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Level 3 Certificate/Extended Certificate
APPLIED SCIENCE

Unit 4 The Human Body

ASC4

Wednesday 19 June 2019 Morning

Time allowed: 1 hour 30 minutes

For this paper you must have:

- a calculator.

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



JUN19ASC401

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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



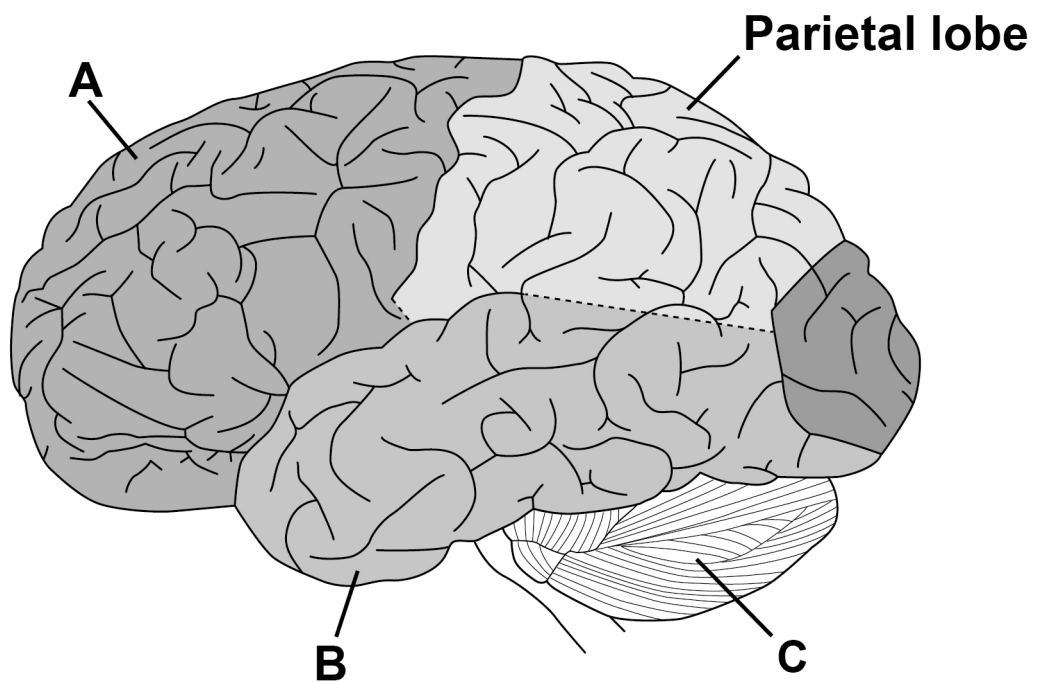
Answer ALL questions.

0 1

Neurologists study the brain and the nervous system.

FIGURE 1 shows the structure of the brain.

FIGURE 1



0 1 . 1 Draw ONE line from each part of the brain to its name. [2 marks]

Part

Name

A

B

Brain stem

Cerebellum

Frontal lobe

Occipital lobe

Temporal lobe

0 1 . 2 What is the role of part C in FIGURE 1?

Tick (✓) ONE box. [1 mark]

Controlling the skeletal muscles

Maintaining breathing rate

Visual processing

[Turn over]



0 1 . 3 A stroke can be caused by a blood clot in the brain. The blood clot can cut off the supply of blood to specific areas of the brain.

Give ONE way a doctor might know which area of the brain is damaged as a result of the blood clot. [1 mark]

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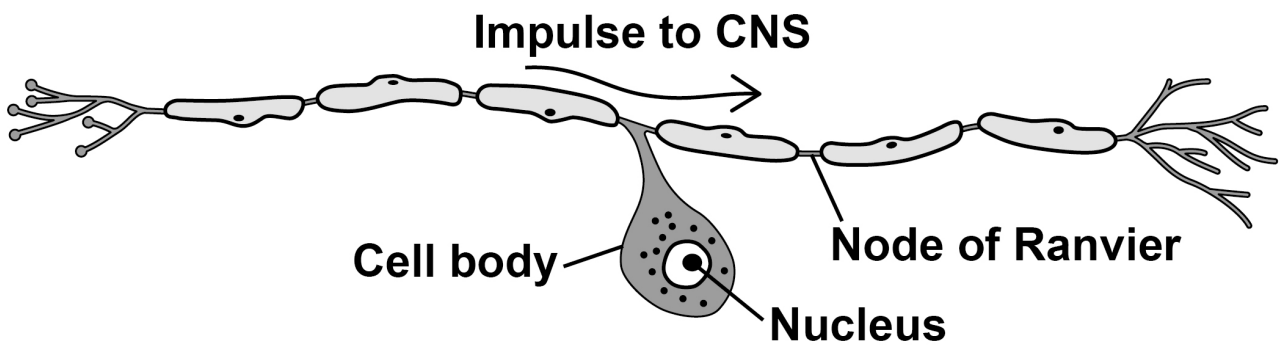


- 01.4 There are many sensory neurones carrying nerve impulses to the brain.

FIGURE 2 shows a sensory neurone.

Sensory neurones carry nerve impulses to the brain at 120 m s^{-1}

FIGURE 2



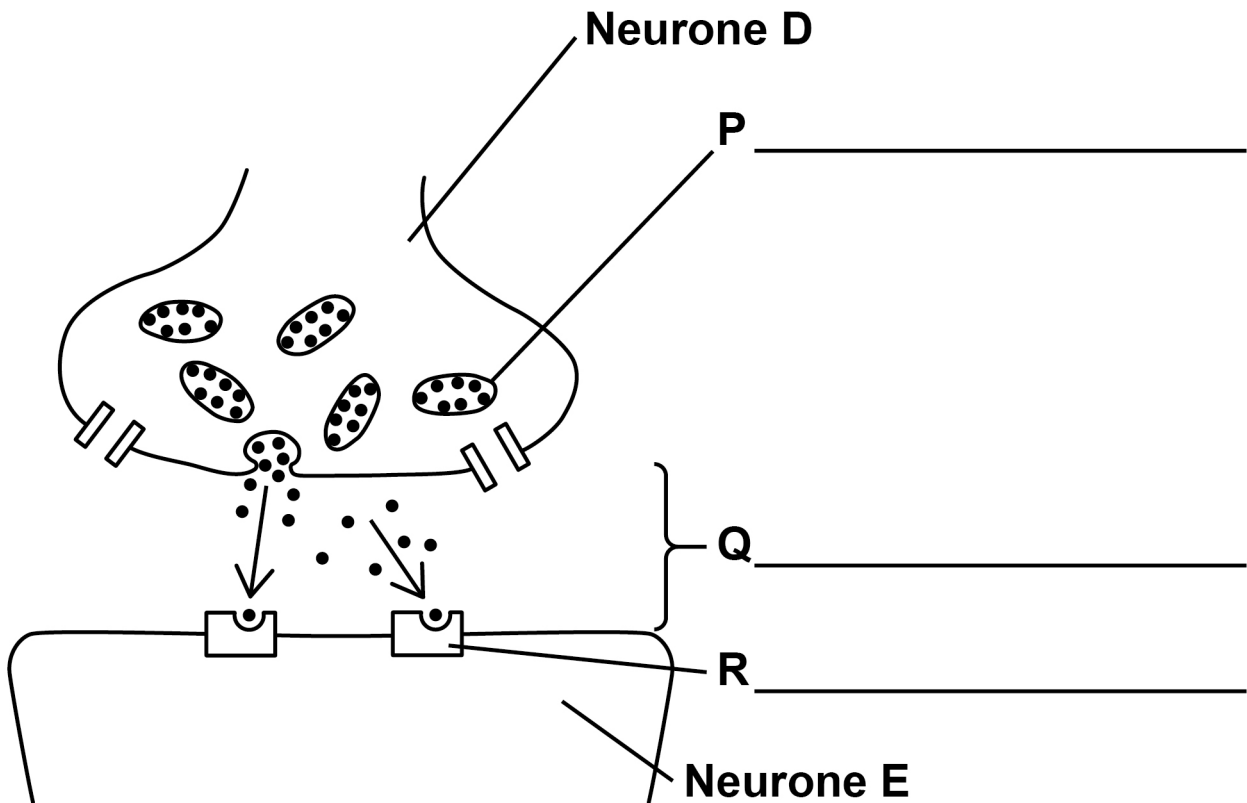
**Explain how the sensory neurone in
FIGURE 2 ensures a fast speed of
conduction of nerve impulses. [2 marks]**

[Turn over]

FIGURE 3 shows two neurones.

In FIGURE 3 acetylcholine (neurotransmitter) is represented by •

FIGURE 3



0 1 . 5 Label P, Q and R in FIGURE 3. [3 marks]



0 1 . 6 The enzyme acetylcholinesterase is found in neurone E.

**Explain the role of acetylcholinesterase.
[2 marks]**

0 1 . 7 Name a disorder caused by a lack of acetylcholine. [1 mark]

[Turn over]

12



0 2

A diet high in lipids can cause obesity.

Enzymes in the digestive system break down lipids.

0 2

. 1

What are lipids broken down into? [2 marks]

0 2

. 2

When lipids are digested ester bonds are broken.

Name the type of reaction that breaks the ester bonds. [1 mark]



02.3 The stomach secretes gastrin as food is eaten.

Describe TWO effects of gastrin that help the process of digestion. [2 marks]

1 _____

2 _____

[Turn over]

Doctors can give a drug called orlistat to people who are trying to lose weight.

A scientist investigated the effect of orlistat on lipase activity.

- **Five people were given orlistat before eating a meal.**
- **Five other people were given a placebo before eating a meal.**
- **A placebo is a substance that has no effect on the human body.**

FIGURE 4, on page 16, shows the results of the investigation.

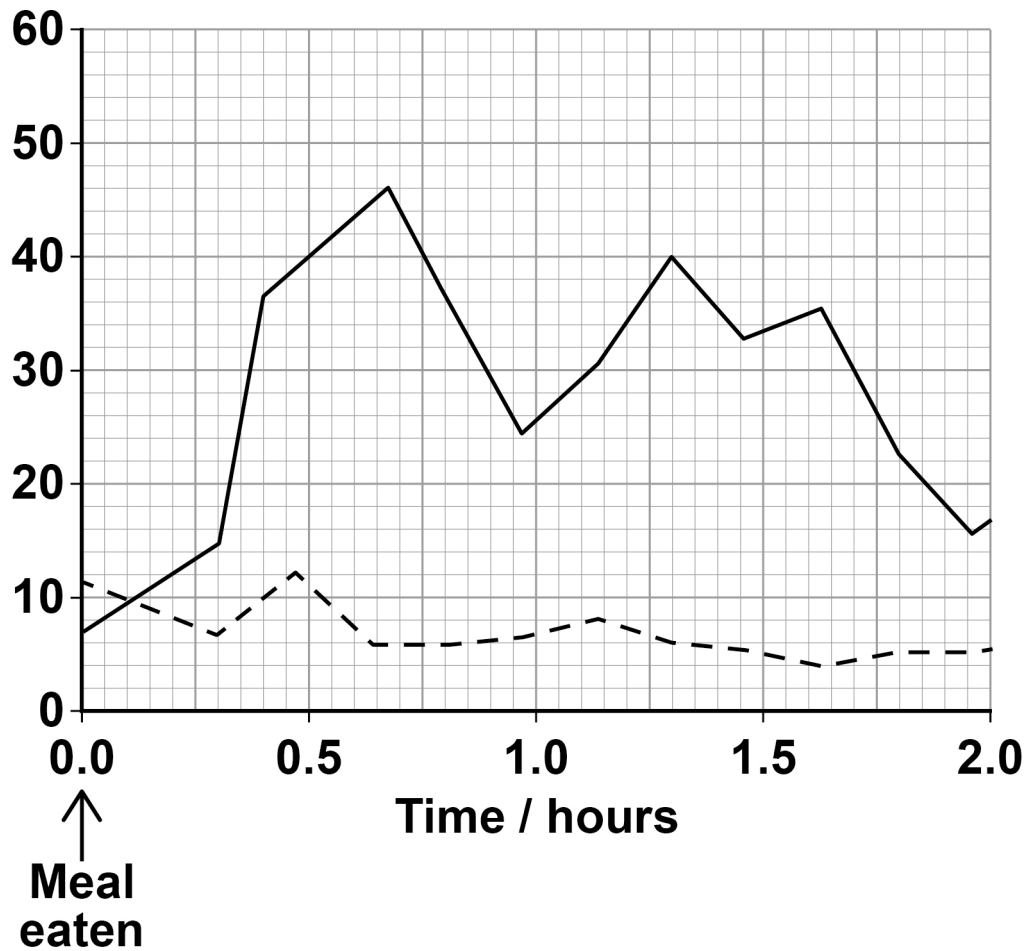
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FIGURE 4

Mean
lipase
activity /
arbitrary
units

**KEY**

- - - People given orlistat
- People given placebo



0 2 . 4 Describe the effects of orlistat on lipase activity.

Use information from FIGURE 4. [2 marks]

0 2 . 5 Calculate the percentage change in lipase activity in the placebo group between 0 and 0.5 hours. [2 marks]

Percentage change = _____ %

[Turn over]



02.6 One possible side effect of taking orlistat is a high concentration of fats and oils in the person's faeces.

Explain why. [2 marks]

02.7 Orlistat can reduce the absorption of vitamin D in the small intestine.

Give TWO ways a person taking orlistat could help prevent vitamin D deficiency. [2 marks]

1 _____

2 _____

[Turn over]

13

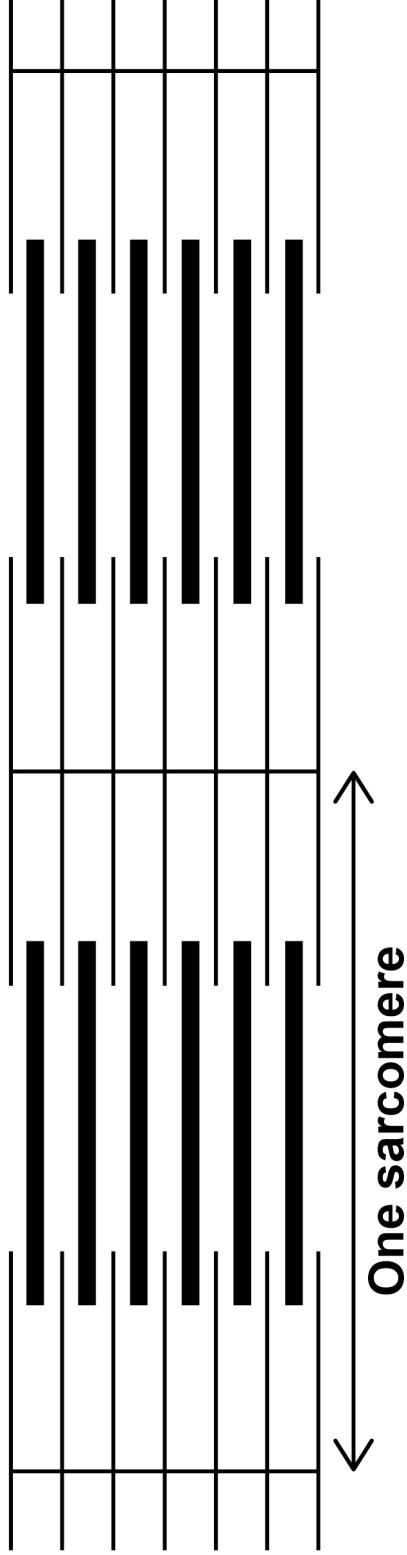


03

Muscles are made of myofibrils.

FIGURE 5 shows part of a myofibril from a muscle.

FIGURE 5



03.1

Label an actin filament and a myosin filament on FIGURE 5.
[2 marks]



03.2

The sliding filament theory explains muscle contraction in myofibrils.

Describe what happens to the position of the actin filaments and myosin filaments when the muscle contracts. [1 mark]

[Turn over]



- 03.3** Explain the role of ATP in the sliding filament theory of muscle contraction.
[2 marks]



03.4 Tropomyosin blocks binding sites on the actin filaments so the myosin heads cannot bind.

Explain what happens to unblock the binding sites when a nerve impulse arrives at the myofibril. [3 marks]

[Turn over]

03.5 Muscles are made of slow-twitch fibres and fast-twitch fibres.

What are **THREE** features of **SLOW-TWITCH** fibres?

Tick (✓) **THREE** boxes. [3 marks]

Fatigue quickly

Function over short periods of time

Respire aerobically

Respire fat stores in the body

Large stores of creatine phosphate

Large stores of glycogen

11



0 4

The skeleton:

- supports and protects the body
- allows movement.

0 4 . 1

Give ONE other function of the skeleton.
[1 mark]

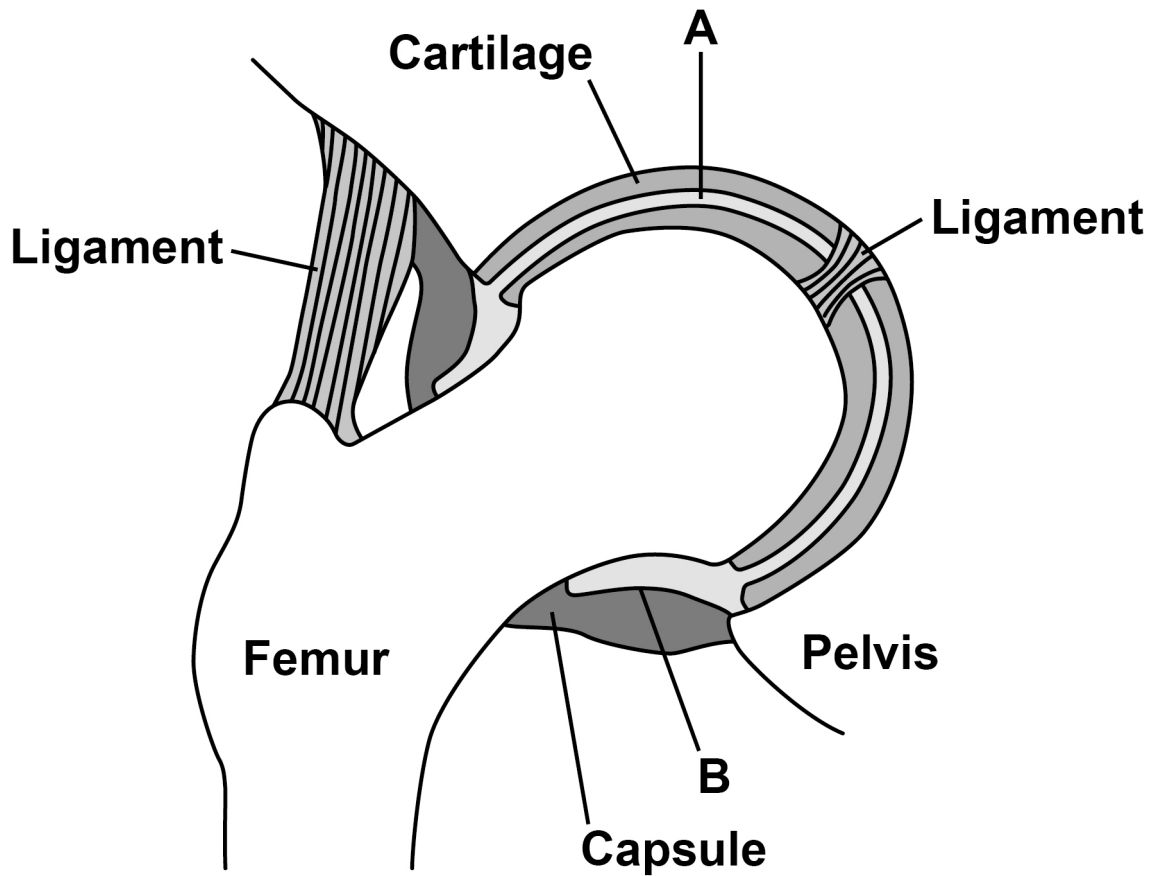
[Turn over]



The skeleton has many joints.

FIGURE 6 shows the joint between the femur and pelvis.

FIGURE 6



0 4 . 2 Name A and B in FIGURE 6. [2 marks]

A _____

B _____

0 4 . 3 Describe the range of movement of the joint in FIGURE 6. [1 mark]

[Turn over]

4



05

A sports scientist investigated the effect of different dietary supplements on lean muscle mass and muscle strength.

- **One group took a creatine supplement daily.**
- **Each of four groups took a different supplement (A, B, C or D) daily.**
- **Another group took a placebo daily.**
- **All of the groups did strength training exercises three times a week.**

FIGURE 7, on page 30, shows the effect on percentage gain in muscle mass.

FIGURE 8, on page 31, shows the effect on percentage increase in muscle strength.



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[Turn over]



FIGURE 7

Percentage
gain in
muscle
mass
per week

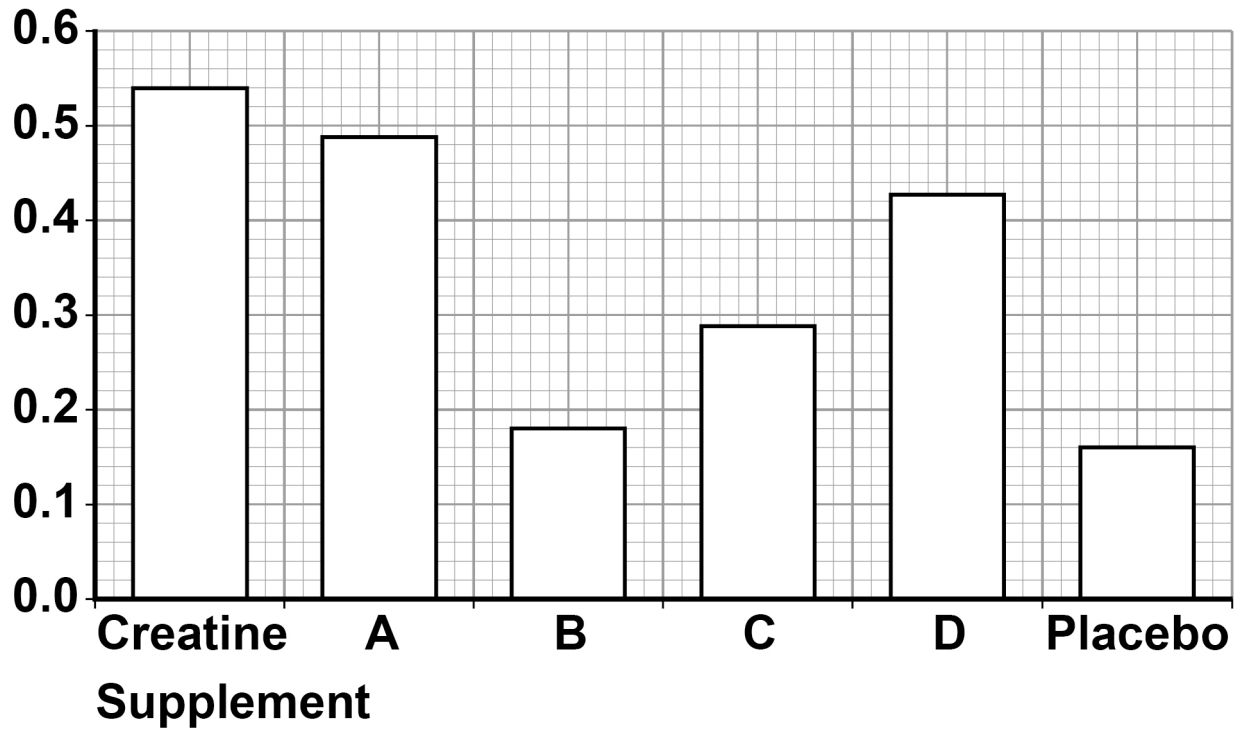
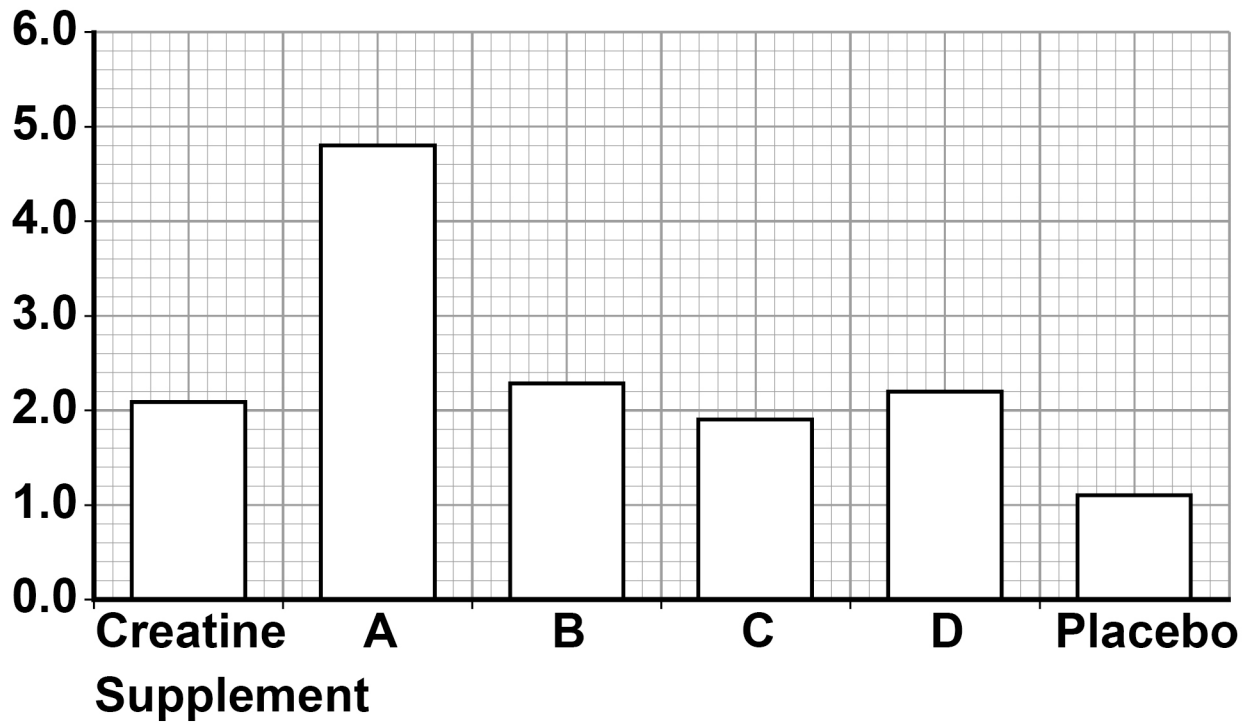


FIGURE 8

Percentage
increase in
muscle
strength
per week



[Turn over]



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05.1 A manufacturer's marketing material states:

'Creatine supplements make you stronger.'

**Give evidence from FIGURE 7, on page 30,
and FIGURE 8, on page 31, to support the
manufacturer's claim. [2 marks]**

[Turn over]

05.2 The manufacturer also states that creatine supplements are the most effective supplement for strength training.

Give TWO reasons why this claim may NOT be valid.

Use information from FIGURE 7, on page 30, and FIGURE 8, on page 31. [2 marks]

1 _____

2 _____

05.3 Creatine supplements contain creatine phosphate.

Describe the role of creatine phosphate in muscles. [2 marks]

[Turn over]

A different scientific study showed that taking creatine supplements might help treat people with Parkinson's disease.

Some of the symptoms of Parkinson's disease are muscle tremors and decreasing muscle strength.

05.4 **People with Parkinson's disease have fewer neurotransmitters in the brain.**

Name the neurotransmitter that is linked to Parkinson's disease. [1 mark]

0 5 . 5 Suggest how increasing creatine phosphate in muscle cells might reduce the symptoms of Parkinson's disease. [2 marks]

[Turn over]

9



06

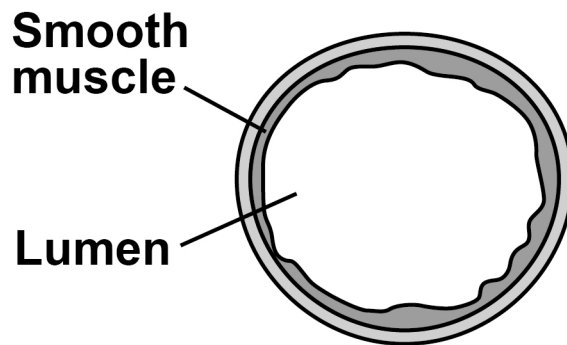
Cystic fibrosis (CF) is a disorder that affects the lungs.

A child with CF is taken to a hospital with shortness of breath.

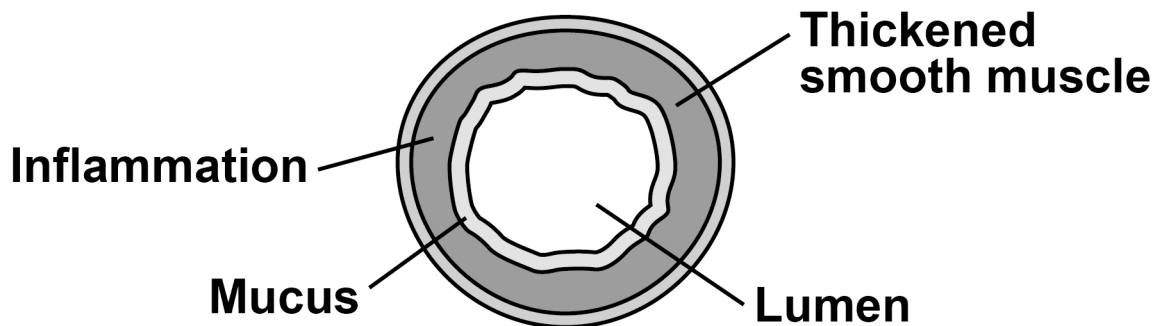
FIGURE 9 shows the trachea from a person without CF and from a person with CF.

FIGURE 9

Trachea from a person without CF



Trachea from a person with CF



06.1 The child's oxygen saturation reading is 94%.

**What can you conclude from this reading?
[1 mark]**

06.2 Explain why people with CF get tired quickly when they exercise.

Use information from FIGURE 9. [3 marks]



[Turn over]

- 06.3** When air enters the lungs, oxygen moves into the bloodstream. The oxygen is carried by haemoglobin.

Blood plasma does not carry much oxygen.

Give the reason why. [1 mark]

FIGURE 10, on the opposite page, shows an oxygen dissociation curve for haemoglobin.

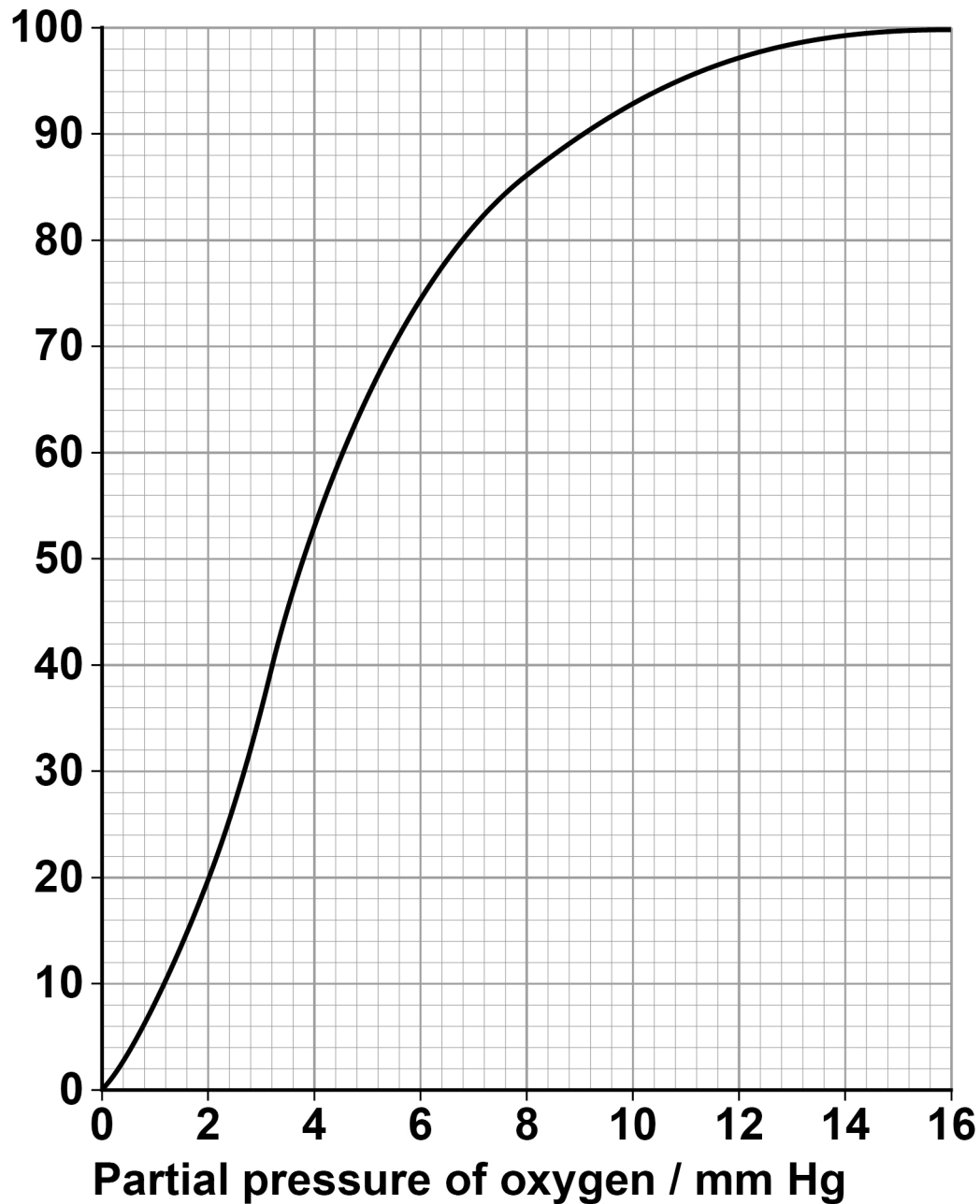
- 06.4** What is the partial pressure of oxygen when the percentage saturation is 94%? [1 mark]

Partial pressure = _____ mm Hg



FIGURE 10

Percentage
saturation of
haemoglobin
with oxygen



[Turn over]



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0 6 . 5 Explain why the oxygen dissociation curve for haemoglobin is the shape shown in **FIGURE 10**, on page 41. [3 marks]

[Turn over]



06.6 The Bohr effect will cause the oxygen dissociation curve in FIGURE 10, on page 41, to shift to the right.

**Explain how the Bohr effect helps maintain a high rate of respiration during exercise.
[2 marks]**

11

END OF QUESTIONS



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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Question	Mark
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