AQA

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

Tuesday 22 May 2018 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.
- 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.
- 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	
TOTAL	

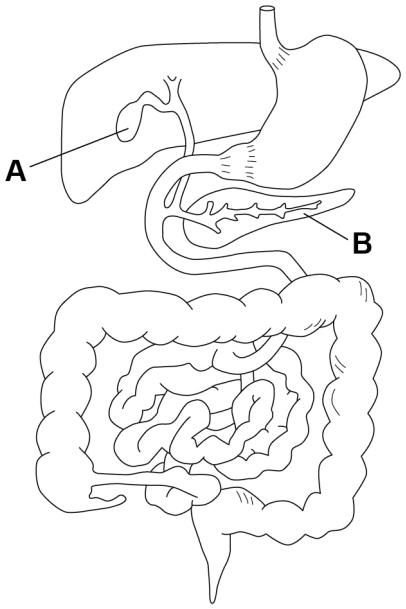
Answer **all** questions.

Do not write outside the box

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 _____

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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	

Question 1 continues on the next page

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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 _____

_____

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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

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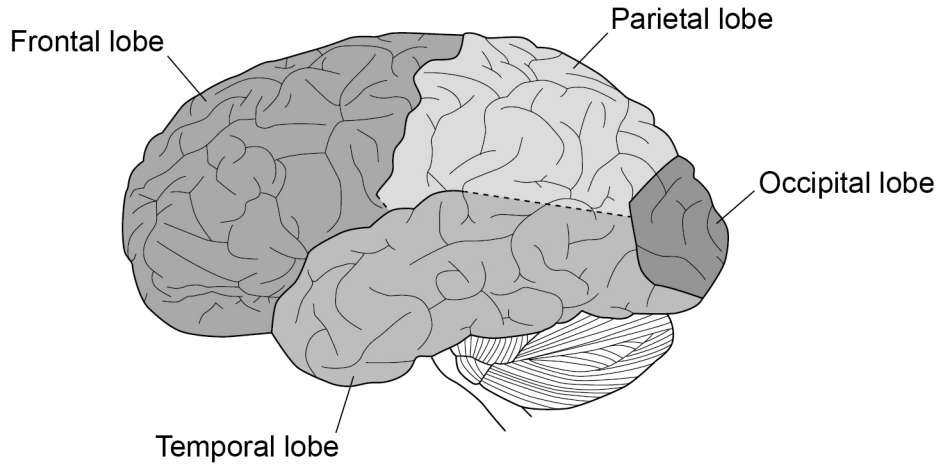
0 2 Neurologists study the brain and its functions to diagnose disorders.

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

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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 ☐

Question 2 continues on the next page

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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]

_____

_____

_____

_____

_____

_____

_____

_____

12

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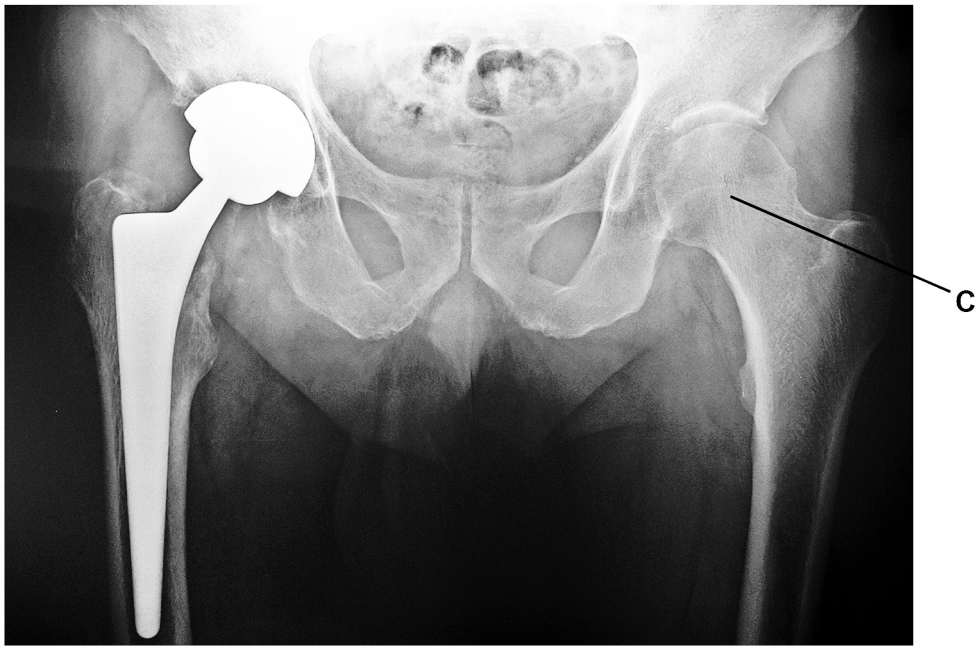
0 3 An elderly woman falls and injures herself. She is taken to hospital to have an X-ray.

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]

_____

_____

Question 3 continues on the next page

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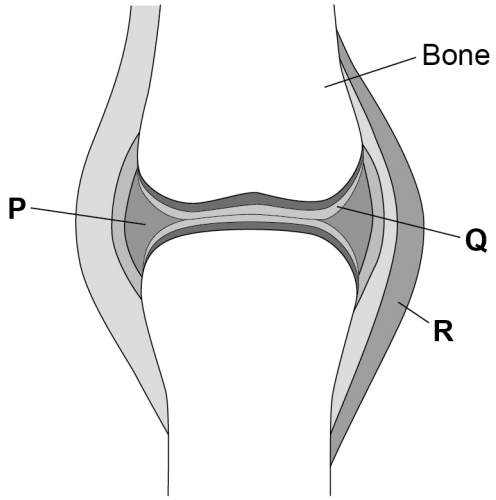
Figure 4 shows some parts of the synovial joint in a knee.

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]

_____

_____

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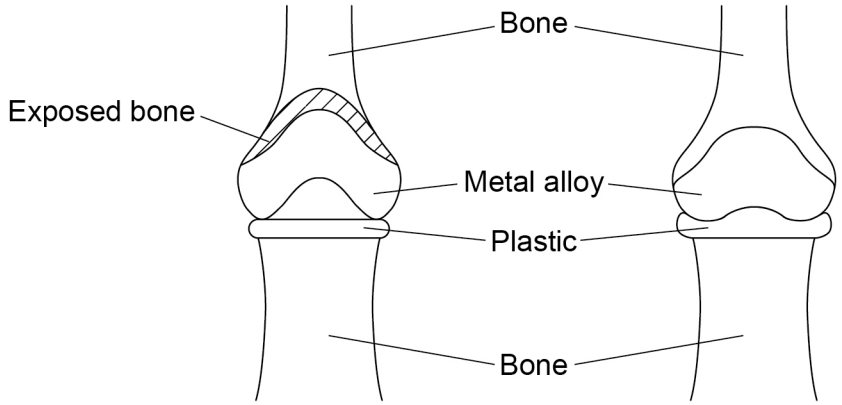
Some people need to have knee replacement surgery.

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

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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 _____

_____

2 _____

_____

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

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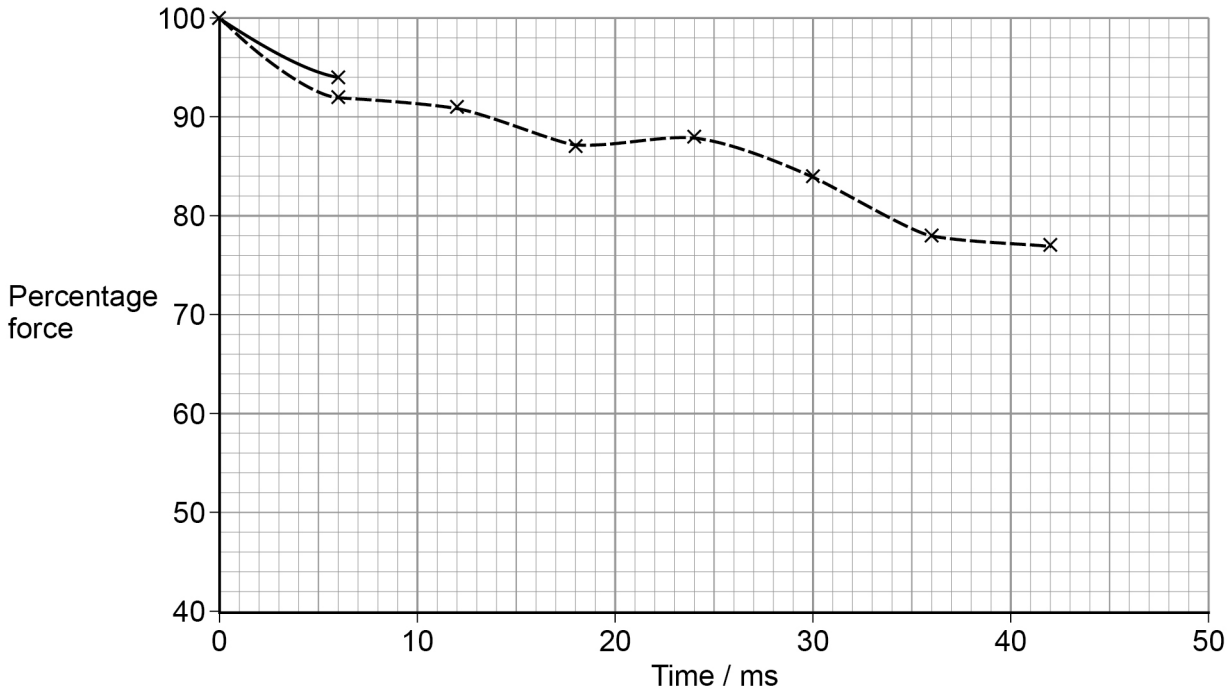
0 4 . 2 Complete the graph for the fast-twitch leg muscle fibre on **Figure 7**.

[2 marks]

Figure 7



Key

——— Fast-twitch leg muscle fibre

– – – – Slow-twitch leg muscle fibre

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 _____

_____

_____

2 _____

_____

_____

Question 4 continues on the next page

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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]

11

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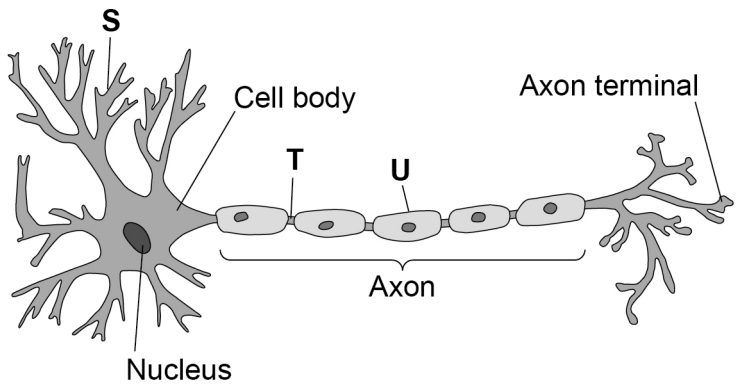
0 5 Devic disease is a disorder that affects motor neurones.

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]

_____

_____

_____

_____

_____

_____

Question 5 continues on the next page

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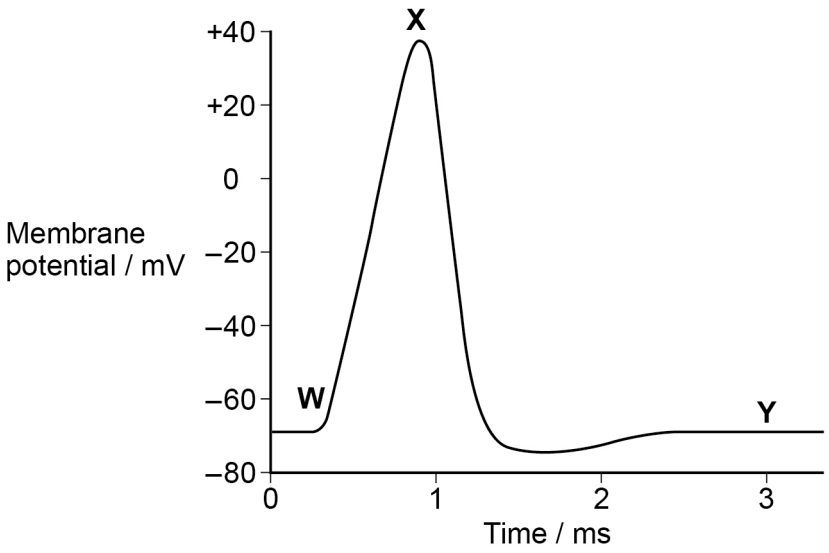
Figure 9 shows changes in membrane potential of a neurone during one action potential.

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]

11

END OF QUESTIONS

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