all.

caught **genotype** **inherited** **phenotype**

Genetic variants arising from mutations can be .....

Most mutations have no effect on .....
[2]

(c) **(i)** Using stem cells is a possible treatment for cystic fibrosis. Stem cells can be taken from embryos or adult humans.

Describe **one** similarity and **one** difference in **function** of embryonic and adult stem cells.

Similarity .....

.....

Difference .....

.....
[2]

(ii) Give **one** advantage and **one** disadvantage of using embryonic stem cells in treating cystic fibrosis.

Advantage .....

.....

Disadvantage .....

.....
[2]

(d) (i) Changes in cells can lead to uncontrolled growth and cell division causing disease.

What name do we use to describe this type of disease?

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

(ii) Leukaemia is a type of this disease which can cause a reduced amount of haemoglobin in red blood cells.

How will this affect the function of the blood?

.....

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

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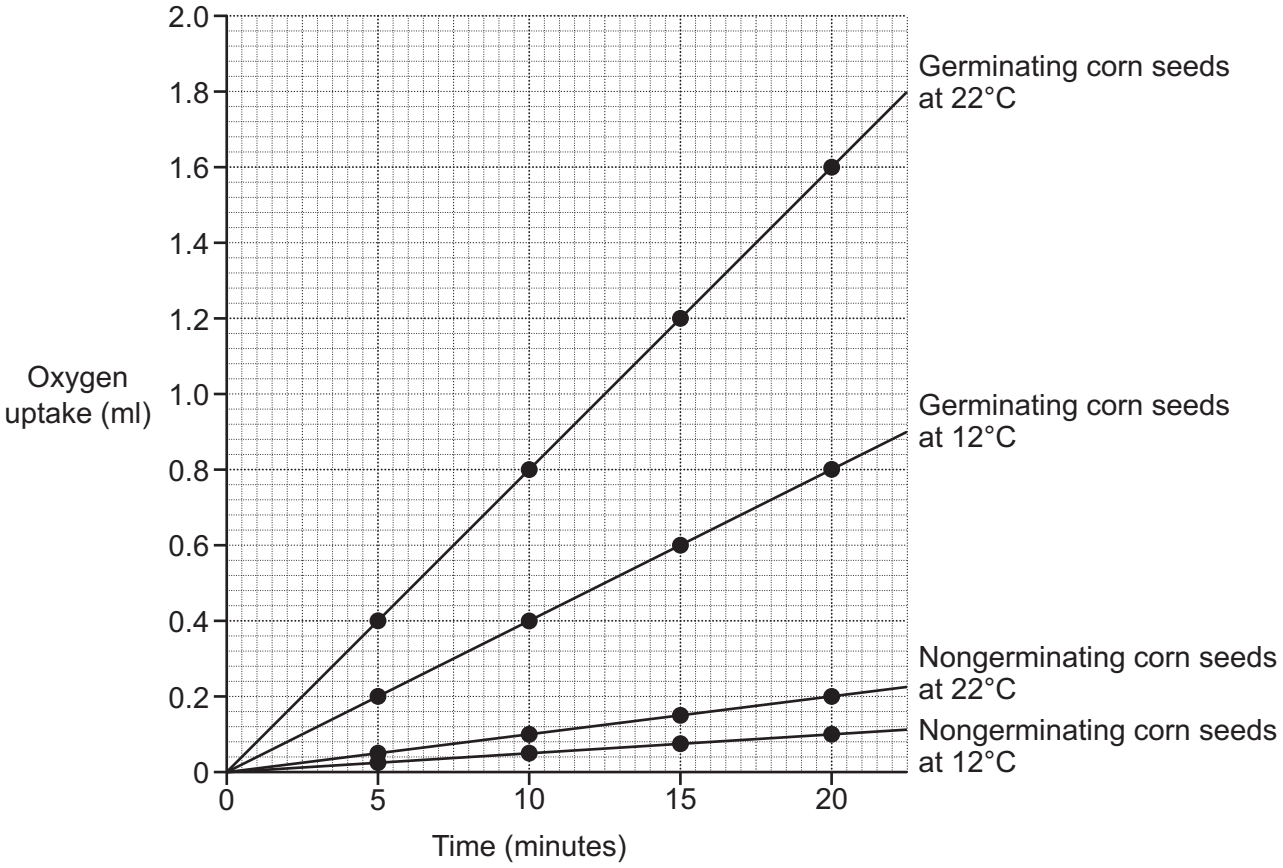
9 The graph shows results from an investigation into the effect of temperature on the volume of oxygen taken up by germinating and nongerminating corn seeds.



(a) How much oxygen has been taken up by germinating corn seeds after 15 minutes at 22 °C?

Oxygen uptake = ... ml **[1]**

(b) Some of the oxygen that the germinating corn seeds take up is **not** used for germination.

Explain how we know this from the graph.

.....

.....

.....

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

(c) After 5 minutes, germinating corn seeds at 12 °C have taken up 0.2 ml of oxygen.

Calculate the rate of oxygen uptake by germinating corn seeds at 12 °C.

Use the equation: rate of oxygen uptake = $\frac{\text{oxygen uptake}}{\text{number of minutes}}$

Rate of oxygen uptake = ... ml/min **[1]**

(d) Which equation represents the linear relationships shown in the graph?

Tick (✓) **one** box

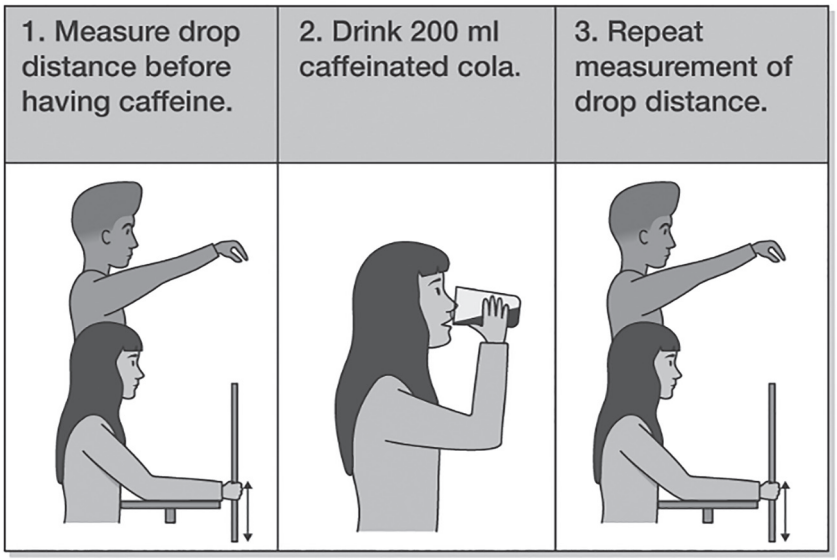
$y = mx + c$ ☐

$y = mc + x$ ☐

$y = m + cx$ ☐

[1]

10* Amir and Nina are investigating the effects of caffeine on reaction time.
The diagram shows their method.



Describe how they could use a double-blind trial to improve their method and how they could collect more valid data.

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

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11 **(a)** Diseases can be communicable or non-communicable.

Which statements describe **communicable** diseases and which statements describe **non-communicable** diseases?

Tick **one** box (✓) in each row.

Statement	Communicable diseases	Non-communicable diseases
They are caused by alleles.		
They are caused by lifestyle choices.		
They are caused by pathogens.		
They are caused by trauma.		

[2]

(b) Measles is caused by a virus. White blood cells help protect us against measles.

Complete each sentence about how white blood cells protect us against measles.

Use the words.

You can use each word once, more than once, or not at all.

abiotic **antibodies** **antigens** **digested** **disabled** **inflamed**

One type of white blood cell makes types of molecules called ..... .

These molecules bind to measles ..... .

Other white blood cells ingest the measles viruses and they are ..... .

[3]

(c) A vaccine can help prevent the spread of measles. Not all parents have their children vaccinated. Parents may have ethical reasons or may need more information before making a decision.

Which parents are talking about an ethical reason and which parents need more information before making a decision?

Tick **one** box (✓) in each row.

Parents	Ethical reason	More information
Mia "I'm worried about how safe the vaccine is."		
Sam "It is up to me to decide what is best for my child."		
Ali "My faith does not allow vaccination."		
Jamal "There is no risk. I don't know anyone who has had measles."		

[3]

12 **(a)** A student is given a slide of a cross section of a plant stem. They clip the slide onto the stage of a light microscope and turn on the light.

Describe how they can focus the image to observe the xylem and phloem tissues.

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.....

.....

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.....

..... **[4]**

(b) Explain how the xylem is adapted to its function.

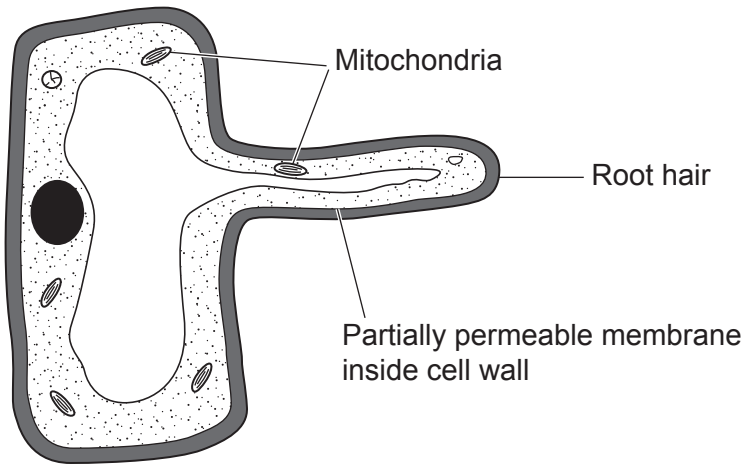
.....

.....

.....

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

(c) The diagram shows the structure of a root hair cell.



(i) Explain how the '**root hair**' is adapted to its function.

.....

.....

.....

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

(ii) Explain why **mitochondria** are required for the uptake of some mineral ions by root hair cells.

.....

.....

.....

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

(d) Which statement about diffusion across the partially permeable membrane of root hair cells is correct?

Tick (✓) **one** box.

Both water and nitrate ions can diffuse through the partially permeable membrane. ☐

Nitrate ions can diffuse through the partially permeable membrane, but water ions cannot. ☐

Both water and nitrate ions cannot diffuse through the partially permeable membrane. ☐

Water ions can diffuse through the partially permeable membrane, but nitrate ions cannot. ☐

[1]

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).