

ERRATUM NOTICE

General Certificate of Education
June 2007



APPLIED SCIENCE
Unit 14 The Healthy Body

SC14

Monday 18 June 2007 9.00 am to 10.30 am

Instructions to Invigilators

Before the start of the examination please ask candidates to amend their question papers as follows.
(Please read out this message twice to ensure understanding.)

Turn to page 14, Question 7 (a)

The word 'led' has been misspelt as 'lead'.

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Education
June 2007
Advanced Level Examination



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

APPLIED SCIENCE
Unit 14 The Healthy Body

SC14

Monday 18 June 2007 9.00 am to 10.30 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a pencil and a ruler • a calculator.

Time allowed: 1 hour 30 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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 maximum mark for this paper is 80.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.

For Examiner's Use			
Question	Mark	Question	Mark
1		5	
2		6	
3		7	
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

There are no questions printed on this page

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

1 A man has been diagnosed with diabetes. He visits a diabetes specialist nurse for some advice. The nurse tells the man that he needs to keep his blood glucose levels within the normal range.

(a) (i) Circle the normal range for fasting blood glucose concentration.

1.5–3.5 mmol l⁻¹ 3.5–7.5 mmol l⁻¹ 7.5–11.5 mmol l⁻¹ 13.5–17.5 mmol l⁻¹

(1 mark)

(ii) Describe how the nurse could check the man’s urine glucose levels.

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(3 marks)

(b) State the function of glucagon and insulin in the maintenance of blood glucose levels.

Glucagon

Insulin

(2 marks)

2 A woman has been involved in a road accident. She is being looked after in a hospital's intensive care unit.

- (a) (i) State a non-invasive method that could be used to monitor the woman's blood oxygen saturation level.

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(1 mark)

- (ii) Her blood oxygen saturation level was 97%. What can you conclude about the ability of the woman's blood to carry oxygen?

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(1 mark)

- (b) At regular intervals, the pH of the woman's blood is monitored. A doctor notices that the woman's blood pH is 7.25. This is 0.1 units lower than the previous reading. The doctor also observes that the woman's blood carbon dioxide levels are increased, her breathing rate is rapid and her pulse is 130 bpm.

- (i) What can you conclude about the change in the woman's blood pH?

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(1 mark)

- (ii) How does sodium bicarbonate help to maintain blood pH within safe limits?

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(2 marks)

- (iii) What is the result of increased carbon dioxide levels in the blood on haemoglobin and its ability to carry oxygen?

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(2 marks)

(iv) Why have the changes in the woman's blood pH and carbon dioxide levels resulted in a change in her breathing rate?

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(3 marks)

(c) Venous blood is more acidic than arterial blood. What is the explanation for this?

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(2 marks)

12

Turn over for the next question

- 3 A school catering manager received some information about nutritional standards. Read the information below about school meals, nutrition and activity.

Nearly 3.5 million school meals are served in English and Welsh schools daily. The school meals service is used by around 45% of school children. In Wales, 19.4% of primary school children are entitled to free school meals. In England 16.8% of primary school children are entitled to free school meals.

Since 1992 the number of school-aged children in England and Wales who are overweight or obese has doubled.

Evidence suggests that for many children the intakes of vitamin A, zinc, iron, calcium and iodine are often below recommended levels. Also, children are eating less than half of the recommended five portions of fruit and vegetables per day. Around 20% of 4–18 year olds who were surveyed eat no fruit at all in a typical week.

Additionally, 58% of 7–10 year olds and 78% of 15–18 year olds spend less than one hour a day taking part in activities of moderate intensity.

Adapted from *Nutrient-based standards for school food*, The National Heart Forum & the Caroline Walker Trust, Autumn 2005.

- (a) (i) Approximately how many school meals are served in one typical school week in England and Wales?

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(1 mark)

- (ii) Calculate how many school meals would be eaten in one day if all the school children in England and Wales ate them.

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(1 mark)

- (b) What are the physical consequences of a diet low in iron and low in calcium for young people?

Low in iron

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Low in calcium

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(4 marks)

(c) (i) What effects might being obese as a child have on a person’s future health?

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(4 marks)

(ii) Use information in the text on **page 6** to suggest why more young people are becoming obese.

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(2 marks)

(d) Guidelines for school meals recommend that salt is not made available on canteen tables or at serving counters.

Explain why it is recommended that salt availability is restricted.

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(2 marks)

Question 3 continues on the next page

(e) Guidelines also recommend that young people should have access to fresh chilled water.

If a child drank nothing all day and then went to the toilet before going home, they would produce a small volume of dark-coloured urine.

(i) Explain why the child would only produce a small volume of dark-coloured urine.

You should make reference to physiological processes.

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(5 marks)

(ii) Why does the body aim to conserve water if none is drunk?

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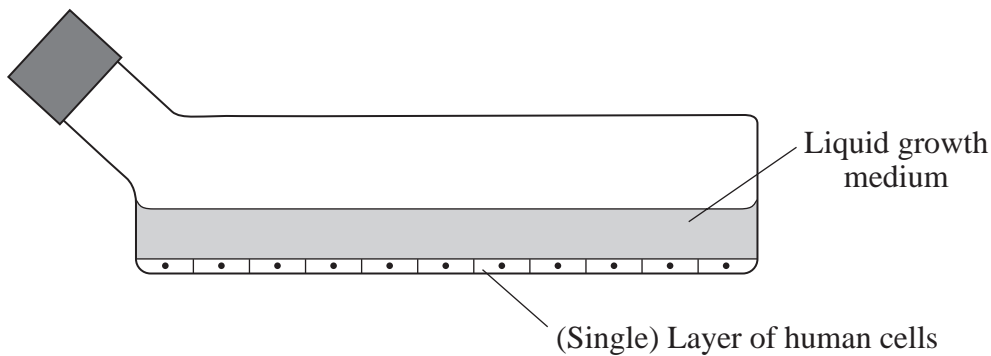
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(2 marks)

- 4 Cell biologists grow human cells in specialised conditions. This is called tissue culture. The cells are grown in special flat-bottomed flasks. A liquid growth medium is added to the flasks. The growth medium provides the nutrients for the cells. An example of a flask of cells is shown below.



- (a) Which nutrient should be present for the cells to use directly in aerobic respiration?

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(1 mark)

- (b) A cell biologist measured the levels of pyruvic acid (pyruvate) produced by the cells.

- (i) What is the name of the process that produces pyruvic acid?

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(1 mark)

- (ii) Pyruvate is used to generate ATP. What is the function of ATP?

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(1 mark)

- (c) The cells were grown in an atmosphere that was very low in oxygen.

Which product of anaerobic metabolism would the cells be most likely to produce from pyruvic acid in these conditions?

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(1 mark)

5 The basal metabolic rate (BMR) is the minimum amount of energy that a body releases to maintain essential body processes. Knowledge of their BMR can help athletes to regulate their diet. A sports nutritionist used indirect calorimetry to determine the BMR of an athlete.

(a) (i) Describe how the sports nutritionist could determine the BMR of the athlete by indirect calorimetry.

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(4 marks)

(ii) Indirect calorimetry is considered to be a better method of determining BMR than direct calorimetry. Give **one** reason for this.

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(1 mark)

(b) Two athletes have their BMR measured. Both are 25 year old males. Both weigh 88 kg. One athlete is 1.89 m tall. The other athlete is 1.72 m tall.

Explain why the taller athlete has the higher BMR.

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(2 marks)

- (c) A research physiologist was investigating BMR.
He had 14 subjects.
The results he collected are shown in the table below.

Males	
Subject age	BMR (kJ/m ² /h)
6	203
10	185
15	172
20	165
30	160
50	155
70	143

Females	
Subject age	BMR (kJ/m ² /h)
6	185
10	181
15	151
20	155
30	151
50	147
70	134

- (i) Describe the trends in this data.

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(2 marks)

- (ii) Explain the trends in this data.

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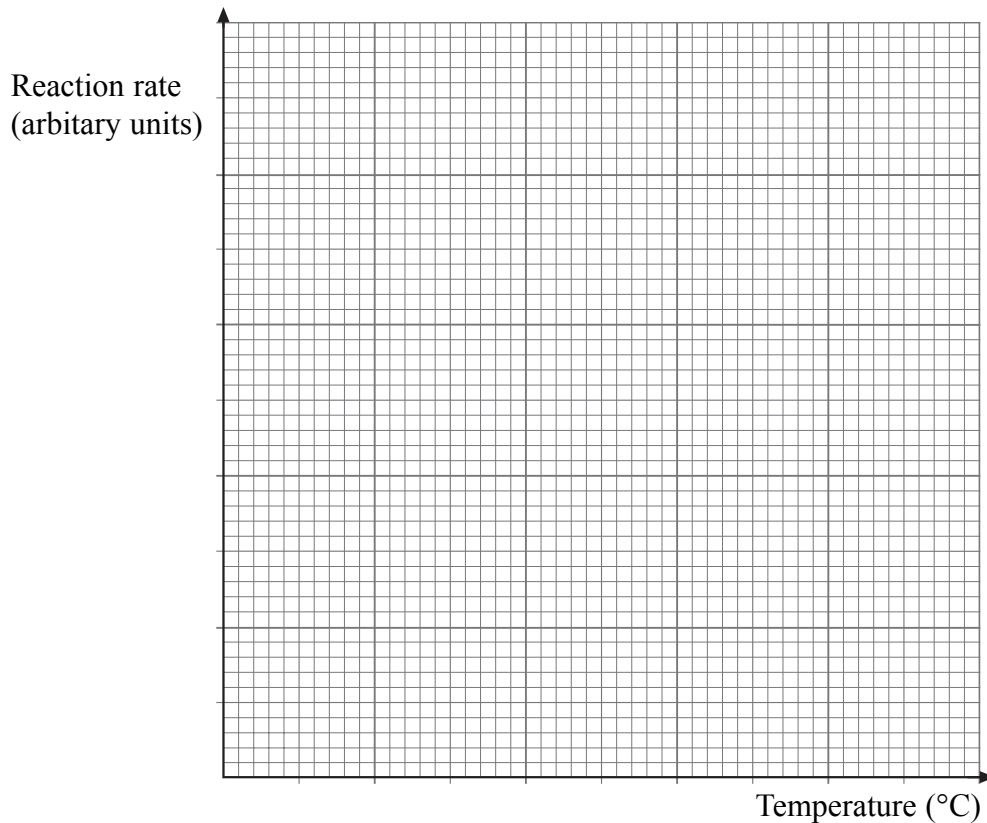
(3 marks)

Turn over for the next question

- 6 Digestion relies on the activity of enzymes in the small intestine. A biochemist analysed the rate of activity of maltase, an enzyme found in the small intestine. The table below shows the results of experiments that she carried out at different temperatures, with all other variables controlled.

Temperature (°C)	Reaction rate (arbitrary units)
15	22
20	32
25	44
30	64
35	88
40	76
45	60

- (a) (i) Plot the results of the experiments on the grid below. Draw a line of best fit to complete the graph.



(ii) What does your graph tell you about the effect of temperature on the activity of maltase?

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(2 marks)

(b) (i) Design an experiment in which you could investigate the effect of pH on enzyme activity.

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(5 marks)

(ii) How would you know if you had completely denatured the enzyme at any stage of your experiment?

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(1 mark)

7 A woman complained of having severe pains in her stomach. At the hospital a doctor used an endoscope to look at the condition of the lining of her stomach. The doctor noticed the lining looked damaged and had been bleeding. She also noticed that there was some green liquid present in the woman's stomach. The green liquid was bile.

- (a) Explain how changes in the normal stomach secretions could have lead to the damage the doctor observed in the woman's stomach.

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(4 marks)

- (b) Bile is normally secreted into the small intestine.

- (i) What is the normal function of bile?

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(1 mark)

- (ii) How does bile help the digestive process?

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(2 marks)

- (c) The woman was given advice by the doctor on what she should eat for the next few days. She was told to avoid foods like tomatoes, oranges and grapefruits and to avoid drinking fizzy drinks and alcohol. She was encouraged to eat milky foods such as custard and ice-cream and to drink milky drinks or water.

Explain why the doctor made these dietary suggestions to the woman.

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(4 marks)

- (d) A few months later, the woman discovered she was now pregnant. What kind of dietary adjustments would the woman need to make to her normal healthy diet to ensure a healthy pregnancy? Give reasons for your choices.

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(4 marks)

END OF QUESTIONS

There are no questions printed on this page