A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

Level 3 Certificate / Extended Certificate
APPLIED SCIENCE

Unit 4 The Human Body

ASC4

Tuesday 22 May 2018 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]

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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.**
- **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.

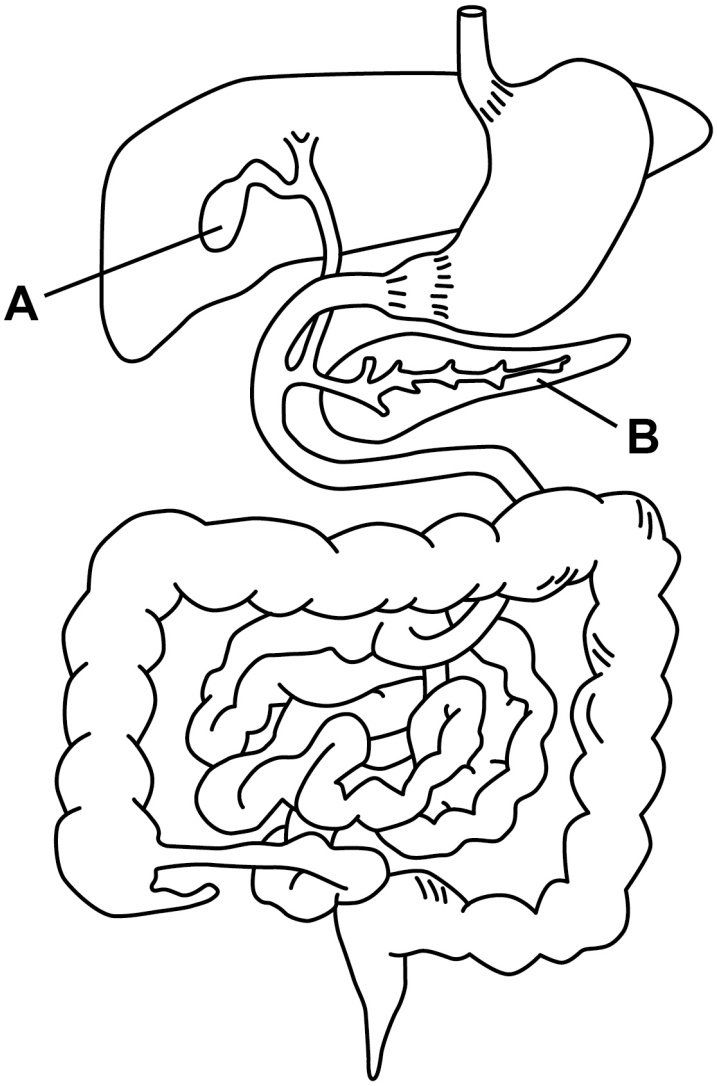
DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions.

0 1 **A man has diarrhoea and goes to see the doctor. The doctor diagnoses irritable bowel syndrome (IBS). IBS can reduce absorption of some nutrients into the blood.**

FIGURE 1 shows the digestive system.

FIGURE 1



0 1 . 1 **Name the part of the digestive system which is affected by IBS.**

Label this part X on FIGURE 1. [2 marks]

Name of part

_____

0 1 . 2 **The man's symptoms are worse after eating fatty foods.**

Parts A and B in FIGURE 1 are involved in the digestion of fats.

Name parts A and B. [2 marks]

A _____

B _____

[Turn over]

0 1 . 3 Explain how part A helps speed up the digestion of fats. [3 marks]

0 1 . 4 **Lipase is a type of enzyme that digests fats.**

Complete TABLE 1 for carbohydrase and protease. [3 marks]

TABLE 1

	Carbohydrase	Lipase	Protease
Enzyme substrate		fats	
ONE place in the body where the enzyme is made		small intestine	
ONE place in the body where the enzyme acts		small intestine	

0 1 . 5 **Vitamins are an essential part of a healthy diet.**

What is the name of the deficiency disease caused by vitamin C deficiency? [1 mark]

_____

_____

0 1 . 6 **Give TWO symptoms of vitamin C deficiency. [2 marks]**

1 _____

_____

2 _____

_____

0 1 . 7 Suggest TWO ways in which vitamin C deficiency can be treated. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

[Turn over]

TABLE 2 shows data from hospital admissions in the UK.

TABLE 2

Year	Total number of adults and children admitted to hospital with vitamin C deficiency	Number of children admitted to hospital with vitamin C deficiency
2010	26	0
2012	10	2
2014	137	10
2016	237	48

0 1 . 8 Calculate the percentage increase in cases of vitamin C deficiency from 2010 to 2016.

Use information from TABLE 2. [2 marks]

Percentage increase = _____

0 1 . 9 **A newspaper makes the following statement:**

Malnutrition in children is on the rise in the UK.

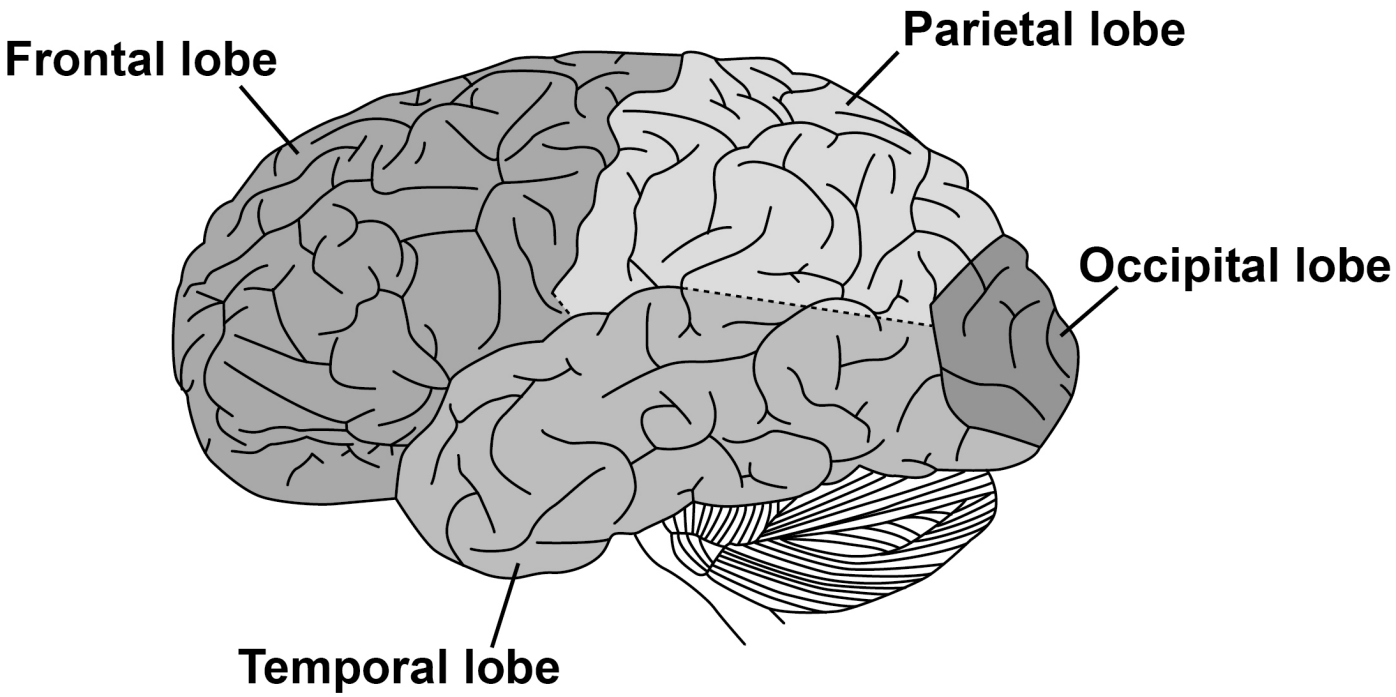
Give ONE reason that supports the newspaper's statement and ONE reason that does not support the newspaper's statement. [2 marks]

19

0 2 **Neurologists study the brain and its functions to diagnose disorders.**

FIGURE 2 shows the lobes of the brain.

FIGURE 2



0 2 . 1 **Draw ONE line from each lobe of the brain to the function of the lobe. [4 marks]**

Lobe of the brain	Function of the lobe
	Controlling heart rate
Frontal	Emotions and reasoning
Occipital	Memory and speech
Parietal	Movement and recognition
Temporal	Posture and balance
	Visual processing

0 2 . 2 Where in the brain are the lobes in Question 02.1 found?

Tick (✓) ONE box. [1 mark]

- ☐ **Brain stem**
- ☐ **Cerebellum**
- ☐ **Cerebral cortex**

0 2 . 3 **When a person is frightened their heart rate increases and their pupils dilate.**

Which part of the nervous system causes these symptoms?

Tick (✓) ONE box. [1 mark]

- ☐ **Parasympathetic**
- ☐ **Peripheral**
- ☐ **Somatic**
- ☐ **Sympathetic**

[Turn over]

0 2 . 4 **Alzheimer's disease affects different parts of the brain.**

Give THREE symptoms of Alzheimer's disease. [3 marks]

1 _____

_____

_____

2 _____

_____

_____

3 _____

_____

_____

0 2 . 5 **People with Alzheimer's disease do NOT produce enough acetylcholine in their brain.**

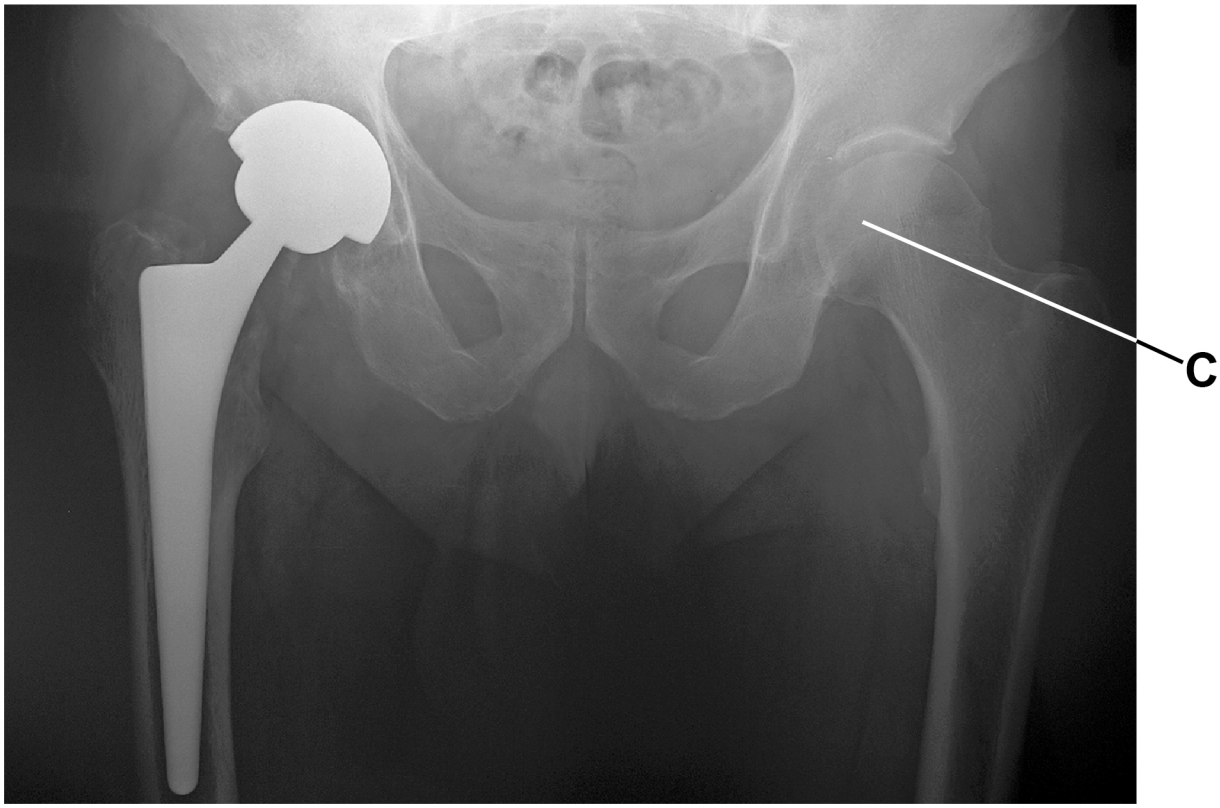
Acetylcholine is a neurotransmitter used in synapses.

Describe the sequence of events that allows an impulse to pass from one neurone to the next neurone at the synapse. [3 marks]

0 3 **An elderly woman falls and injures herself. She is taken to hospital to have an X-ray.**

FIGURE 3 shows the X-ray.

FIGURE 3



0 3 . 1 **The X-ray shows that the woman has had a joint replaced.**

What type of joint has been replaced?

Tick (✓) ONE box. [1 mark]

- ☐ **Ball and socket**
- ☐ **Gliding**
- ☐ **Hinge**
- ☐ **Pivot**

0 3 . 2 **What range of movement does joint C in FIGURE 3 have? [1 mark]**

_____

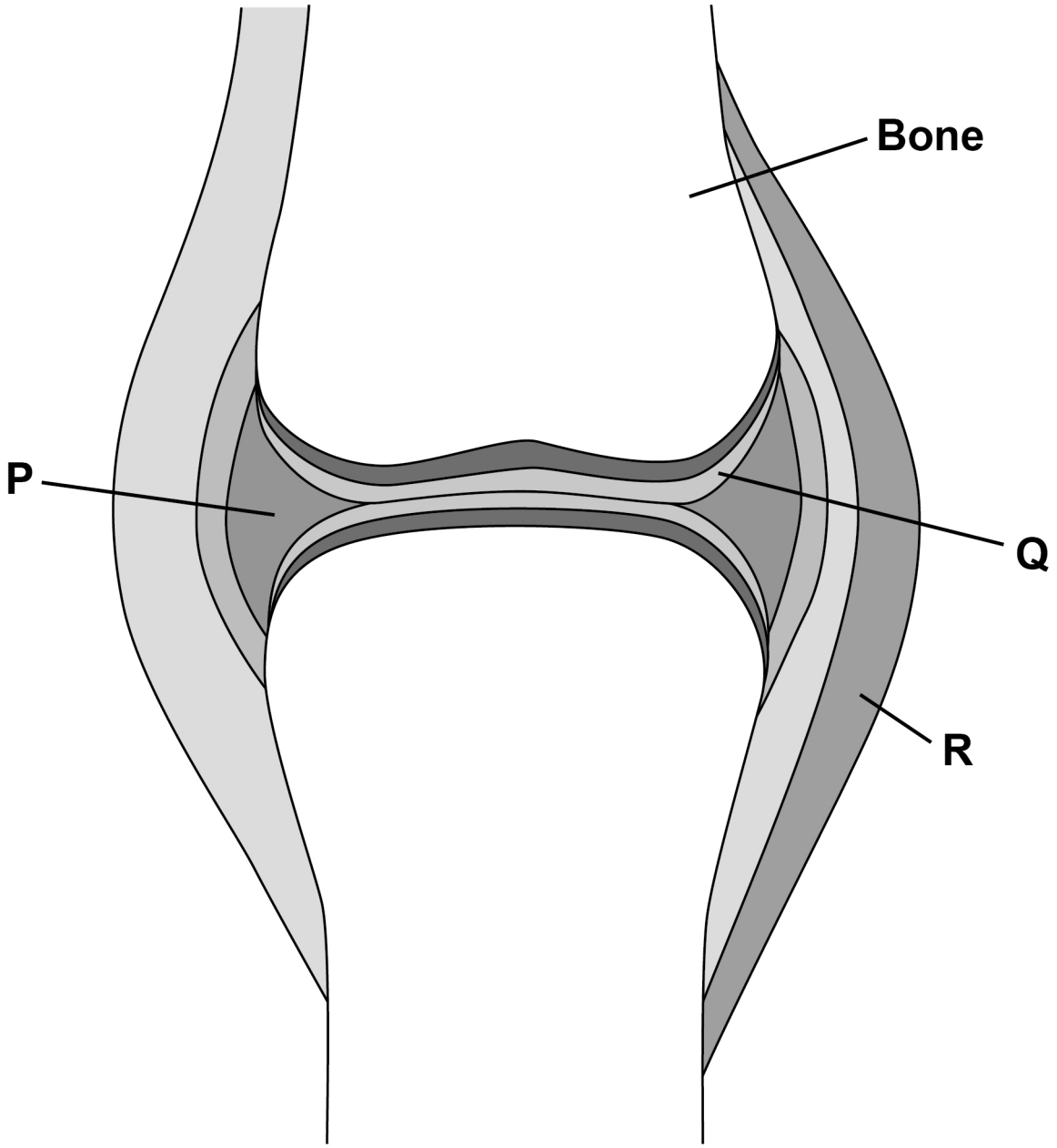
_____

_____

[Turn over]

FIGURE 4 shows some parts of the synovial joint in a knee.

FIGURE 4



0 3 . 3 Name parts P and Q in FIGURE 4. [2 marks]

P _____

Q _____

0 3 . 4 What is the role of part R in FIGURE 4?
[1 mark]

_____

_____

_____

[Turn over]

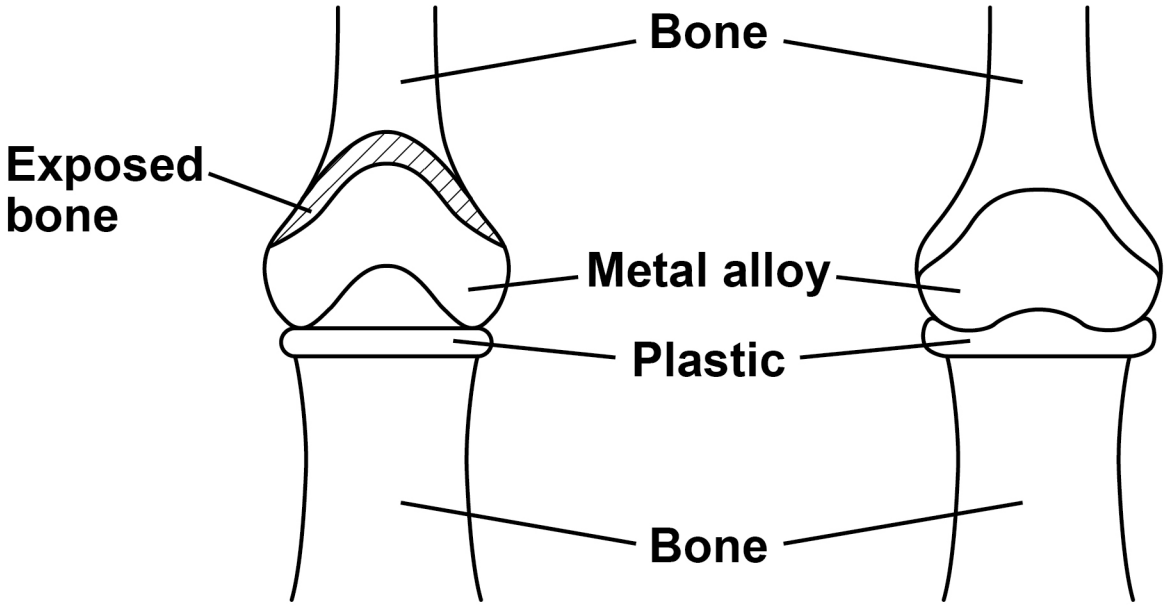
Some people need to have knee replacement surgery.

FIGURE 5 shows a traditional artificial knee joint.

FIGURE 6 shows an artificial knee joint made using 3D printing technology.

FIGURE 5

FIGURE 6



0 3 . 5 **What is the function of the plastic between the metal alloy and the bone? [1 mark]**

0 3 . 6 **The knee in FIGURE 6 has been made for a specific patient using a 3D printer.**

Suggest ONE advantage of the knee joint in FIGURE 6 compared with the knee joint in FIGURE 5. [1 mark]

7

0 4 **Sports science students were investigating the effect of fatigue on fast-twitch muscle fibres and slow-twitch muscle fibres.**

0 4 . 1 **Give TWO adaptations of slow-twitch muscle fibres. [2 marks]**

1 _____

_____

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2 _____

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_____

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[Turn over]

In the investigation, the students used muscle fibres from rats. Using data loggers the students measured the force produced by each muscle contraction until the force declined to 50% of the original.

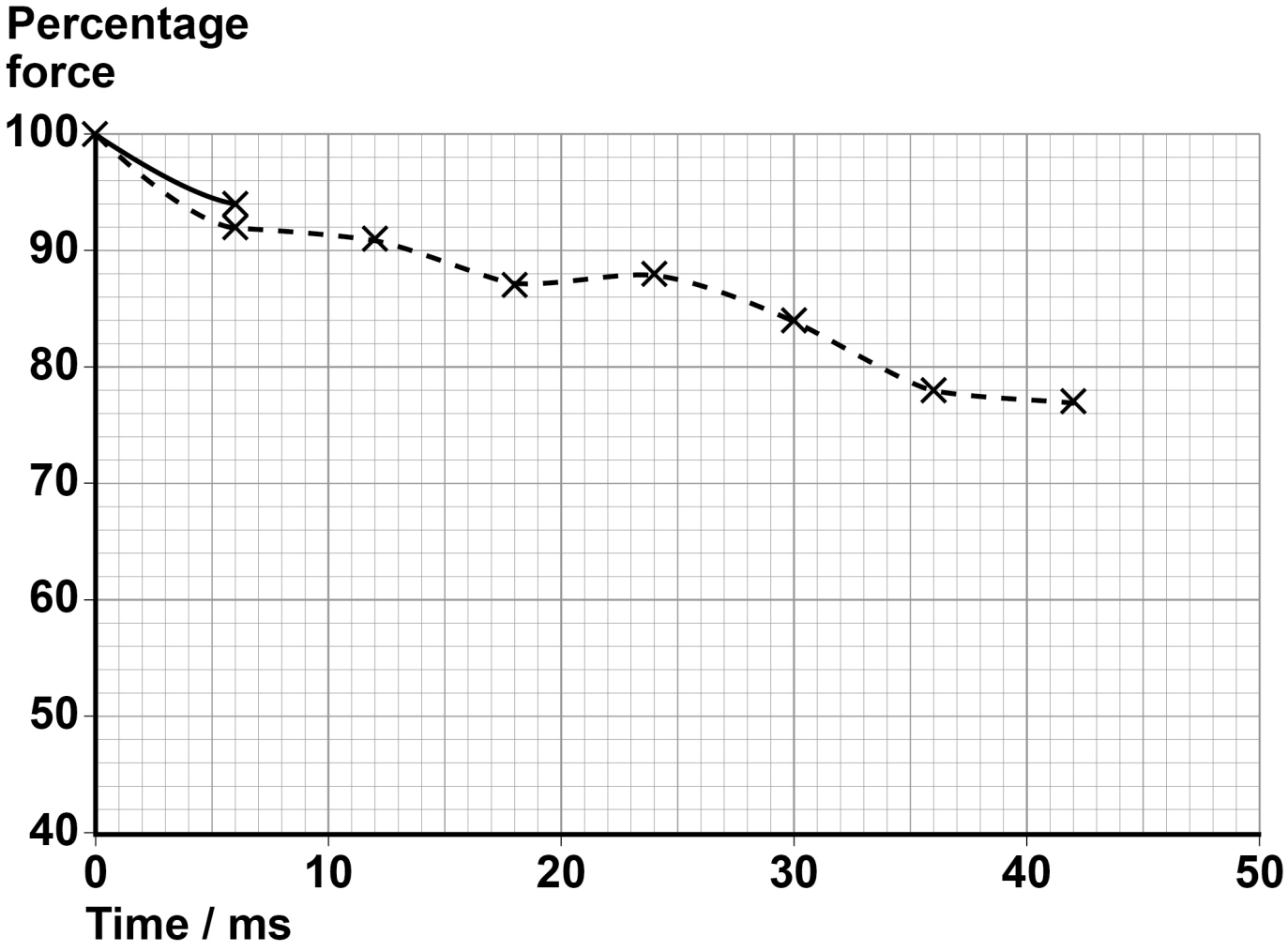
TABLE 3 shows some of their results.

TABLE 3

Time / ms	Force of muscle contraction as a percentage of the original force	
	Slow-twitch leg muscle fibre	Fast-twitch leg muscle fibre
0	100	100
6	92	94
12	91	86
18	87	77
24	88	70
30	84	61
36	78	57
42	77	50

0 4 . 2 **Complete the graph for the fast-twitch leg muscle fibre on FIGURE 7. [2 marks]**

FIGURE 7



KEY

—— Fast-twitch leg muscle fibre

- - - Slow-twitch leg muscle fibre

[Turn over]

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0 4 . 3 **Give TWO conclusions the sports science students could make from the data shown in TABLE 3 and FIGURE 7. [2 marks]**

1 _____

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2 _____

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_____

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_____

[Turn over]

0 4 . 4 Explain why muscles become fatigued.

Use knowledge of the sliding filament theory of muscle contraction in your answer.
[2 marks]

0 4 . 5 **Some athletes take creatine supplements.**

Explain why the force of a muscle contraction may be greater in someone taking creatine supplements. [3 marks]

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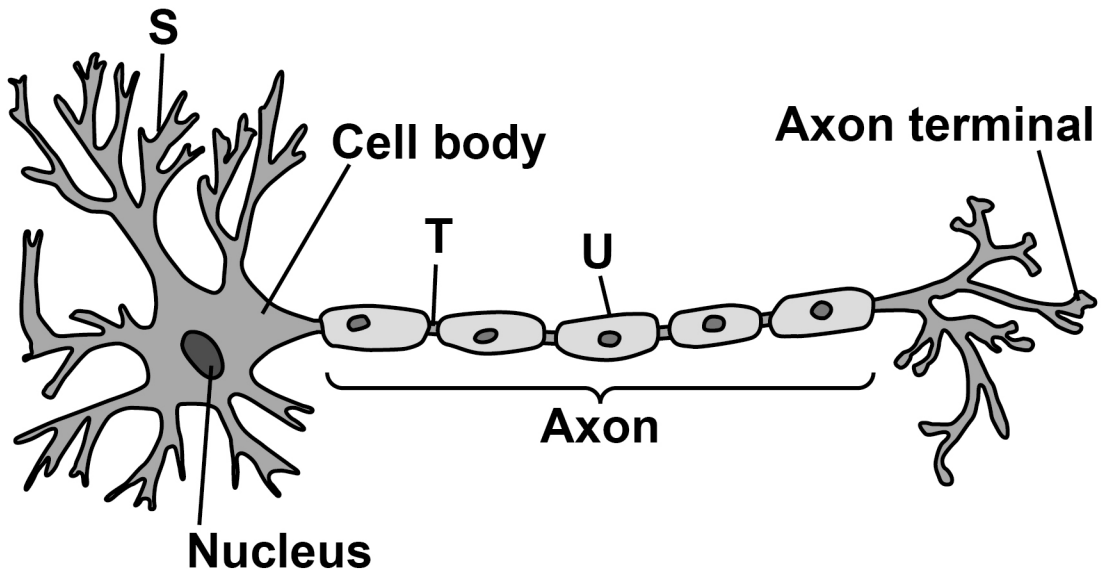
0 5 **Devic disease is a disorder that affects motor neurones.**

FIGURE 8 shows a motor neurone from a healthy person.

FIGURE 8



0 5 . 1 **Name S, T and U in FIGURE 8. [3 marks]**

S _____

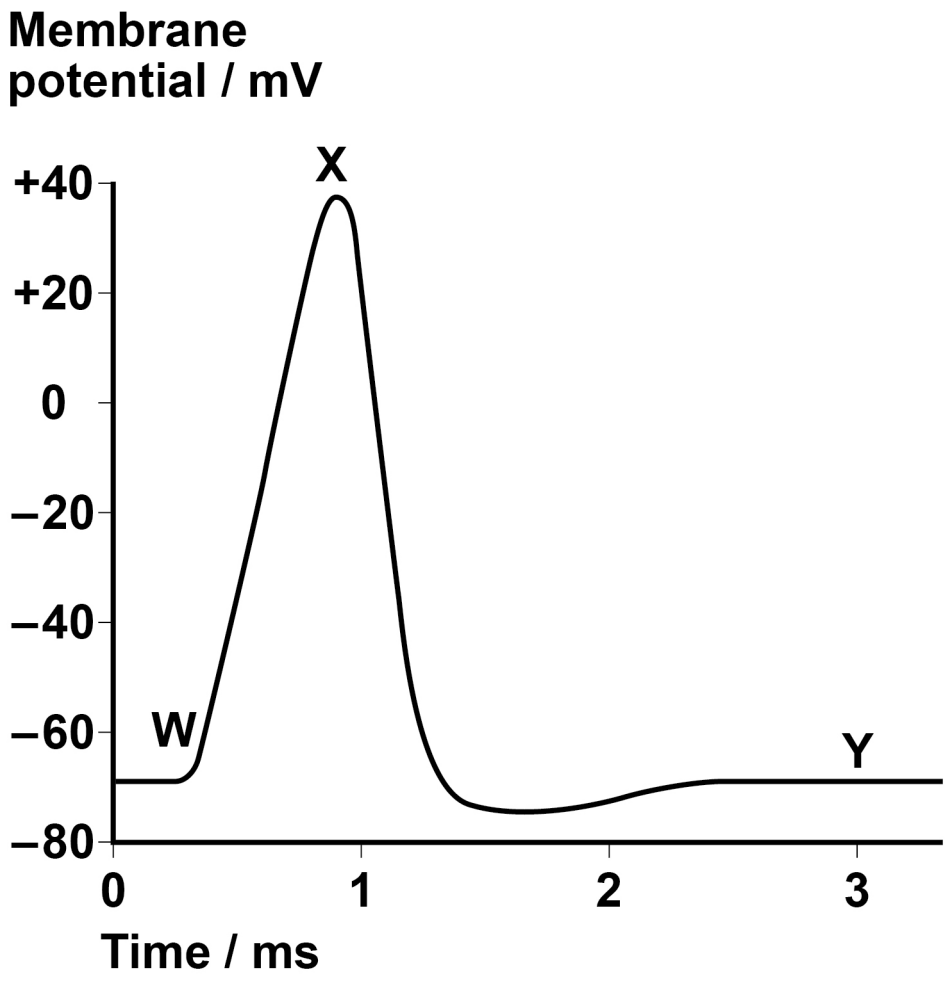
T _____

U _____

0 5 . 2 **Explain how part U enables nerve impulses to travel at high speed along the motor neurone in FIGURE 8. [3 marks]**

FIGURE 9 shows changes in membrane potential of a neurone during one action potential.

FIGURE 9



0 5 . 3 **Describe what happens to cause the change in membrane potential between point W and point X on FIGURE 9. [2 marks]**

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0 5 . 4 **At point Y the neurone is maintaining its resting potential.**

Explain how the resting potential is maintained. [3 marks]

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END OF QUESTIONS

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