

Surname					Other Names				
Centre Number					Candidate Number				
Candidate Signature									

For Examiner's Use
--------------------

General Certificate of Education  
 January 2008  
 Advanced Level Examination



**APPLIED SCIENCE**  
**Unit 14 The Healthy Body**

**SC14**

Friday 1 February 2008 9.00 am to 10.30 am

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

Time allowed: 1 hour 30 minutes

**Instructions**

- Use black ink or black 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			

---

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

---

1 (a) A woman receives some blood test results. The results show that her levels of thyroxine are below normal levels.

(i) Name the organ in the body that produces thyroxine.

.....  
(1 mark)

(ii) State **two** functions of thyroxine.

1 .....

2 .....

(2 marks)

(b) The woman is advised to include sea salt in her diet. Sea salt is rich in iodine.

(i) How will this help her body produce thyroxine?

.....  
.....  
(1 mark)

(ii) Name **two** functions of salt in the body.

1 .....

2 .....

(2 marks)

(iii) What long-term effect would salt deficiency have on a person's health?

.....  
(1 mark)

(iv) How does the body respond when sodium ion levels fall?

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(4 marks)*

<b>11</b>

**Turn over for the next question**

**Turn over ▶**

2 A biochemist was studying the metabolic activity of different body tissues. She was interested in comparing aerobic and anaerobic respiration in the tissues.

(a) Mark with an **X**, on the diagram of a cell, where the Krebs cycle takes place.



(1 mark)

(b) The Krebs cycle uses a 3-carbon compound from glycolysis along with acetyl CoA to generate ATP, FADH<sub>2</sub> and NADH. Circle the correct 3-carbon compound that combines with acetyl CoA in the Krebs cycle.

**lactic acid      citric acid      pyruvic acid      glucose      ethanol**

(1 mark)

*There is a problem with this question, please refer to the appropriate sections of the Mark Scheme/Examiners' Report.*

(c)  $\text{FADH}_2$  and  $\text{NADH}$  enter the electron transport chain.  
In the electron transport chain, they can help to generate two molecules of ATP for every one molecule of  $\text{FADH}_2$  and three molecules of ATP for every one molecule of  $\text{NADH}$ .

A total of 10  $\text{NADH}$  and two  $\text{FADH}_2$  molecules are generated from one molecule of glucose by aerobic respiration. How many ATP molecules would this generate?

.....  
.....  
.....

(2 marks)

(d) Explain how the body is able to use fats and oils (lipids) in respiration.

.....  
.....  
.....  
.....  
.....  
.....  
.....

(4 marks)

**Turn over for the next question**

8

**Turn over ▶**

3 A man is in an Intensive Care Unit after having a heart operation. He has had a coronary artery bypass graft. A surgeon used a blood vessel to bypass a blockage in a coronary artery.

(a) Mark a coronary artery, on the diagram of the outside of the heart, with a letter C.



(1 mark)

(b) What effect would a blocked coronary artery have on the heart muscle?

.....  
(1 mark)

(c) While the man is in the Intensive Care Unit his body functions are monitored.

(i) Name the machine that is used to monitor oxygen saturation.

.....  
(1 mark)

(ii) What feature of this monitoring method makes it safe for use on very ill patients?

.....  
(1 mark)

(iii) Circle the normal oxygen saturation level for a healthy individual.

**38%**

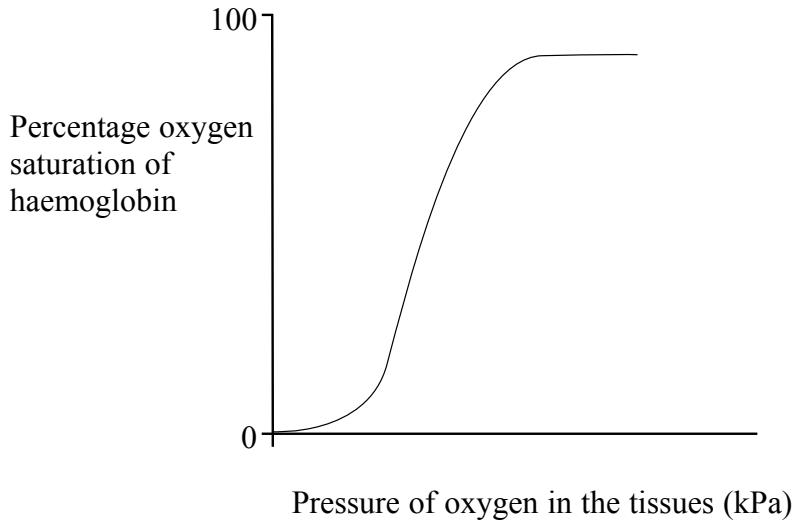
**58%**

**78%**

**98%**

(1 mark)

- (iv) The man had a fever after his operation. The fever raised his body temperature. On the graph below, draw a line that would show the effect of this raised body temperature on the man's oxygen dissociation curve.



(2 marks)

- (d) The man also had his blood pH monitored. Explain in detail what happens in the man's blood when there are increased levels of carbon dioxide.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)

4 A mother has a 6 month old baby. A health visitor gives the mother some advice about feeding her baby.

- (a) Explain why the health visitor advises the mother to give her baby cooled, boiled tap water to drink, rather than water straight from the tap.

.....  
 .....

(1 mark)

- (b) The baby has been breast-fed since birth. The mother wants to go back to work. She asks the health visitor about formula (powdered) baby milk. The health visitor gives the mother the following information.

	<b>Mother's milk composition per 100 g</b>	<b>Formula baby milk composition per 100 g</b>
Energy	289 kJ	281 kJ
Protein	1.3 g	2.2 g
Fat	4.1 g	3.0 g
Carbohydrate	7.2 g	7.8 g
Calcium	34 mg	90 mg

- (i) The average woman who is breast feeding will produce 800 g of breast milk per day. Calculate the daily amount of energy that is available to the baby. Express your answer in megajoules (MJ).

.....  
 .....

..... MJ

(2 marks)

- (ii) How many times more calcium is in formula baby milk compared to mother's milk?

.....  
 .....

(1 mark)

- (iii) What is the normal level of calcium ion concentration in the blood?

.....  
 .....

(1 mark)



- (iv) 1 g of carbohydrate can produce 17 kJ of energy. What percentage of the total energy in 100 g of the mother's milk is derived from carbohydrate?

.....  
 .....  
 .....

*(2 marks)*

- (v) How does your answer to part (b)(iv) compare with the normal recommended carbohydrate intake for an adult?

.....  
 .....

*(1 mark)*

- (c) The health visitor suggests that the mother can now start to feed her baby on solid foods, and wean the baby.

- (i) Why is this a sensible suggestion?

.....  
 .....

*(1 mark)*

- (ii) The foods suggested include small amounts of mashed, dark green, leafy vegetables, lean red meat and citrus fruits like oranges. Identify **one** mineral and **one** vitamin this combination of foods will supply.

Mineral .....

Vitamin .....

*(2 marks)*

- (iii) Explain why it is important to combine eating this mineral and this vitamin.

.....  
 .....  
 .....

*(2 marks)*

5 A dental hygienist is writing an information leaflet for patients. One part of the leaflet states ‘Your mouth is where you start to digest your food’. The leaflet also contains information about why it is important to maintain good oral hygiene.

- (a) (i) Identify and describe **two** different digestive processes that your mouth is responsible for.

Process 1 .....

.....

.....

.....

.....

Process 2 .....

.....

.....

.....

.....

*(5 marks)*

- (ii) Explain why you need to prevent microbial growth in your mouth, and how the mouth does this.

.....

.....

.....

.....

.....

.....

.....

*(4 marks)*

(b) Good dental hygiene is important. Describe how you could determine and evaluate how good a person is at brushing their teeth.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(5 marks)*

<b>14</b>

**Turn over for the next question**

**Turn over ▶**

- 6 A triathlon is an endurance sporting event. Athletes take part in three consecutive events. Typically these are a swim of 4 km, followed by a long distance cycle race of 120 km, finishing with a marathon race of 42 km.

At the finishing line after a particular race, doctors looked after the athletes. The doctors looked at the haematocrits (packed cell volume) and haemoglobin levels of 10 athletes **A – J**.

Normal haematocrit range:                    males = 42 – 54%;                    females = 37 – 47%  
 Normal haemoglobin range:                males = 14 – 18 g/dl;                females = 12 – 16 g/dl

<b>Athlete</b>	<b>Sex</b>	<b>Haematocrit (%)</b>	<b>Haemoglobin level (g/dl)</b>
<b>A</b>	Male	52	17.3
<b>B</b>	Male	51	17.0
<b>C</b>	Female	41	13.9
<b>D</b>	Male	43	14.3
<b>E</b>	Female	40	14.3
<b>F</b>	Male	57	19.0
<b>G</b>	Female	37	12.5
<b>H</b>	Female	38	12.9
<b>I</b>	Male	49	16.3
<b>J</b>	Female	34	11.6

- (a) Compare these data for males and females.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....

(3 marks)

- (b) (i) All of the female athletes were over 18 years old. Which female athlete is most likely to have stopped menstruating normally?

.....  
 .....

(1 mark)

- (ii) Identify which male athlete would have been most at risk of fatigue. Give an explanation for your choice.

Athlete .....

Explanation.....

.....

.....

.....

*(4 marks)*

- (c) Before a race like a triathlon, the athletes need to adapt their diet. They should include foods like pasta, noodles and rice in their diet. During the race, it is hard for the athletes to eat large amounts of food. Instead they eat glucose gels, cereal bars and dried fruits.

Explain why eating these foods is beneficial for the athletes.

- (i) Pasta/noodles/rice

.....

.....

.....

.....

.....

.....

*(4 marks)*

- (ii) Glucose gels/cereal bars/dried fruits

.....

.....

.....

.....

.....

.....

*(3 marks)*

**Turn over ▶**

7 A 70 year old man complains of difficulty in passing faeces and of pain in his lower abdomen. He goes to hospital for an endoscopy. This is an investigation where a specialised camera is inserted via the anus and rectum into the large intestine. The camera allows doctors to look for cancerous growths.

(a) State **two** functions of the large intestine.

.....  
.....  
*(2 marks)*

(b) Describe how the process of peristalsis moves faeces towards the rectum.

.....  
.....  
.....  
.....  
.....  
.....  
*(3 marks)*

(c) (i) Bacteria in the large intestine help the body to make vitamin B<sub>3</sub> (niacin). What is the normal function of vitamin B<sub>3</sub> (niacin)?

.....  
*(1 mark)*

(ii) State **one** possible effect of vitamin B<sub>3</sub> (niacin) deficiency.

.....  
.....  
*(1 mark)*

**END OF QUESTIONS**

7

**There are no questions printed on this page**

**There are no questions printed on this page**