AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

A-level
APPLIED SCIENCE

Unit 14 The Healthy Body

Thursday 16 June 2016 Afternoon Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a pencil
- a ruler
- 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.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- Show the working of your calculations.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You will be marked on your ability to
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.
- You are expected to use a calculator where appropriate.

Answer **all** questions in the spaces provided.

1 A 17-year-old student went to the supermarket to buy a bacon, lettuce and tomato sandwich. He found two options – the standard sandwich and a 'light option'.

Table 1 shows some of the information on the packaging.

Table 1

Standard sandwich

Energy /kJ	Sugar /g	Fat /g	Saturated fat/g	Salt /g
2290	3	28	6	3
A 'serving' contains these percentages (%) of the guideline daily amount				
Energy	**Sugar**	**Fat**	**Saturated fat**	**Salt**
28	3	41	26	50

'Light option' sandwich

Energy /kJ	Sugar /g	Fat /g	Saturated fat/g	Salt /g
1420	5	8	3	1.8
A 'serving' contains these percentages (%) of the guideline daily amount				
Energy	**Sugar**	**Fat**	**Saturated fat**	**Salt**
17	6	11	13	30

1 (a) The student chose the 'light option' sandwich because he thought it was the healthier option.

Use the data in **Table 1** to answer the following questions.

1 (a) (i) State and explain **one** piece of evidence that supports his decision.

[2 marks]

Evidence _____

_____

Explanation _____

_____

1 (a) (ii) State and explain **one** piece of evidence that does **not** support his decision.

[2 marks]

Evidence _____

_____

Explanation _____

_____

1 (b) **Table 1** states that 6 g of saturated fat is 26% of the guideline daily amount.

Calculate how many grams of saturated fat there are in the guideline daily amount.
Show your working.

[2 marks]

_____ g

1 (c) The student bought an identical 'light option' sandwich for his elderly grandfather.

Suggest why the 'light option' sandwich might be a good choice for an elderly person.

[2 marks]

_____

_____

_____

_____

8

Turn over for the next question

2 A sports science student was learning about cellular respiration in skeletal muscles.

2 (a) Write a balanced chemical equation for aerobic respiration.

[2 marks]

_____

_____

2 (b) Glycolysis is the first stage of respiration.

2 (b) (i) What is the end product of glycolysis?

[1 mark]

_____

_____

2 (b) (ii) Where in a cell does glycolysis take place?

[1 mark]

_____

_____

2 (c) Which stage of aerobic respiration produces the most adenosine triphosphate (ATP)?

[1 mark]

_____

_____

2 (d) Human skeletal muscles can also respire anaerobically.

Describe what would happen to glucose in **anaerobic** respiration and explain why anaerobic respiration can be advantageous to human skeletal muscles.

You will be assessed on the quality of written communication in your answer to this question.

[5 marks]

Extra space (if needed) _____

10

3 A 60-year-old woman has mild kidney disease. She was advised by a nurse to do the following to prevent more damage to her kidneys:

- drink 2 litres of water every day
- eat no more than 6 g of added salt each day.

3 (a) Name the hormone that regulates the concentration of sodium ions in the blood.

[1 mark]

_____

3 (b) Describe the source, function and control of the hormone that regulates the concentration of sodium ions in the blood.

[3 marks]

Source _____

_____

Function _____

_____

Control _____

_____

3 (c) The woman drank much more than the 2 litres of water a day recommended by the nurse.

Describe how her body would react to maintain her blood volume at the correct level.

[3 marks]

_____

_____

_____

_____

_____

_____

3 (d) The woman decided to avoid all salt in her diet. Eventually she became unconscious and had to be rushed to hospital. She was diagnosed as having hyponatraemia, which is a medical term for low blood sodium.

3 (d) (i) Apart from becoming unconscious, give **three** other symptoms the woman could have shown.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

3 (d) (ii) A doctor told the woman that sodium ions and chloride ions are essential aqueous electrolytes in blood.

Suggest what is meant by the term **aqueous electrolytes** in this context.

[3 marks]

_____

_____

_____

_____

_____

_____

13

Turn over for the next question

4 A man with diabetes was taken to hospital after complaining of feeling unwell. The man's blood and urine were tested.

The tests showed that the man had very high blood glucose levels. The tests also showed that the pH of his blood was abnormal.

4 (a) (i) What is the normal range of blood pH values in a healthy person?

[2 marks]

_____

4 (a) (ii) The man has diabetes.

Suggest the most likely abnormality in the man's blood pH.

[1 mark]

_____

_____

4 (a) (iii) Describe how blood pH is usually maintained within safe limits.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

4 (b) The man recovered in a few days. A dietician advised him to change his diet to manage his diabetes.

Suggest **three** ways in which the man could change his diet to manage his diabetes.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

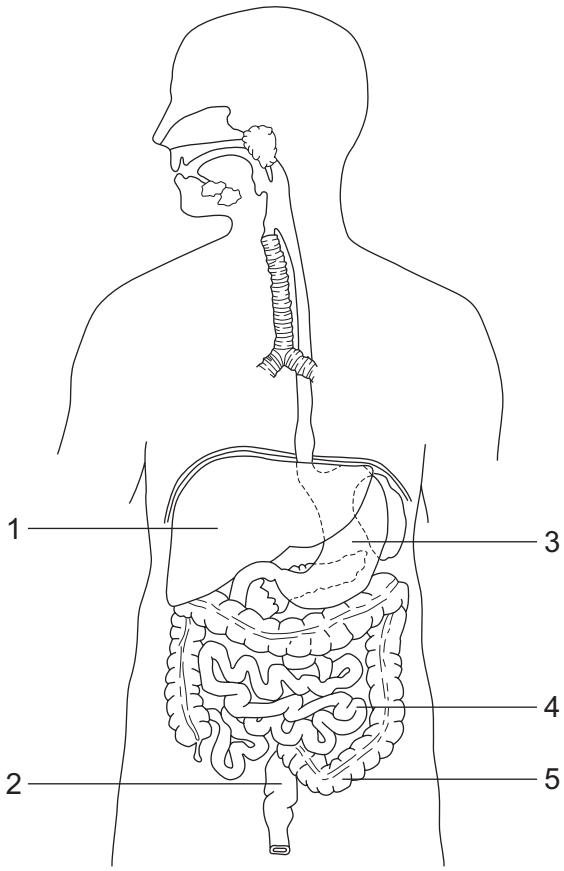
_____

10

Turn over for the next question

5 **Figure 1** shows some of the organs in the human digestive system.

Figure 1



5 (a) Write in the box the number that corresponds to the small intestine in **Figure 1**.

[1 mark]

5 (b) **Table 2** shows statements about some of the biological molecules found in the contents of the small intestine.

Complete **Table 2** by putting ticks in the boxes where the statement is **true**.

[3 marks]

Table 2

Statement	Proteins	Fats	Starch
Digested by hydrolysis reactions			
Contain glucose			
Contain amino acids			

5 (c) Some scientists investigated whether yoghurt drinks that contain 'friendly' gut bacteria reduce the probability of patients with an inflamed small intestine developing diarrhoea.

The scientists studied a large number of patients who each had an inflamed small intestine. They divided the patients into two groups.

- Group **A** received a yoghurt drink that contained friendly gut bacteria.
- Group **B** received a yoghurt drink that didn't contain friendly gut bacteria.

The patients did not know whether they were or were not receiving the yoghurt drink with the friendly gut bacteria.

The results showed that 14% of the patients in group **A** developed diarrhoea and 79% of group **B** developed diarrhoea.

5 (c) (i) It was important that the patients did not know whether they were receiving the yoghurt drink containing friendly gut bacteria or not.

Explain why.

[1 mark]

_____

_____

_____

_____

_____

_____

Question 5 continues on the next page

5 (c) (ii) Describe how the scientists could have allocated patients to each group.

[2 marks]

_____

_____

_____

_____

5 (c) (iii) Suggest **two** reasons why the results were reported in percentages.

[2 marks]

1 _____

_____

2 _____

_____

9

6 A 50-year-old woman visited her doctor for a check-up and her total blood cholesterol was measured.

6 (a) What is the normal range for total blood cholesterol?

[1 mark]

_____ mmol/litre

6 (b) State **two** methods of measuring total blood cholesterol in a healthcare setting.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

6 (c) The nurse explained to the woman that high total blood cholesterol could lead to an increased risk of coronary heart disease (CHD).

Explain how high total blood cholesterol could increase the risk of CHD.

You will be assessed on the quality of written communication in your answer to this question.

[5 marks]

Extra space (if needed) _____

6 (d) The woman's total blood cholesterol was found to be higher than normal. The nurse advised the woman that some lifestyle changes could help to reduce it.

State **two** lifestyle changes the woman could make to try to reduce her total blood cholesterol.

[2 marks]

1 _____

_____

2 _____

_____

10

Turn over for the next question

7 Some scientists investigated the use of diet to treat people who have diabetes. They recruited a group of volunteers who had just been diagnosed with diabetes and who ate a lot of processed food.

7 (a) Describe how the scientists could diagnose diabetes from a urine sample taken from a volunteer.

[2 marks]

_____

_____

_____

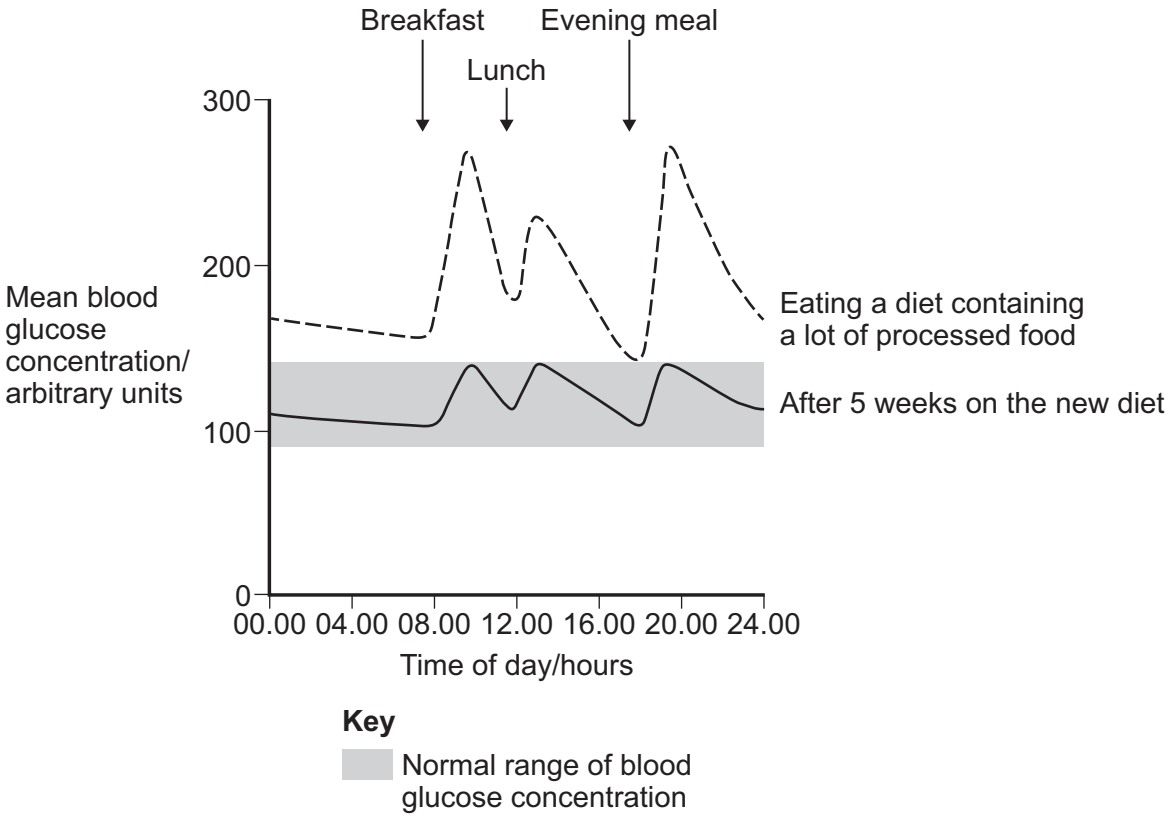
_____

7 (b) The scientists measured the blood glucose concentration of each volunteer over a 24-hour period. They then gave the volunteers a new diet. The new diet contained no processed food, was low in carbohydrate and was high in fibre.

After 5 weeks on the new diet, each volunteer had their blood glucose measured again over a 24-hour period.

Figure 2 shows the mean blood glucose concentrations over periods when the volunteers were eating the two different diets.

Figure 2



7 (b) (i) At the start of the investigation, the scientists measured the blood glucose concentration of the volunteers when they were eating the diet that contained a lot of processed food.

Why was this important?

[1 mark]

_____

_____

7 (b) (ii) Describe the effect of the new diet on the mean blood glucose concentrations of the volunteers.
Use information in **Figure 2**.

[2 marks]

_____

_____

_____

_____

_____

_____

7 (b) (iii) Explain why the new diet has the effect you described in **7(b)(ii)**.

[2 marks]

_____

_____

_____

_____

_____

_____

Question 7 continues on the next page

7 (b) (iv) A medical journal published the results of these tests in an article. The article suggested that the diet was a successful treatment for **Type 2** diabetes.

Give **two** reasons why this suggestion might **not** be valid.

[2 marks]

1 _____

_____

2 _____

_____

9

Turn over for the next question

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8 People suffering from cystic fibrosis have thick mucus in their respiratory tract and gut.

8 (a) (i) Use this information to explain why people suffering from cystic fibrosis frequently have lung infections.

[2 marks]

_____

_____

_____

_____

8 (a) (ii) Why do people suffering from cystic fibrosis need to eat a very nutritious, high-energy diet?

[2 marks]

_____

_____

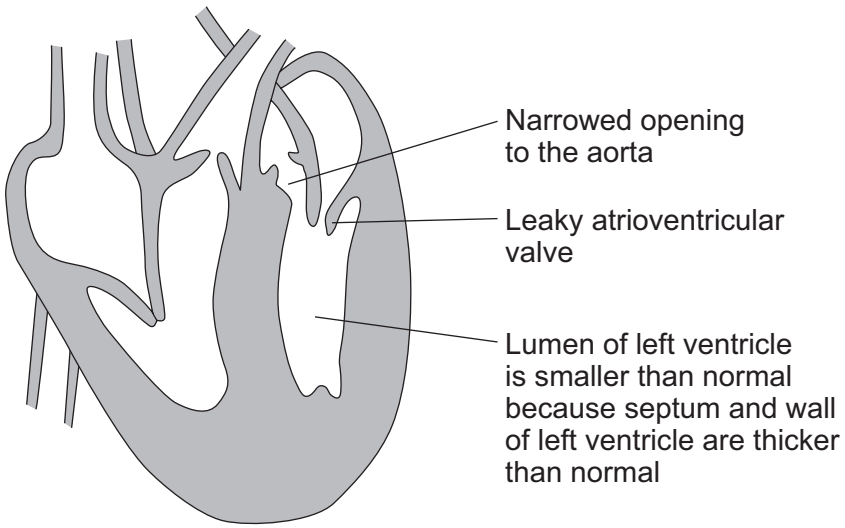
_____

_____

8 (b) A 10-year-old boy was taken to hospital. He was complaining of chest pain (angina), especially when he was exercising and when he was extremely tired. A scan showed that he had a heart condition called hypertrophic cardiomyopathy (HC).

Figure 3 shows some of the features of HC.

Figure 3



8 (b) (i) A nurse explained that people with HC can get chest pains when they exercise. The chest pain is associated with the wall of the left ventricle being thicker than normal.

Suggest how a thicker muscle might lead to chest pain during exercise.

[2 marks]

8 (b) (ii) People with HC have difficulty in supplying enough blood to their tissues, resulting in tiredness.

Explain why this happens, using the information in **Figure 3**.

[3 marks]

8 (c) Emphysema is a lung disease that involves the walls of the alveoli breaking down.

People with both emphysema and cardiovascular disease are more likely to die at an earlier age than people with emphysema who do not have cardiovascular disease.

Suggest why.

[2 marks]

11

END OF QUESTIONS

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