Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

# Level 3 Certificate/Extended Certificate

# APPLIED SCIENCE

## Unit 4 The Human Body

# ASC4

**Wednesday 19 June 2019 Morning**

**Time allowed: 1 hour 30 minutes**

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

**[Turn over]**

**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**

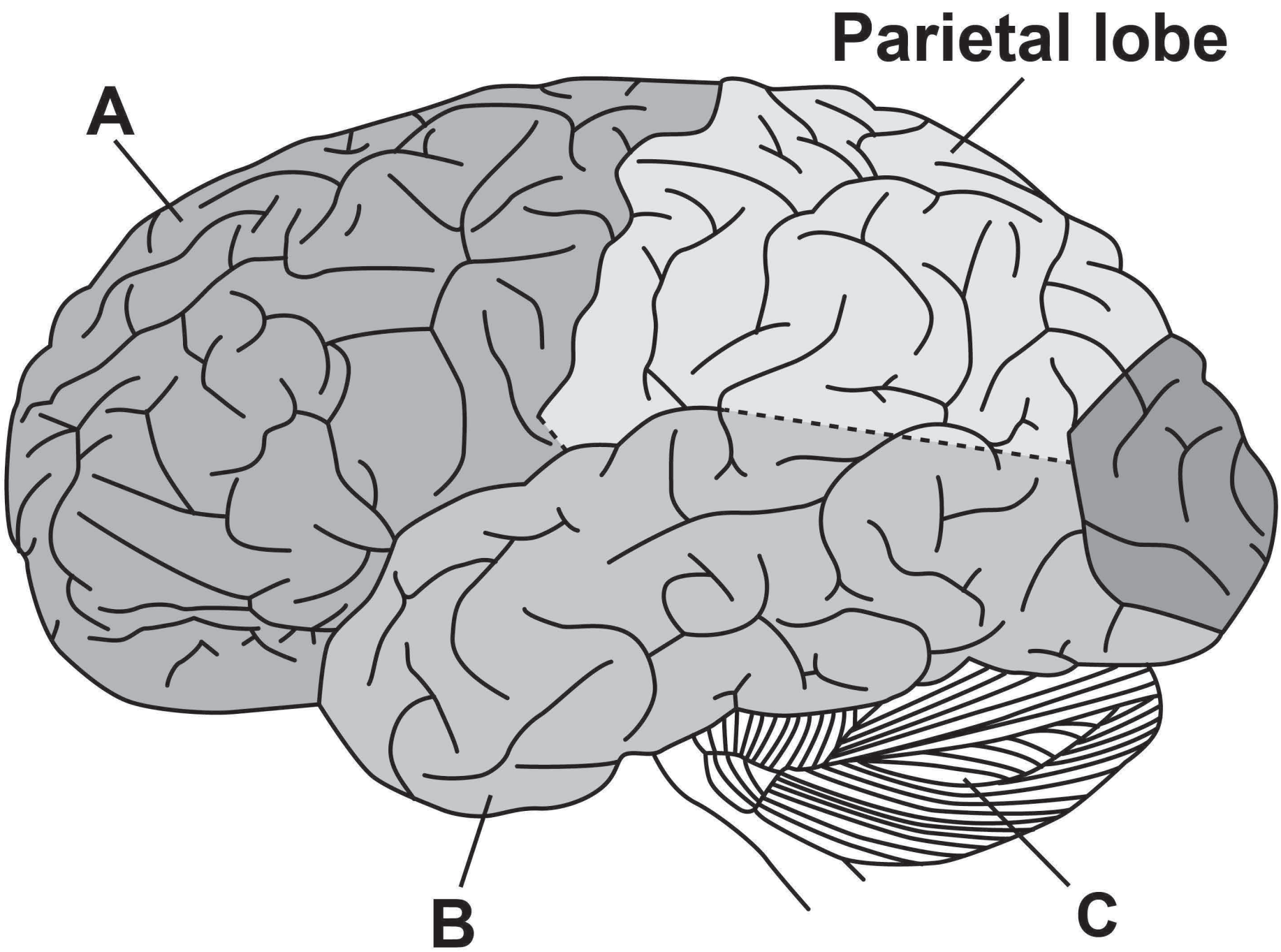
**Answer ALL questions.**

**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 |
| --- | --- |
| | Brain stem |
| A | Cerebellum |
| | Frontal lobe |
| B | Occipital lobe |
| | Temporal lobe |

**[Turn over]**

**0 1 . 2**

**What is the role of part C in FIGURE 1, on page 4?**

**Tick (✓) ONE box. [1 mark]**

☐ **Controlling the skeletal muscles**

☐ **Maintaining breathing rate**

☐ **Visual processing**

**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]**

_____

_____

_____

_____

**[Turn over]**

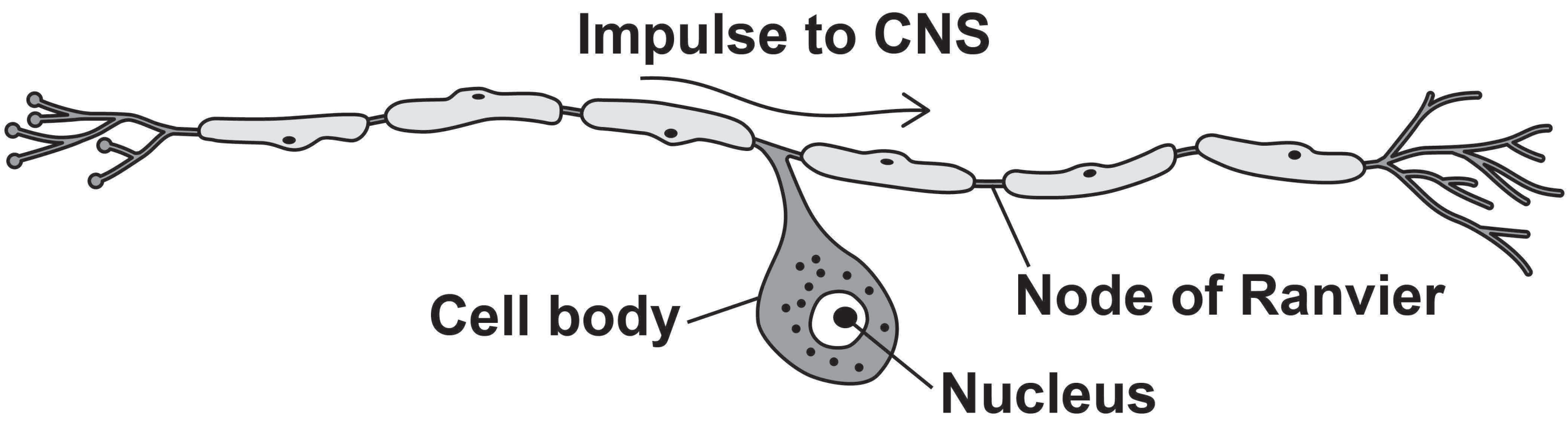
**0 1 . 4**

**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]**

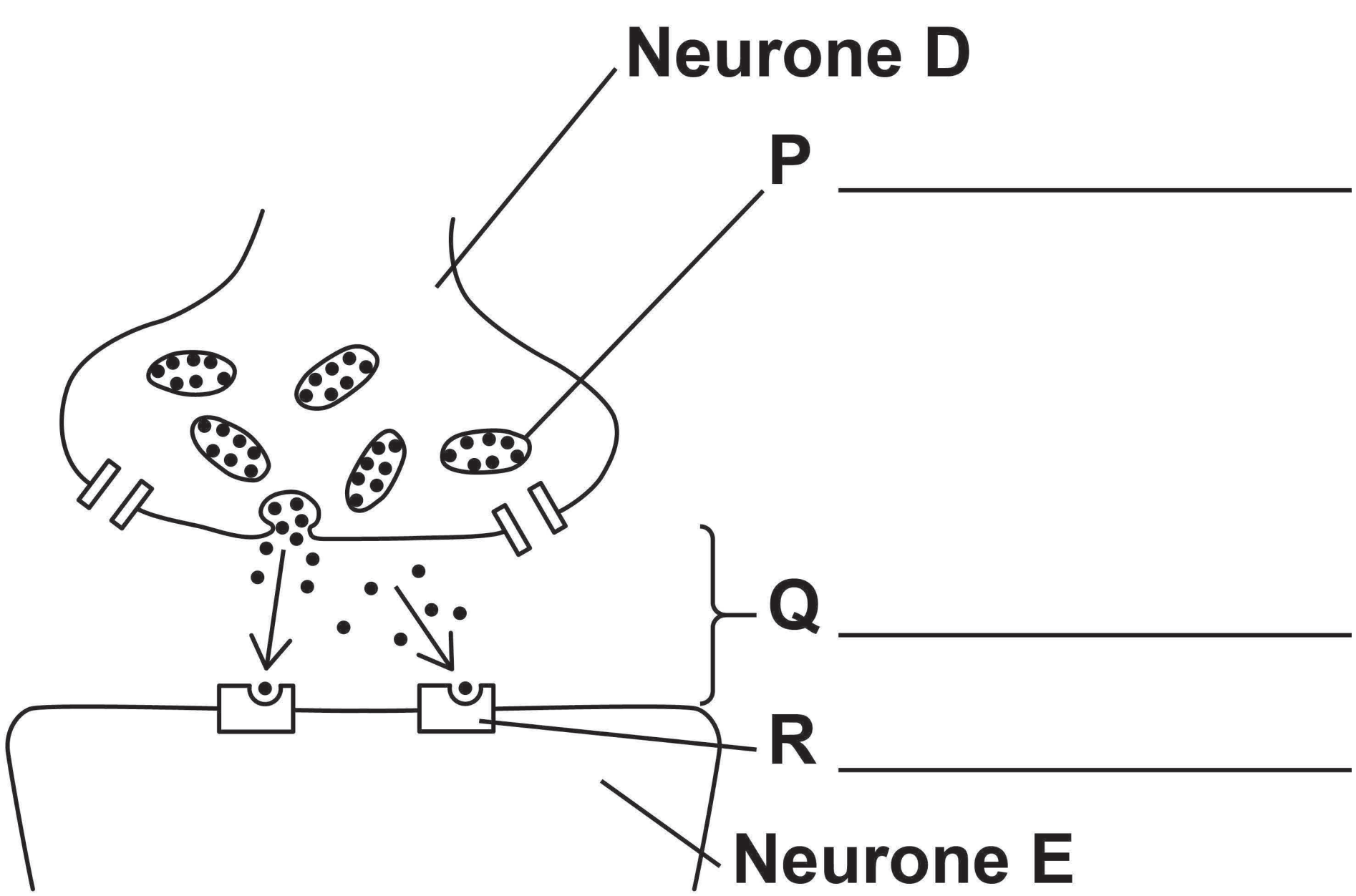


**[Turn over]**

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]**

**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]**

**0 2 . 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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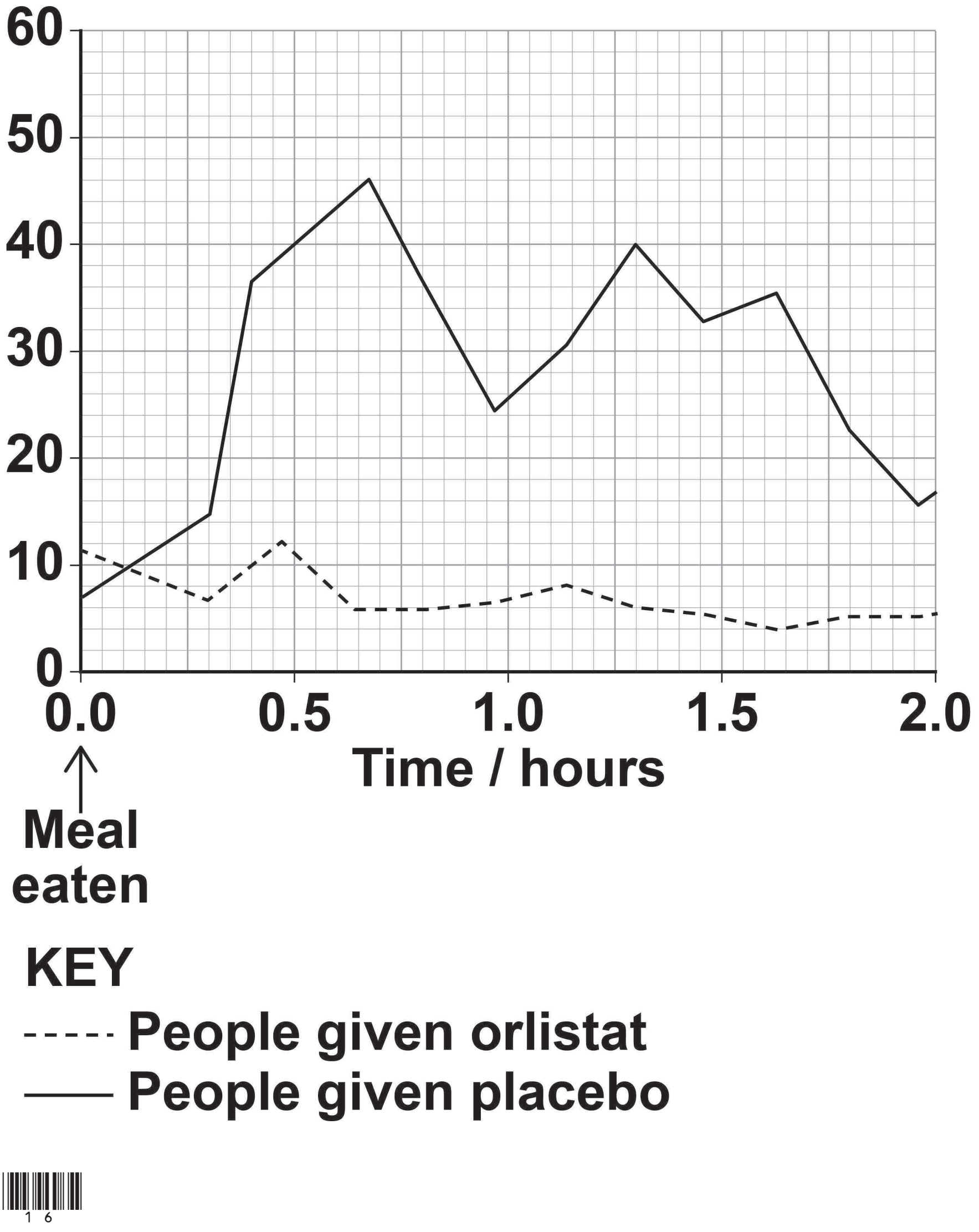
# FIGURE 4


Mean lipase activity / arbitrary units
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
Time / hours
Meal eaten
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 = _____ %**

**0 2 . 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]**

**0 2 . 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**

**13**

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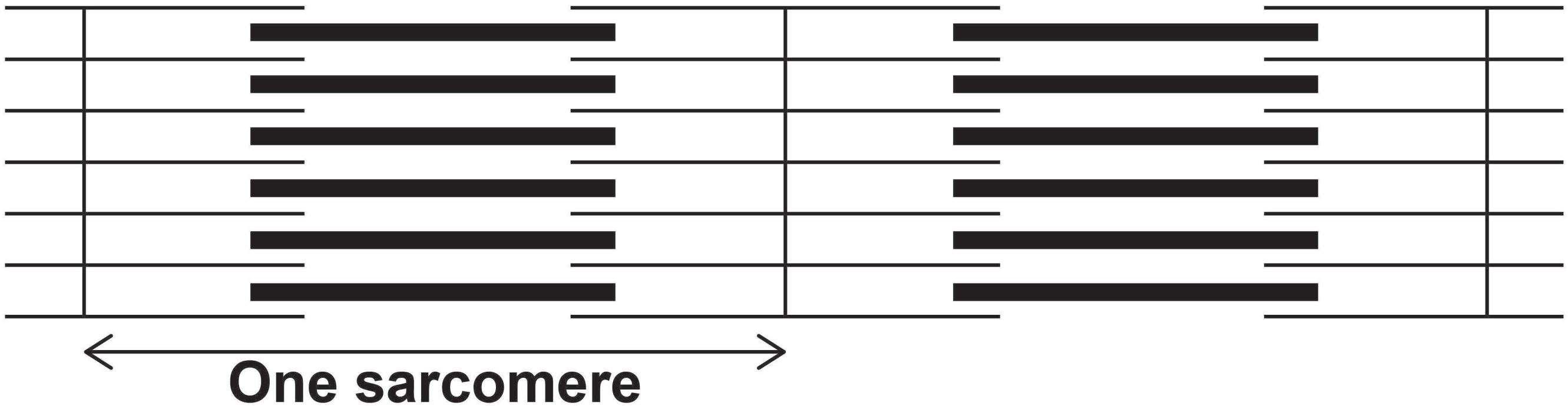
**[Turn over]**

**0 3**

**Muscles are made of myofibrils.**

**FIGURE 5 shows part of a myofibril from a muscle.**

**FIGURE 5**



**0 3 . 1**

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

**0 3 . 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]**

**0 3 . 3**

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

**0 3 . 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]**

**0 3 . 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]**

_____

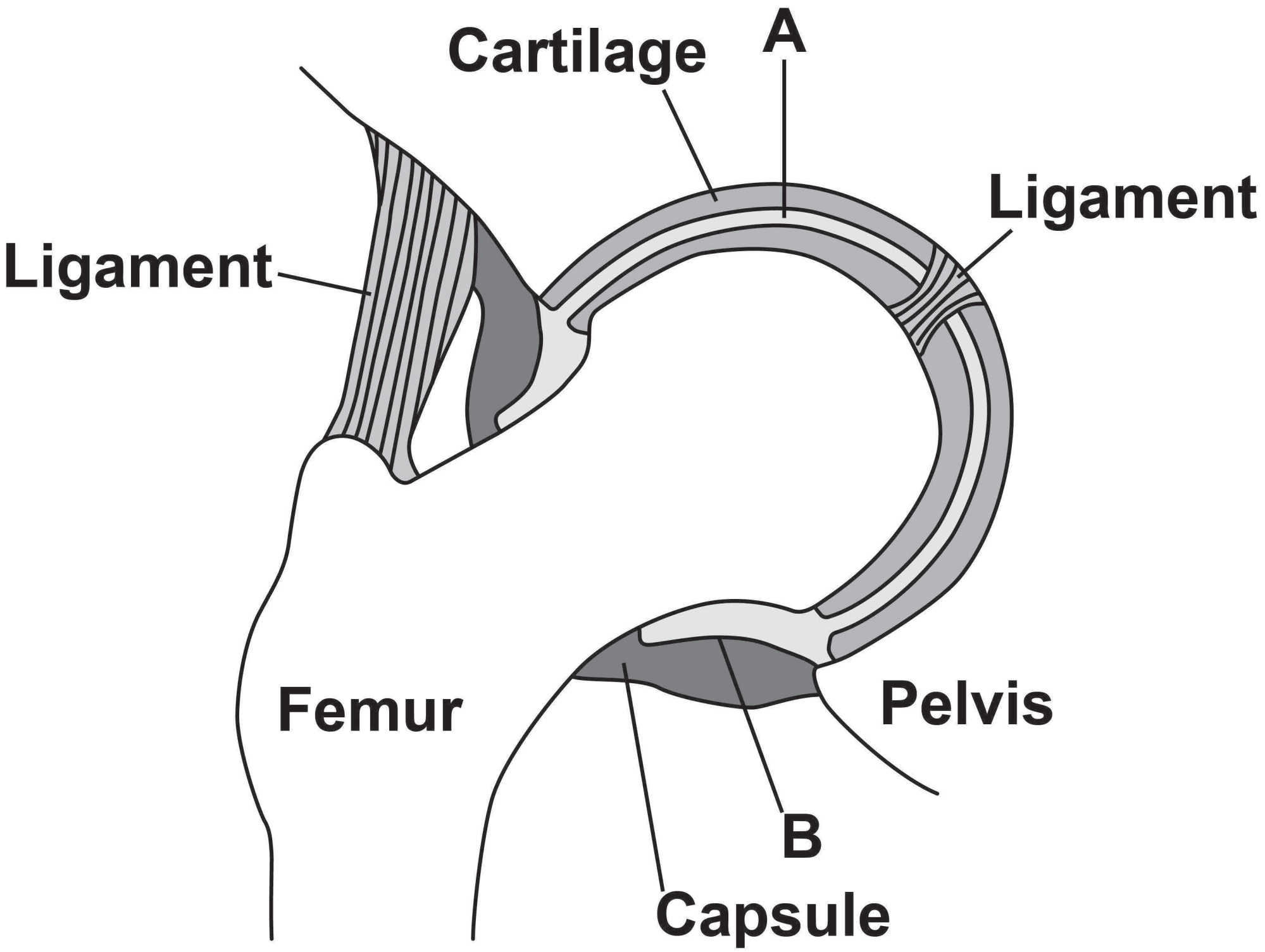
_____

**[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]**

_____

_____

4

**0 5**

**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 32, shows the effect on percentage gain in muscle mass.**

**FIGURE 8, on page 33, shows the effect on percentage increase in muscle strength.**

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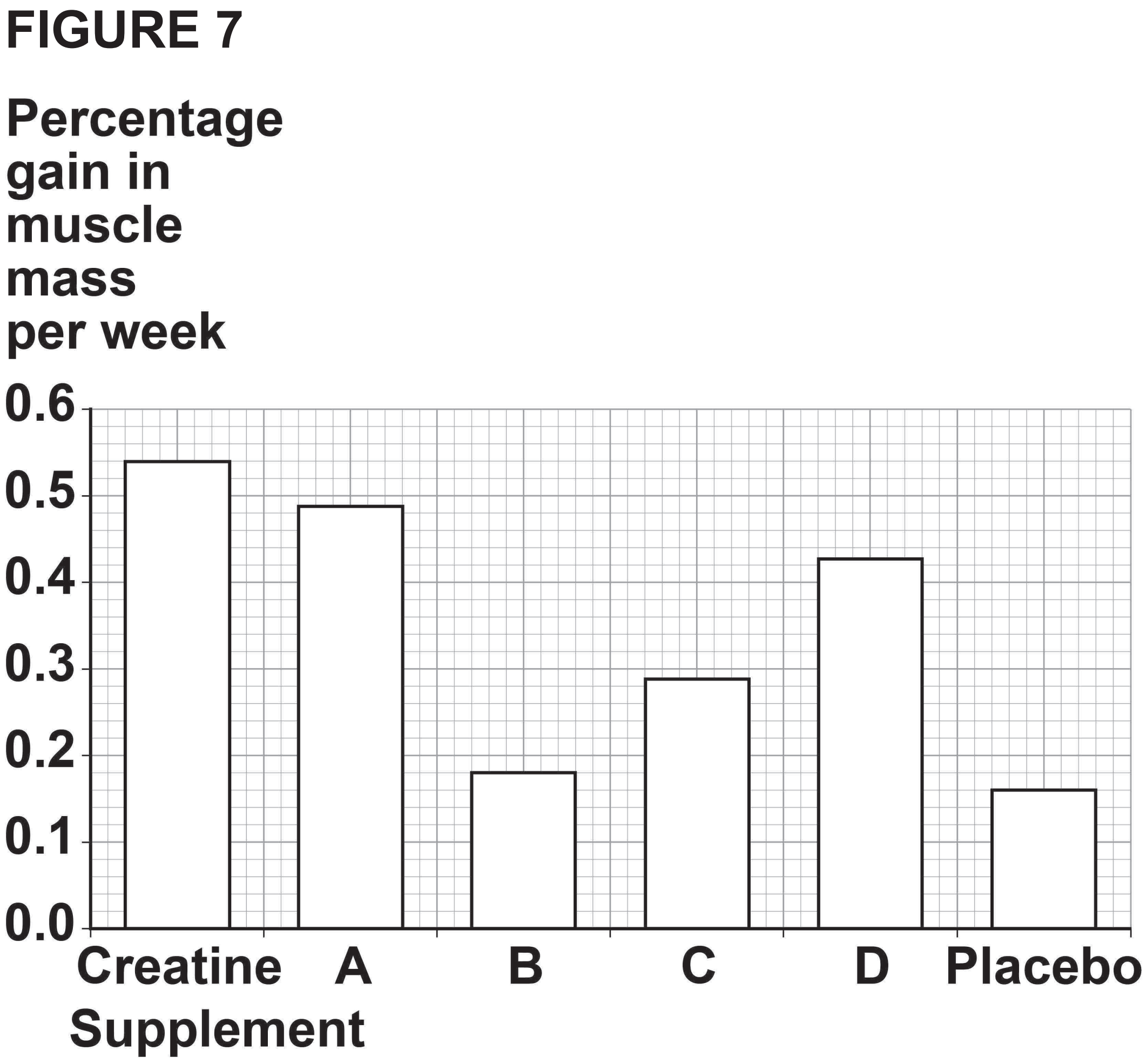
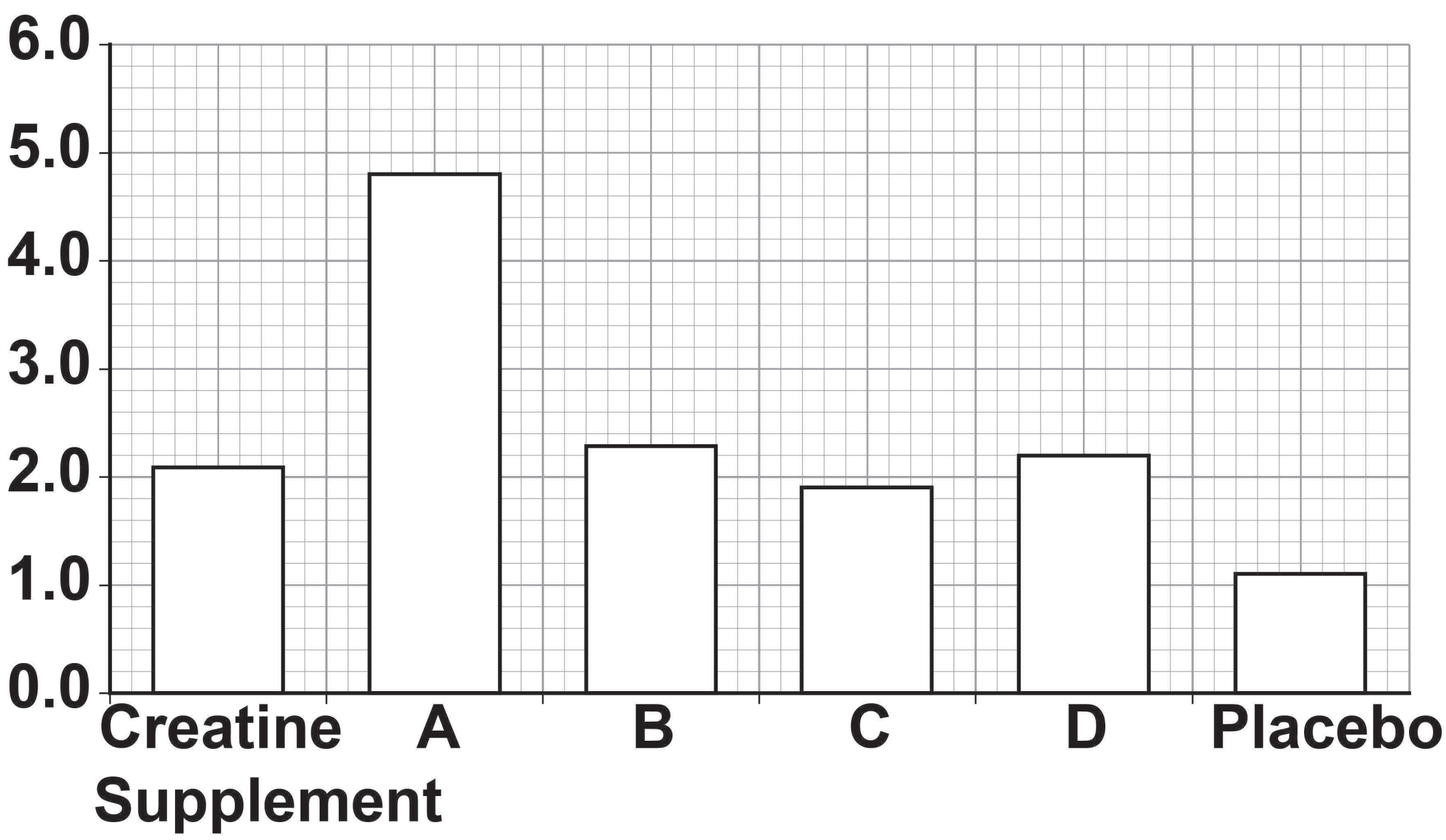
# FIGURE 7


Percentage gain in muscle mass per week
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Creatine
A
B
C
D
Placebo
Supplement

# FIGURE 8





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**0 5 . 1**

**A manufacturer's marketing material states:**

**'Creatine supplements make you stronger.'**

**Give evidence from FIGURE 7, on page 32, and FIGURE 8, on page 33, to support the manufacturer's claim.**
**[2 marks]**

**0 5 . 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 32, and FIGURE 8, on page 33.**
**[2 marks]**

**1** _____

_____

_____

**2** _____

_____

_____

**0 5 . 3**

**Creatine supplements contain creatine phosphate.**

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

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.

**0 5 . 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]**

**9**

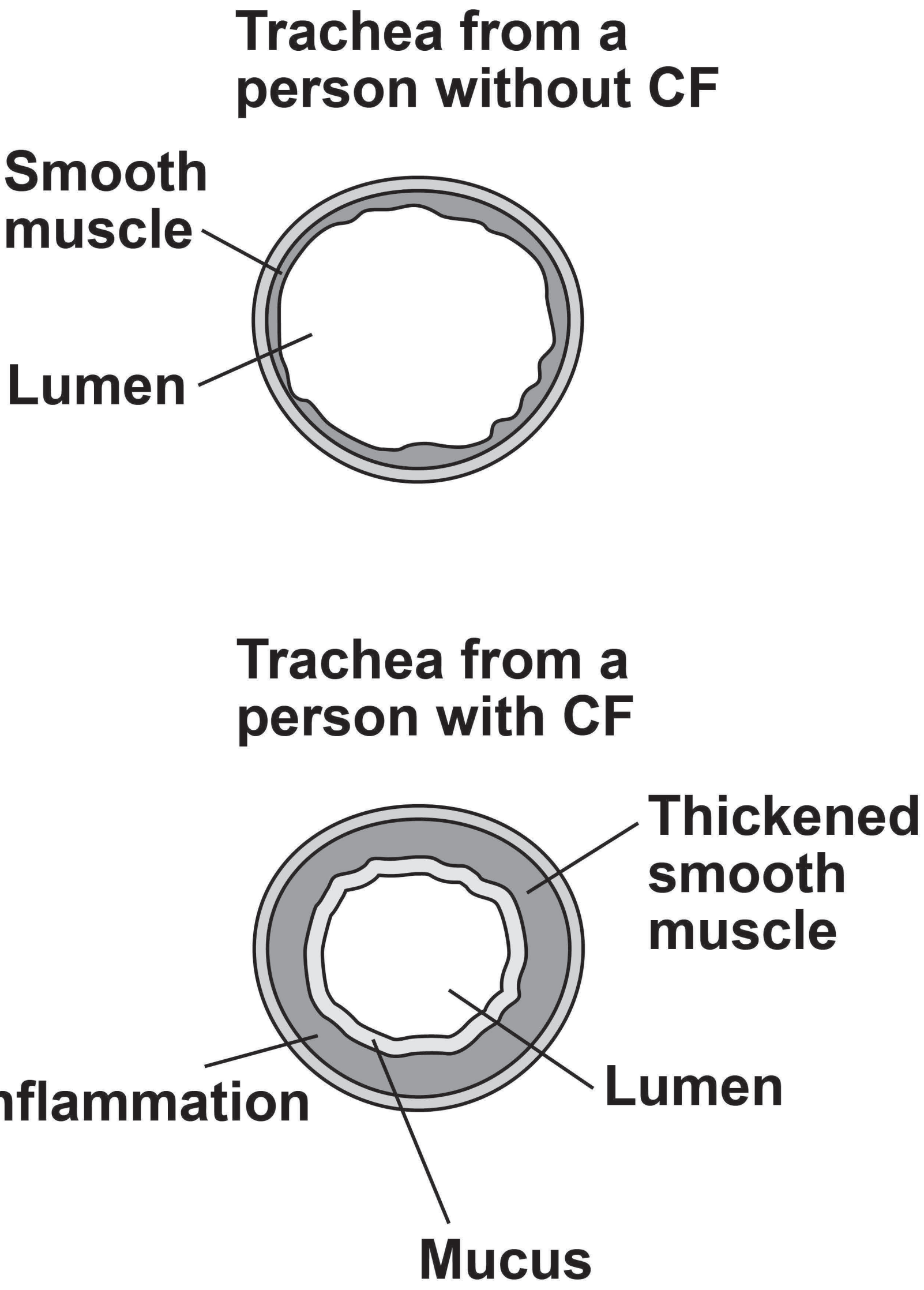
**0 6**

**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, on the opposite page, shows the trachea from a person without CF and from a person with CF.**

# FIGURE 9




[Turn over]

**0 6 . 1**

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

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

**0 6 . 2**

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

**Use information from FIGURE 9, on page 41. [3 marks]**

**0 6 . 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]**

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[Turn over]

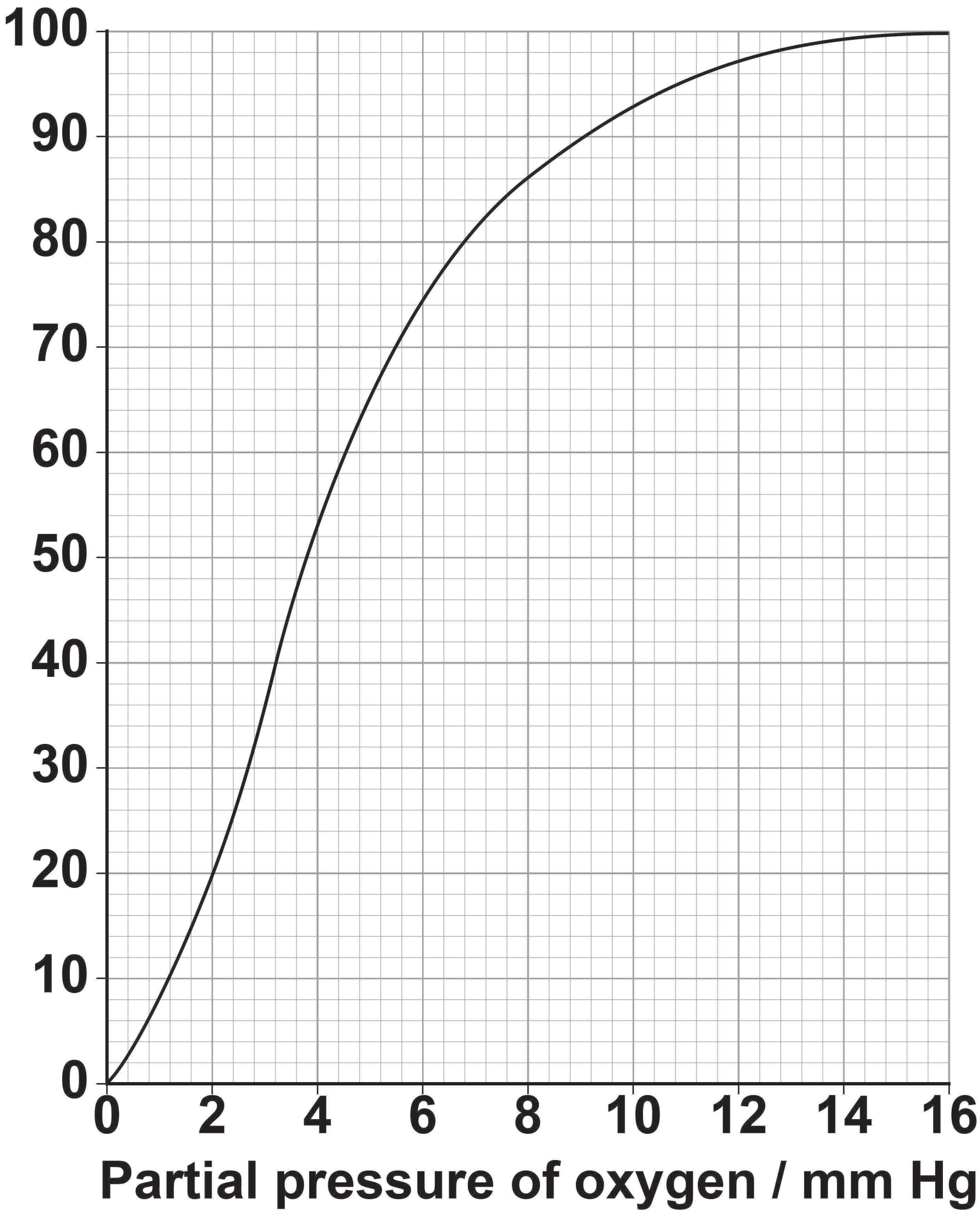
**FIGURE 10, on the opposite page, shows an oxygen dissociation curve for haemoglobin.**

**0 6 . 4**

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

**Partial pressure = _____ mm Hg**

# FIGURE 10

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**0 6 . 5**

**Explain why the oxygen dissociation curve for haemoglobin is the shape shown in FIGURE 10, on page 47.**
**[3 marks]**

**0 6 . 6**

**The Bohr effect will cause the oxygen dissociation curve in FIGURE 10, on page 47, to shift to the right.**

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

**END OF QUESTIONS**

**11**

**Additional page, if required.**

**Write the question numbers in the left-hand margin.**

**Additional page, if required.**

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**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 | |
| 5 | |
| 6 | |
| TOTAL | |