

Please write clearly in block capitals.

Centre number

Candidate number

Surname _____

Forename(s) _____

Candidate signature _____

Level 3 Certificate/Extended Certificate APPLIED SCIENCE

Unit 4 The Human Body

Wednesday 19 June 2019

Morning

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



Answer **all** questions.

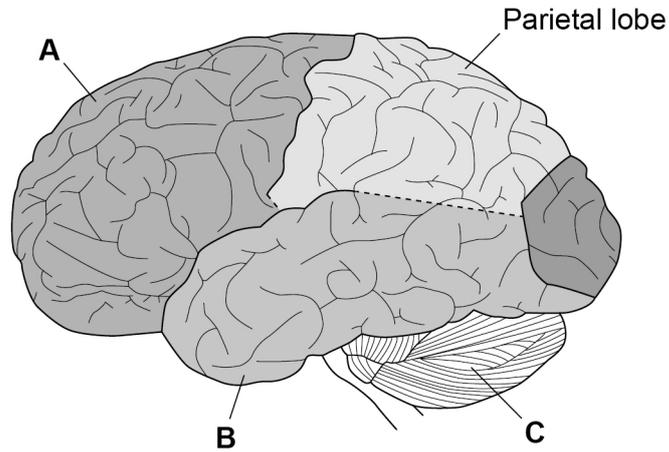
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0 1

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

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]

Question 1 continues on the next page

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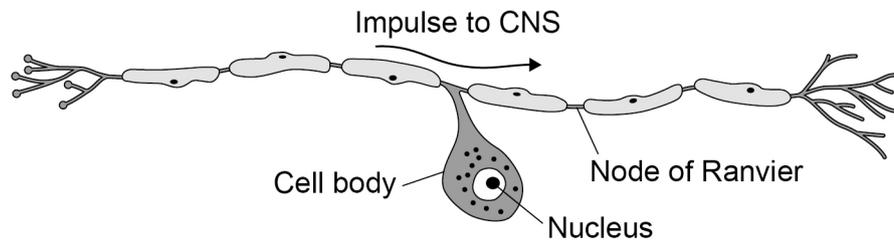
0 1 . 4

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.

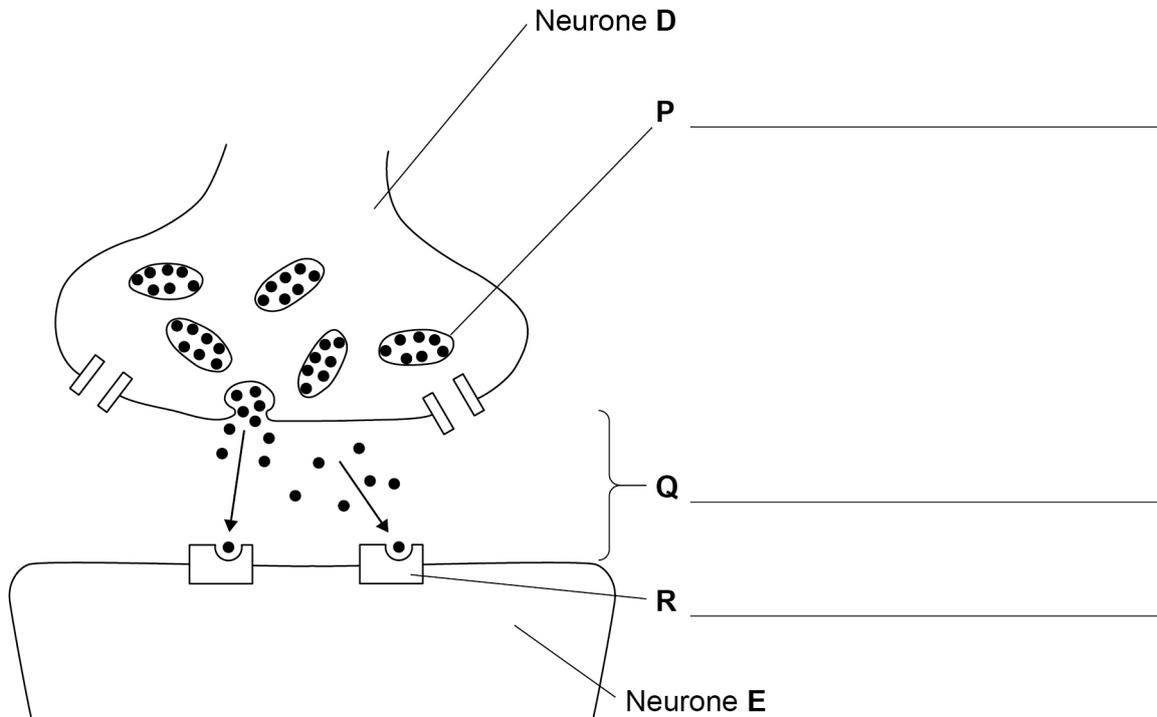
[2 marks]



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]



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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

Question 2 continues on the next page**Turn over ►**

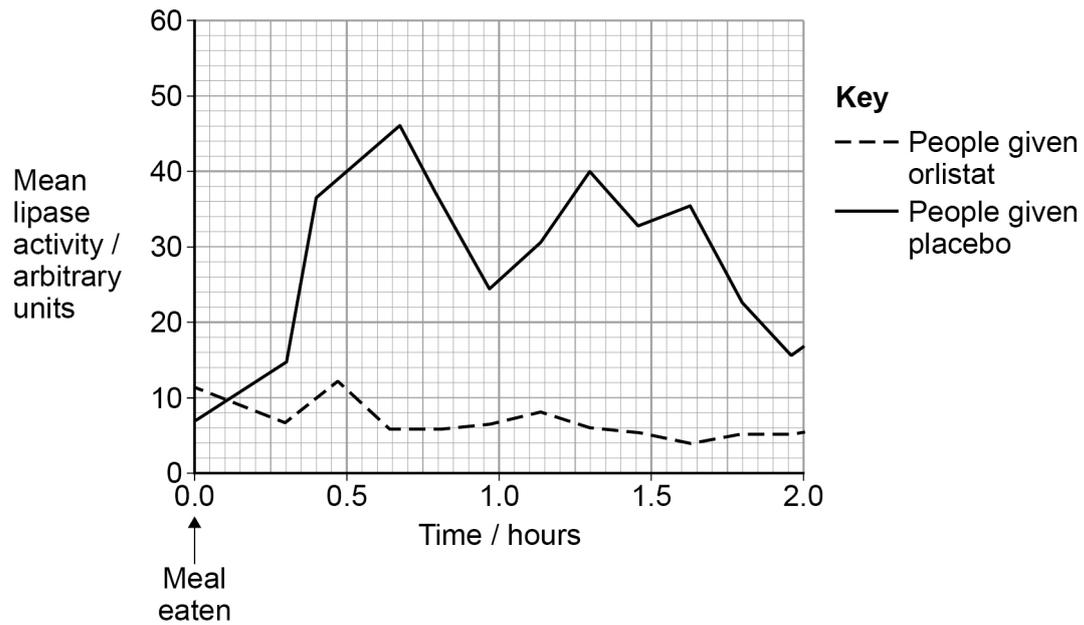
Doctors can give a drug called orlistat to people who are trying to lose weight.

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 shows the results of the investigation.

Figure 4



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

Turn over for the next question

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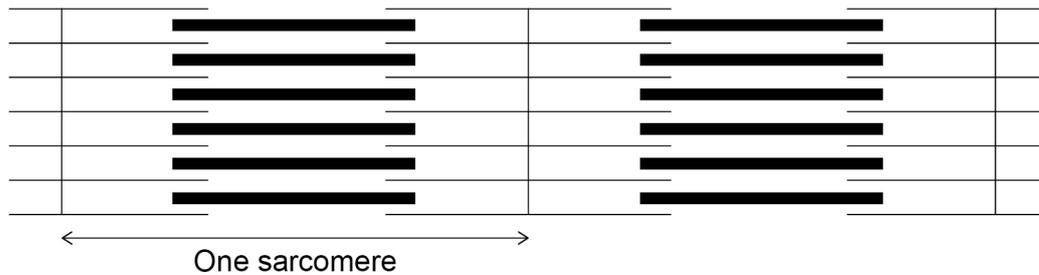


0 3

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

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0 4

The skeleton:

- supports and protects the body
- allows movement.

0 4 . 1

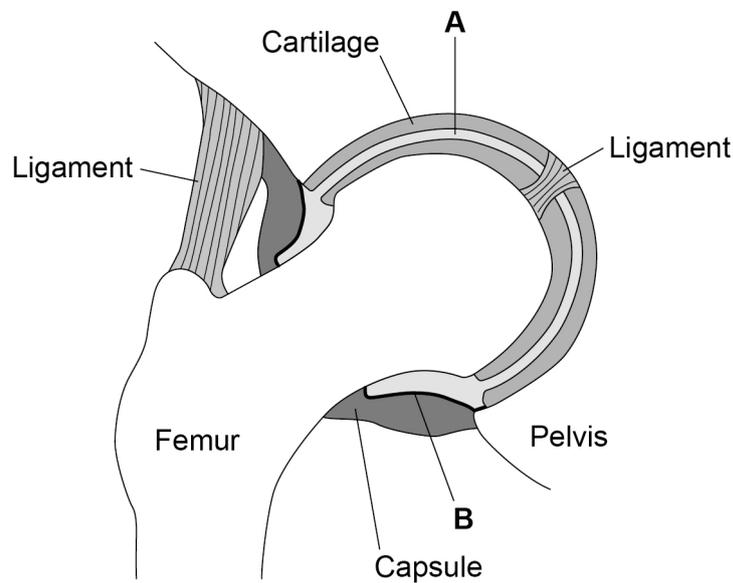
Give **one** other function of the skeleton.

[1 mark]

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



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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 shows the effect on percentage gain in muscle mass.

Figure 8 shows the effect on percentage increase in muscle strength.

Figure 7

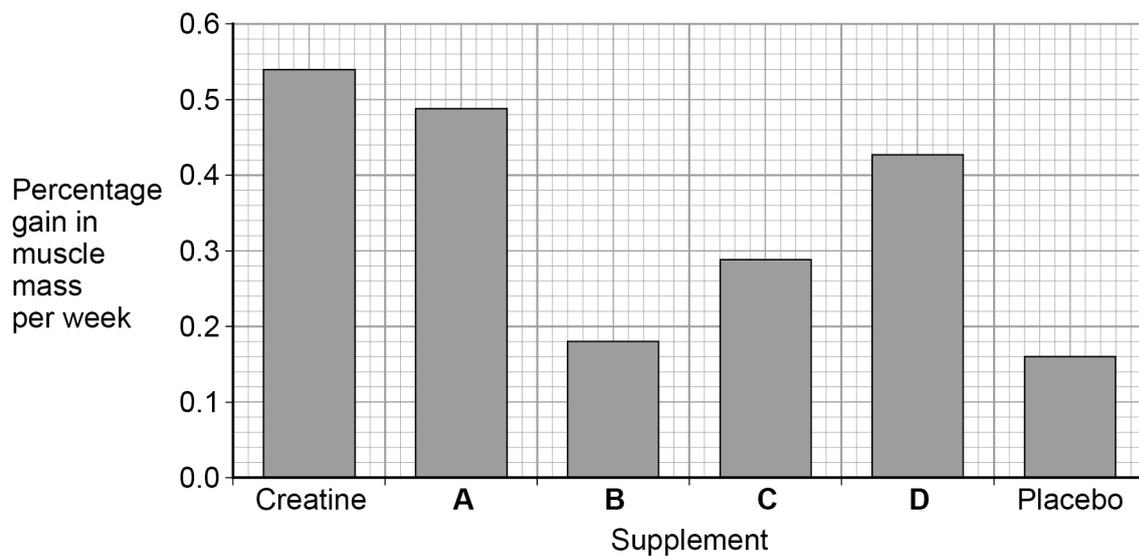
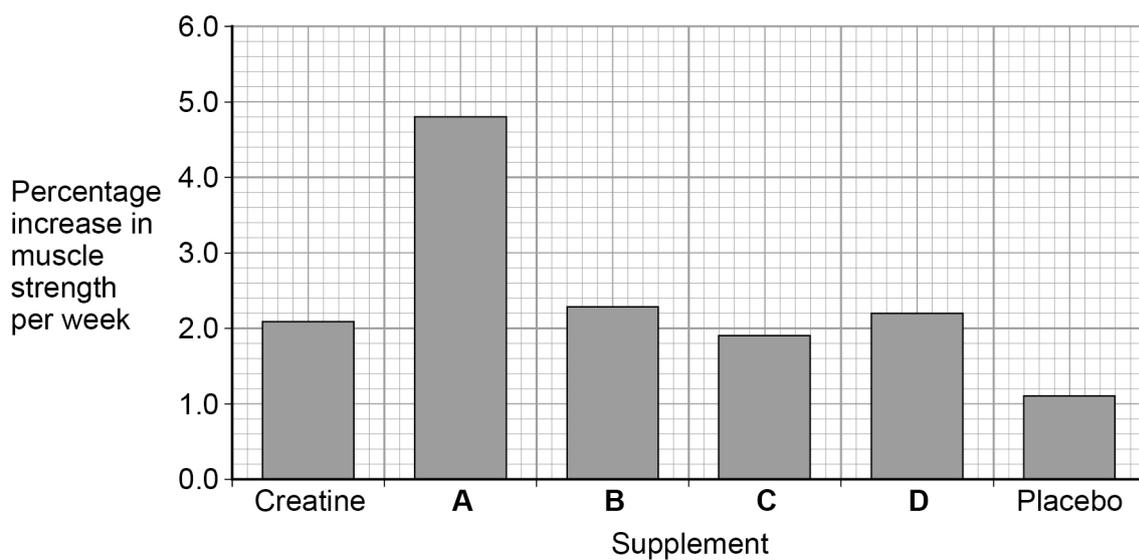


Figure 8



0 5 . 1

A manufacturer's marketing material states:

'Creatine supplements make you stronger.'

Give evidence from **Figure 7** and **Figure 8** 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** and **Figure 8**.

[2 marks]

1 _____

2 _____

0 5 . 3

Creatine supplements contain creatine phosphate.

Describe the role of creatine phosphate in muscles.

[2 marks]

Question 5 continues on the next page

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.

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



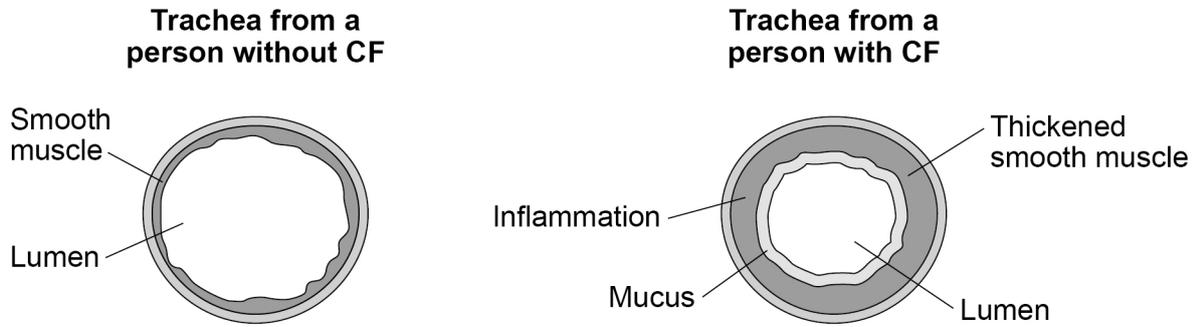
0 6

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

Figure 9



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**.

[3 marks]

Question 6 continues on the next page

Turn over ►



0 6 . 3 When air enters the lungs, oxygen moves into the bloodstream. The oxygen is carried by haemoglobin.

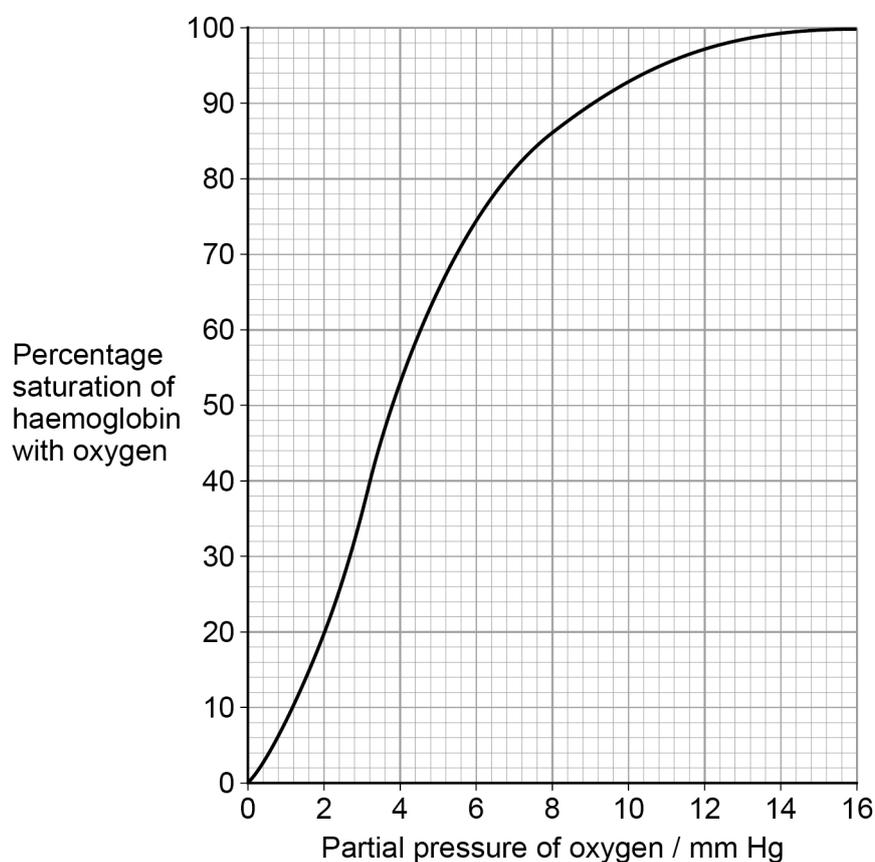
Blood plasma does not carry much oxygen.

Give the reason why.

[1 mark]

Figure 10 shows an oxygen dissociation curve for haemoglobin.

Figure 10



0 6 . 4 What is the partial pressure of oxygen when the percentage saturation is 94%?

[1 mark]

Partial pressure = _____ mm Hg



0 6 . 5

Explain why the oxygen dissociation curve for haemoglobin is the shape shown in **Figure 10**.

[3 marks]

0 6 . 6

The Bohr effect will cause the oxygen dissociation curve in **Figure 10** 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



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