A

AQA

Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

Level 3 Certificate/Extended Certificate

APPLIED SCIENCE

Unit 4 The Human Body

ASC4

Thursday 12 January 2023 **Afternoon**

Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]

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MATERIALS

For this paper you must have:

- **a calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**

INFORMATION

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 60.**

ADVICE

Read each question carefully.

DO NOT TURN OVER UNTIL TOLD TO DO SO

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Answer ALL questions.

0 1

The human nervous system coordinates and controls our voluntary and involuntary actions.

Communication between cells in the body and the brain is along neurones.

0 1 . 1

In what form do nerve impulses travel along neurones? [1 mark]

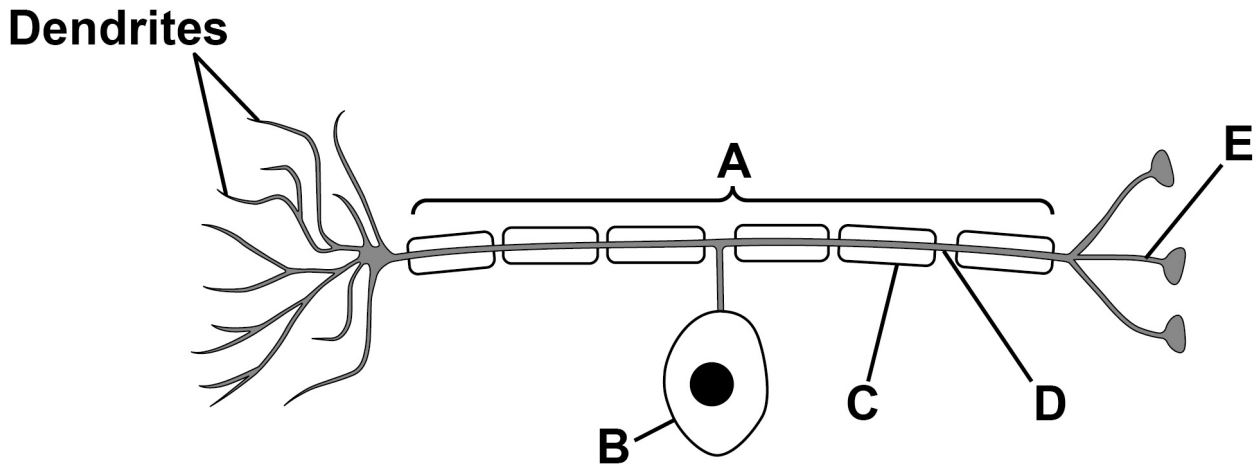
Tick (✓) ONE box.

- ☐ **Chemical signal**
- ☐ **Electrical signal**
- ☐ **Light signal**
- ☐ **Sound signal**

[Turn over]

FIGURE 1 shows a neurone.

FIGURE 1



0 1 . 2

Draw ONE line from each part of the neurone shown in FIGURE 1 to the correct label for that part. [3 marks]

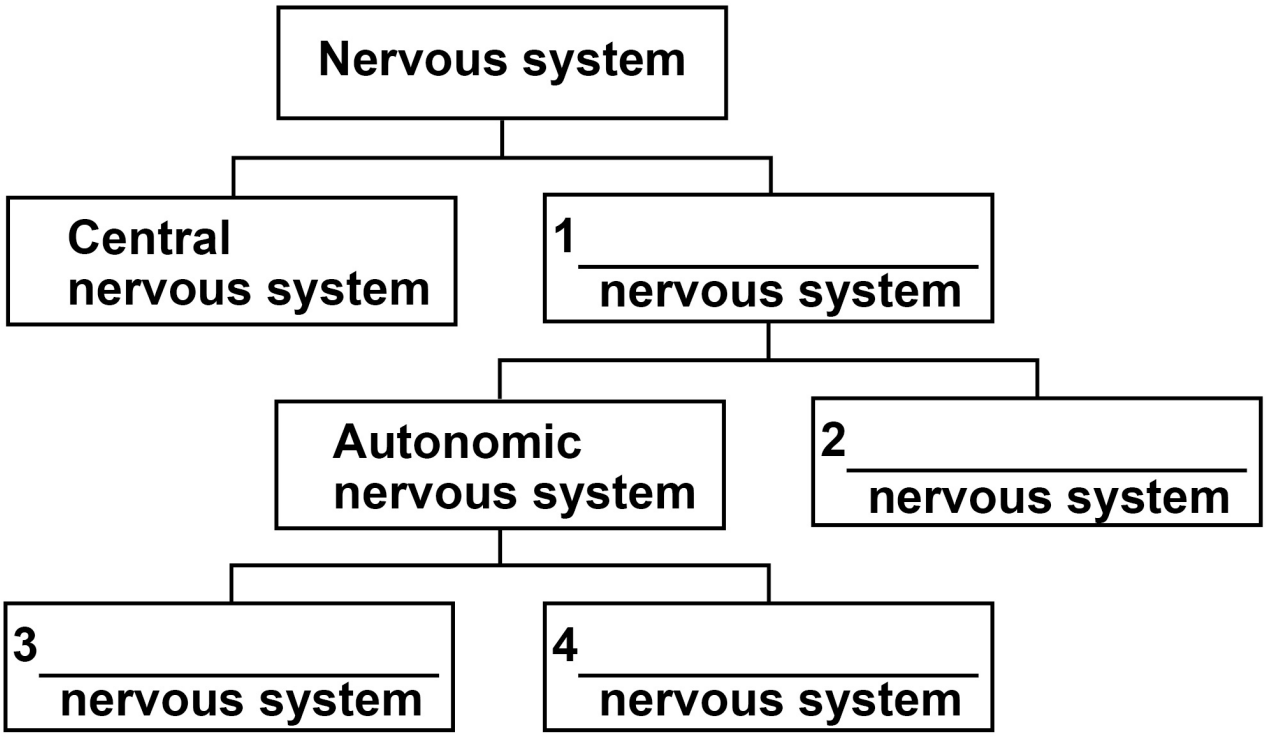
PART OF THE NEURONE	LABEL
	A
Axon	B
Cell body	C
	D
Node of Ranvier	E

0 1 . 3

Complete FIGURE 2 to show how the human nervous system is organised.

Write your answers on lines 1, 2, 3 and 4. [4 marks]

FIGURE 2



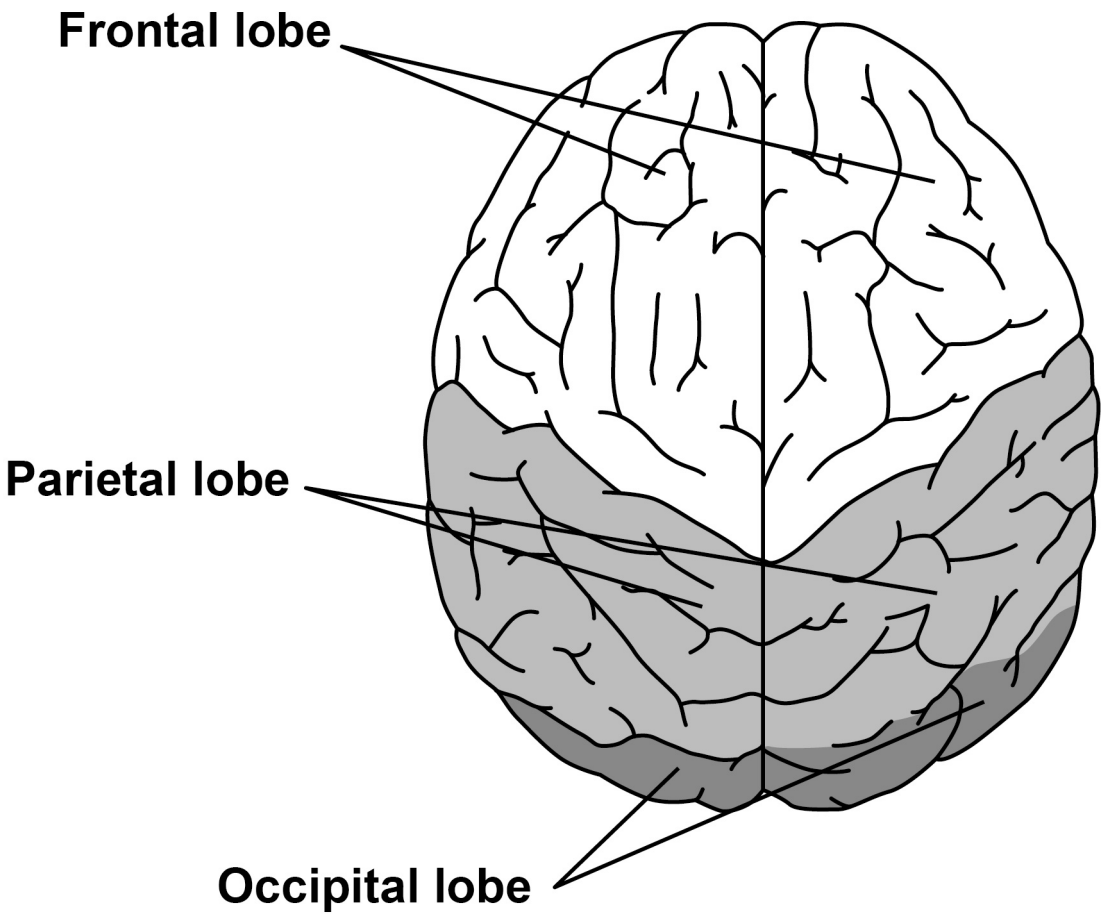
[Turn over]

The brain is part of the central nervous system.

Doctors can scan a person's brain to look for damage.

FIGURE 3 shows some different parts of the brain.

FIGURE 3



0 1 . 4

Three of the four lobes in the brain are shown and labelled in FIGURE 3.

What is the name of the fourth lobe? [1 mark]

---

0 1 . 5

Give the function of the occipital lobe. [1 mark]

---

0 1 . 6

Name the part of the brain that controls breathing rate and heart rate. [1 mark]

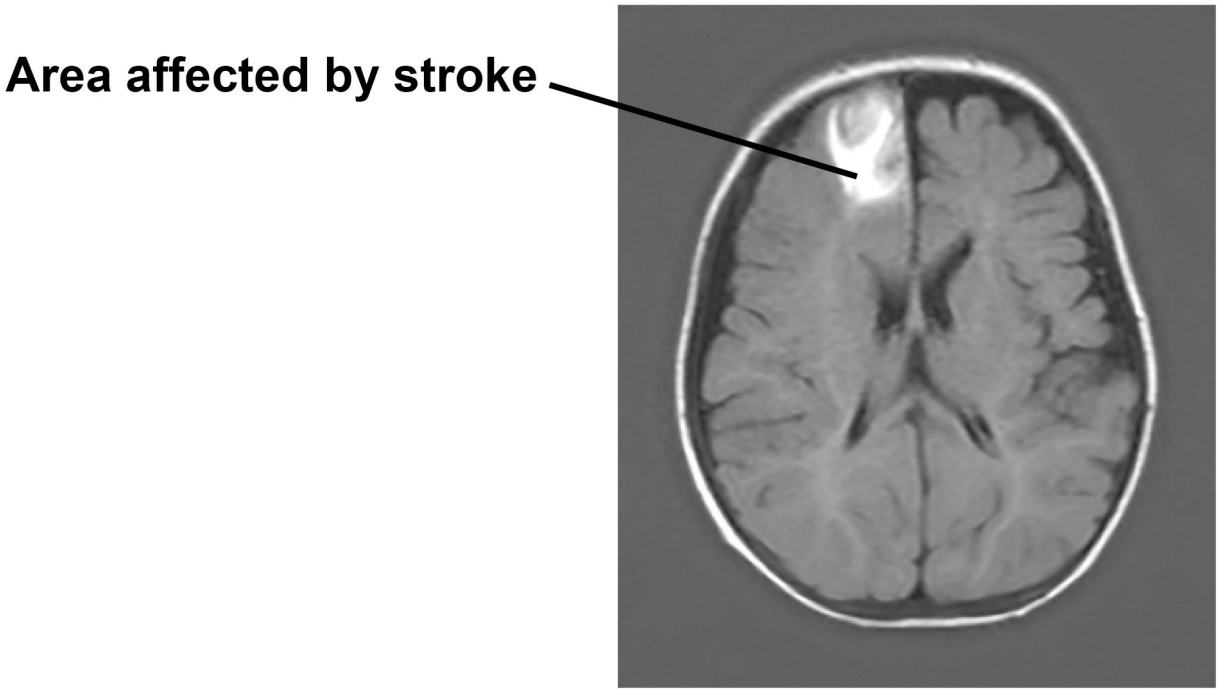
[Turn over]

Sometimes a blood vessel in the brain is blocked, causing the blood supply to be cut off. This is known as a stroke.

Doctors use brain scans to view the affected areas.

FIGURE 4 shows a brain scan of a person who has had a stroke.

FIGURE 4



0 1 . 7

Describe TWO symptoms that a doctor would observe in the person.

Give a reason for your answer.

Use FIGURE 3 and FIGURE 4. [3 marks]

1 _____

_____

_____

2 _____

_____

_____

Reason _____

_____

_____

[Turn over]

0 1 . 8

Alzheimer's is a disorder affecting the brain.

One cause of Alzheimer's is a lack of acetylcholine in the brain.

What is the function of acetylcholine in the nervous system? [1 mark]

Tick (✓) ONE box.

☐ **As a chemical to increase the speed of nerve impulses along neurones.**

☐ **As a neurotransmitter to transfer impulses from neurone to neurone.**

☐ **To break down other chemicals in the synapses between neurones.**

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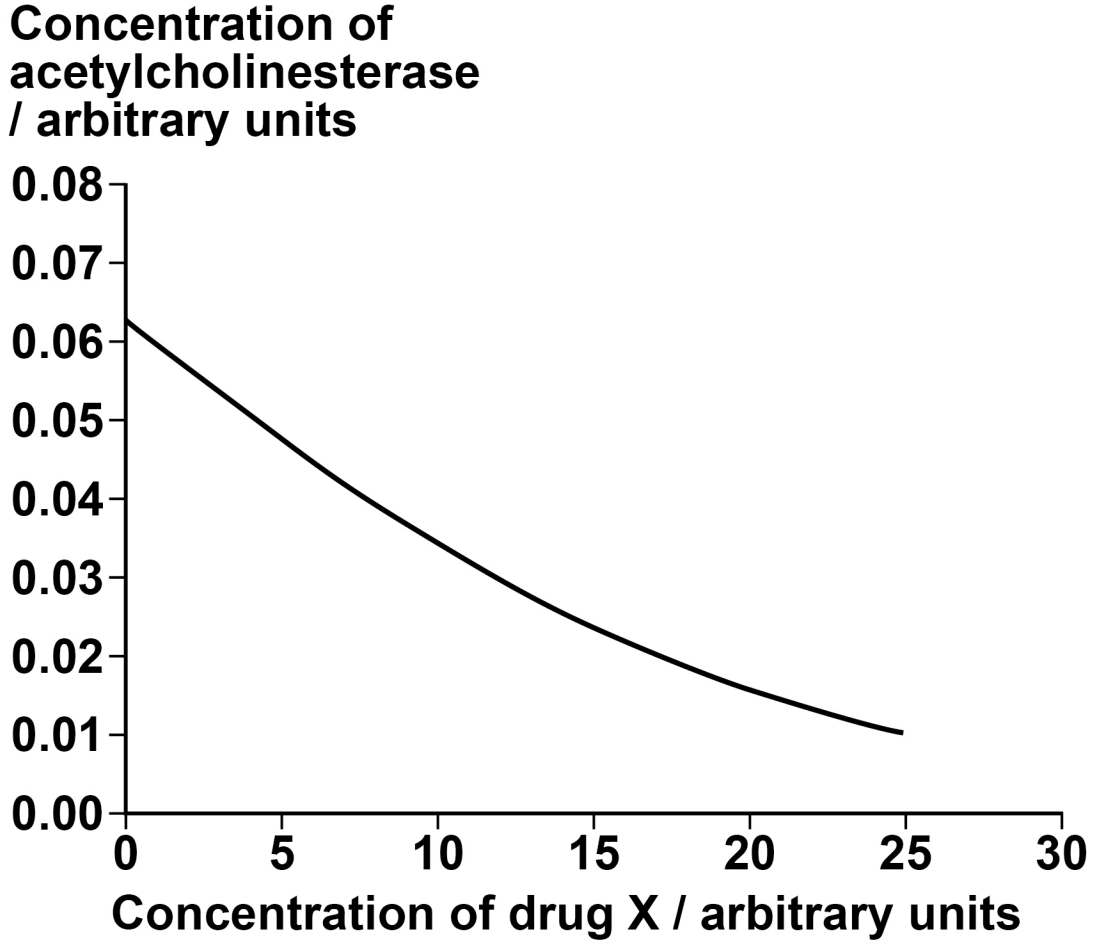
[Turn over]

0 1 . 9

Acetylcholinesterase is an enzyme that breaks down acetylcholine.

FIGURE 5 shows how drug X affects the concentration of acetylcholinesterase in the brain.

FIGURE 5



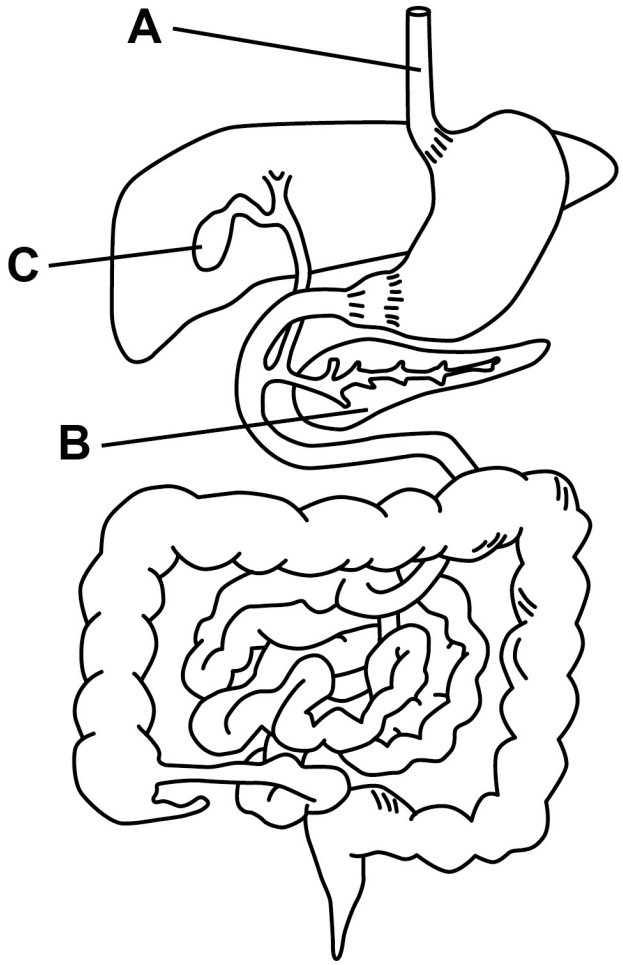
Explain how increasing the concentration of drug X reduces the symptoms of Alzheimer's. [2 marks]

17

0 2

FIGURE 6 shows the human digestive system.

FIGURE 6



0 2 . 1

Name parts A, B and C in FIGURE 6. [3 marks]

A _____

B _____

C _____

[Turn over]

Lipids are an important part of a healthy diet.

0 2 . 2

Explain how lipase and bile are used to digest lipids.
[3 marks]

0 2 . 3

A healthy diet also includes a range of micronutrients.

Complete TABLE 1. [3 marks]

TABLE 1

MICRONUTRIENT	EXAMPLE OF A FOOD RICH IN THE MICRONUTRIENT
Calcium	
Vitamin C	
Vitamin D	

[Turn over]

0 2 . 4

A diet too high in sodium chloride (salt) can cause high blood pressure.

Give TWO consequences of high blood pressure.
[2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 2 . 5

A person has high blood pressure. The doctor tells them to reduce their salt intake.

Which food should be reduced in their diet? [1 mark]

Tick (✓) ONE box.

- ☐ **Cow's milk**
- ☐ **Eggs**
- ☐ **Fresh vegetables**
- ☐ **Processed meat**

[Turn over]

0 2 . 6

Which piece of equipment can be used to measure blood pressure? [1 mark]

Tick (✓) ONE box.

- ☐ **Dipstick**
- ☐ **Pulse oximeter**
- ☐ **Sphygmomanometer**
- ☐ **Thermometer**

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[Turn over]

0 3

The human skeleton has several functions.

One function is movement.

0 3 . 1

Give TWO OTHER functions of the human skeleton.
[2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 3 . 2

Synovial joints between bones of the skeleton are needed for movement.

Describe TWO features of synovial joints that allow movement. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 3 . 3

Describe the range of motion in a gliding joint. [1 mark]

_____

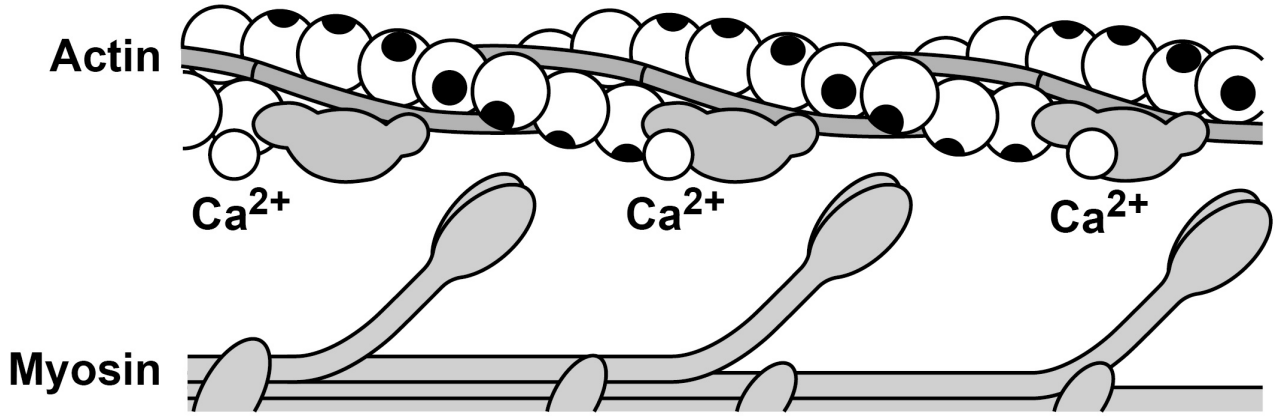
_____

_____

[Turn over]

FIGURE 7 shows part of an actin filament and a myosin filament in a muscle fibre when calcium ions have been released in response to a nerve impulse.

FIGURE 7



0 3 . 4

Explain what happens when calcium ions are released in response to a nerve impulse stimulating the muscle fibre. [3 marks]

0 3 . 5

Explain how actin filaments and myosin filaments cause contraction of a muscle fibre.

Use FIGURE 7. [3 marks]

[Turn over]

0 3 . 6

Long-distance runners have a higher proportion of slow-twitch muscle fibres compared with fast-twitch muscle fibres.

Give TWO reasons why a long-distance runner has a higher proportion of slow-twitch muscle fibres.
[2 marks]

1 _____

_____

_____

2 _____

_____

_____

Fast-twitch muscle fibres store creatine phosphate.

0 3 . 7

Describe how creatine phosphate is used to transfer energy to the muscle fibres. [2 marks]

_____

_____

0 3 . 8

Describe how creatine phosphate is regenerated after a period of exercise. [2 marks]

17

0 4

Some babies are born early and are called premature babies.

Oxygen saturation levels in premature babies can be too low due to a low breathing rate.

0 4 . 1

Which oxygen saturation level is in the normal range? [1 mark]

Tick (✓) ONE box.

- ☐ **91%**
- ☐ **93%**
- ☐ **94%**
- ☐ **95%**

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[Turn over]

Premature babies can be helped with their breathing using two different methods.

METHOD 1: provides a continuous flow of oxygen in the nose.

METHOD 2: uses a ventilator to force air into the lungs.

Scientists investigated the effectiveness of the two methods to improve oxygen saturation in premature babies.

FIGURE 8, on the opposite page, shows the scientists' results.

0 4 . 2

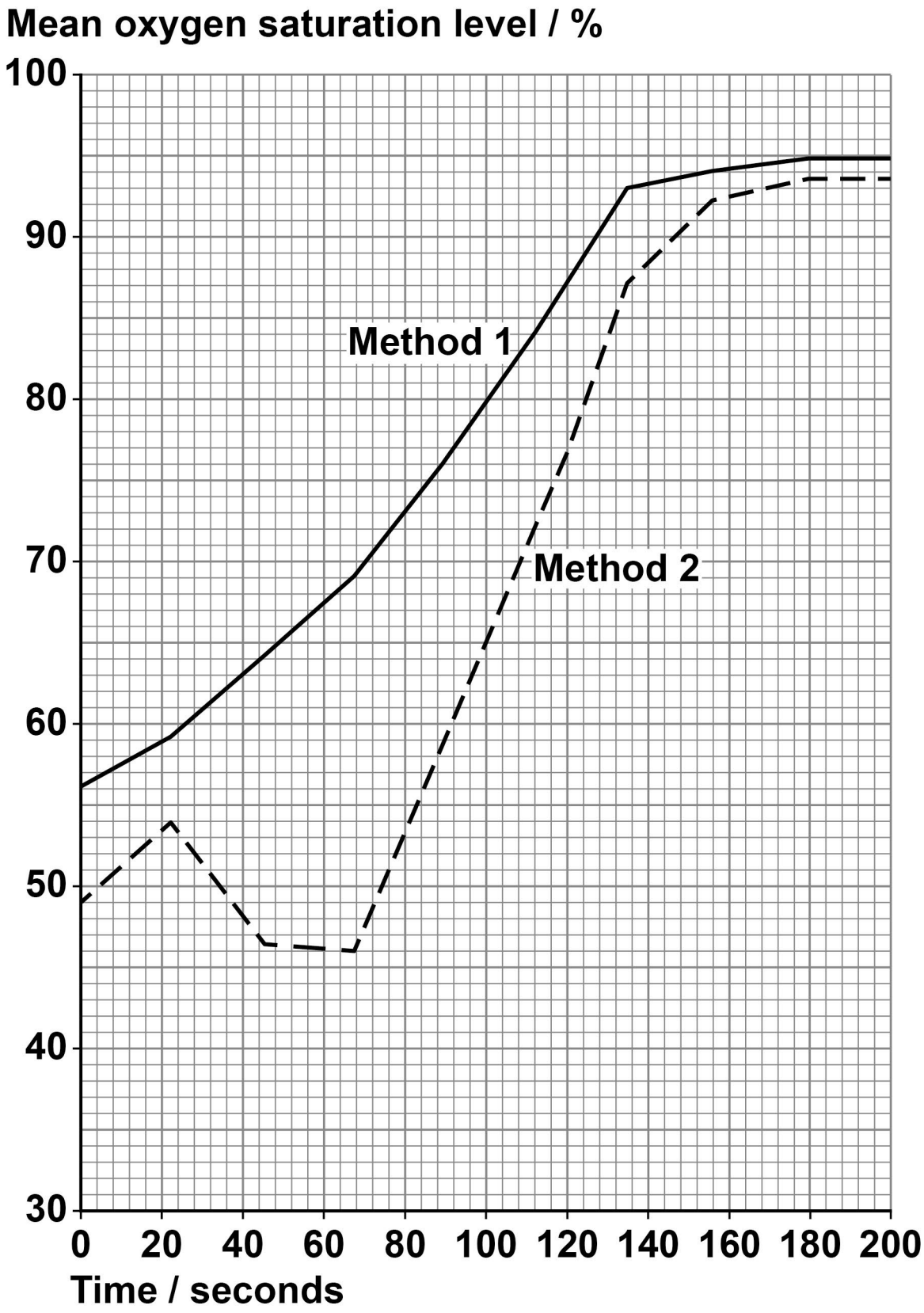
Determine the time it took for the mean oxygen saturation level to reach 90% in METHOD 1 and METHOD 2.

Use FIGURE 8. [2 marks]

METHOD 1 = _____ seconds

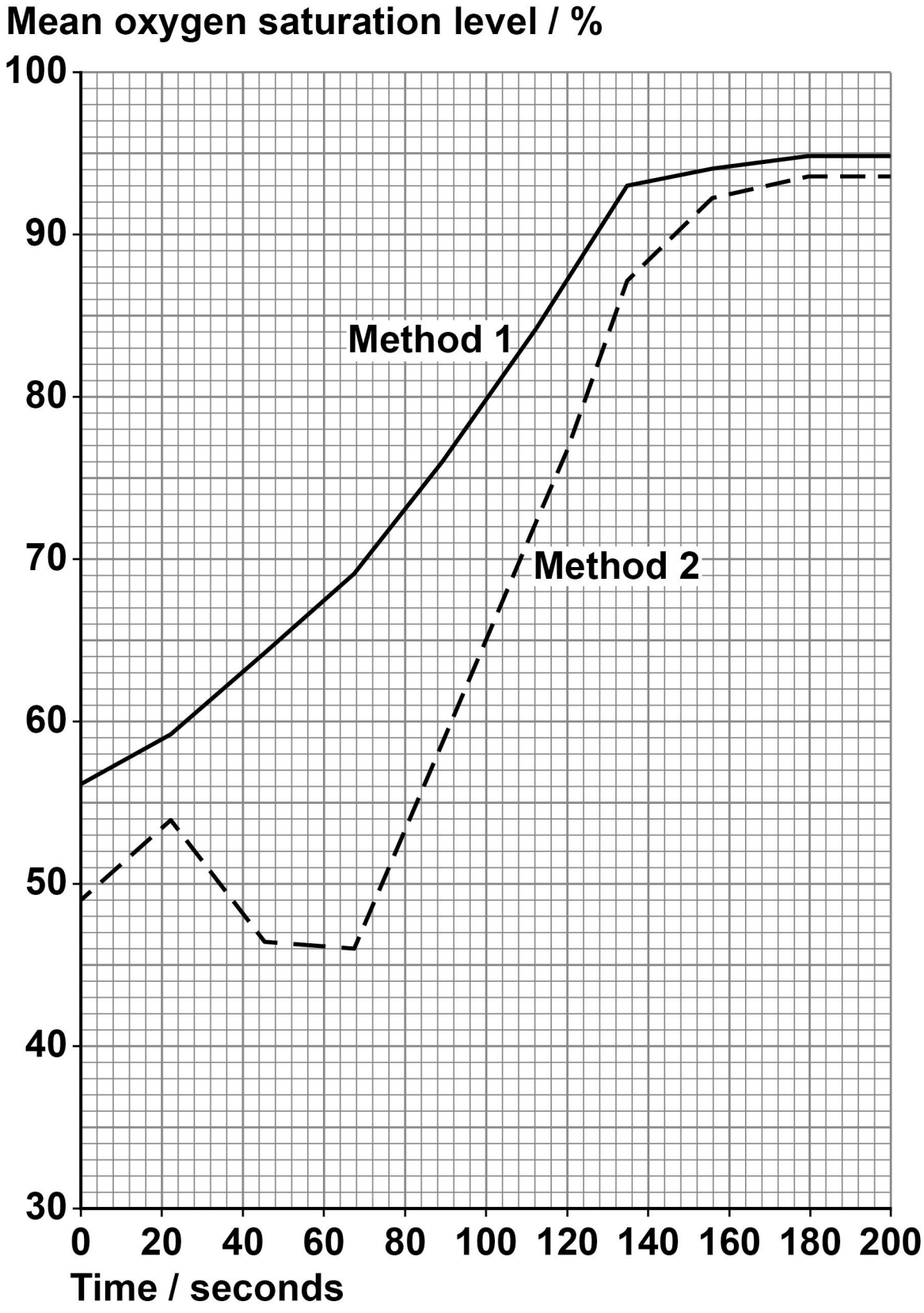
METHOD 2 = _____ seconds

FIGURE 8



[Turn over]

REPEAT OF FIGURE 8



0 4 . 3

The mean oxygen saturation in babies who received METHOD 1 increased from 56% at the start to 95% after 180 seconds.

Calculate the percentage increase in the mean oxygen saturation for METHOD 1 from 0 seconds to 180 seconds.

Give your answer to 2 significant figures. [3 marks]

Percentage increase = _____ %

[Turn over]

0 4 . 4

A student stated that METHOD 1 was better than METHOD 2 at helping breathing in premature babies.

Give THREE reasons to support the student's statement.

Use information from FIGURE 8, on page 34. [3 marks]

1 _____

_____

_____

2 _____

_____

_____

3 _____

_____

_____

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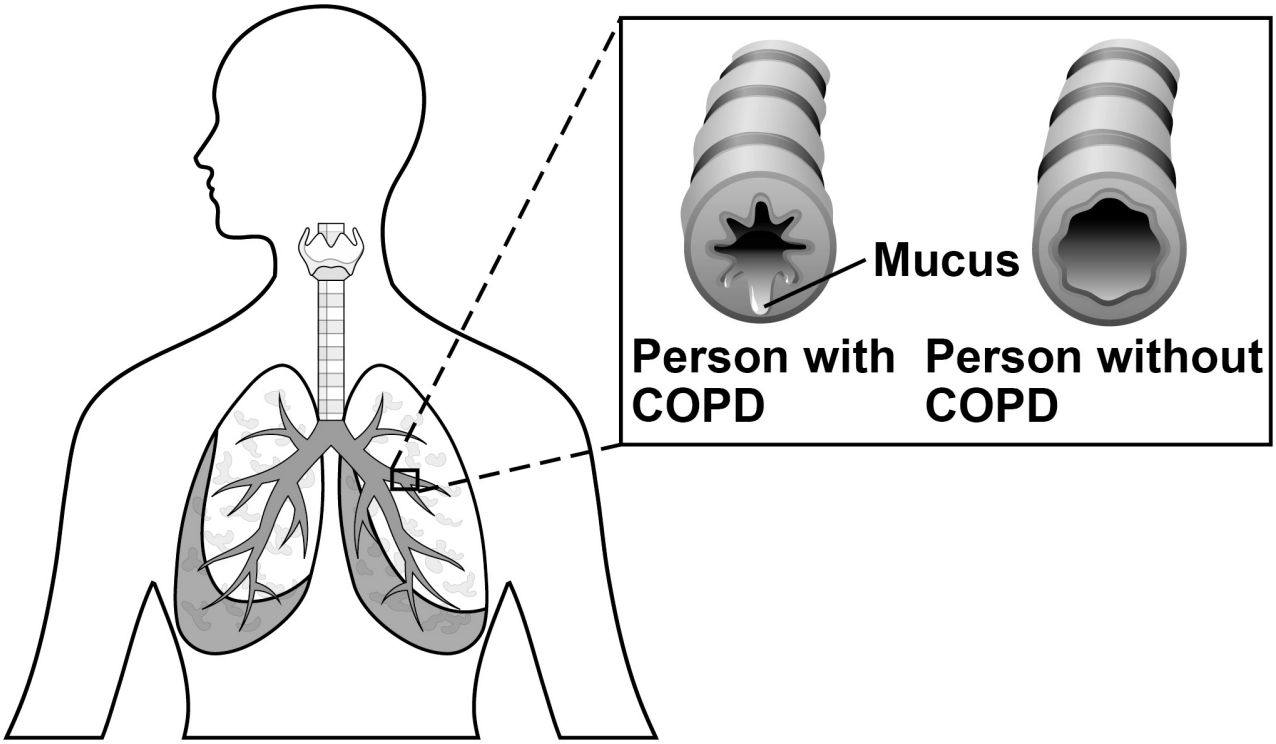
[Turn over]

Some people develop a lung disorder called COPD (chronic obstructive pulmonary disorder). METHOD 1 can be used for people with COPD to help them breathe when they are asleep.

FIGURE 9 compares the bronchioles of a person with COPD with the bronchioles of a person without COPD.

FIGURE 9



0 4 . 5

Explain why a person with COPD has a lower oxygen saturation level than a person without COPD. [4 marks]

END OF QUESTIONS

13

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
3	
4	
TOTAL	