

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Education  
 June 2008  
 Advanced Subsidiary Examination



**BIOLOGY/HUMAN BIOLOGY (SPECIFICATION A)      BYA1 R**  
**Unit 1    Molecules, Cells and Systems**

Tuesday 3 June 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 ruler with millimetre measurements.</li> </ul> <p>You may use a calculator.</p>
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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.
- You must answer the questions in the spaces provided. **Answers written in margins or on blank pages will not be marked.**
- If you need extra space use page 20 for your answers.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**

- The maximum mark for this paper is 75.
- The marks for questions are shown in brackets.
- You will be marked on your ability to use good English, to organise information clearly and to use accurate scientific terminology where appropriate.

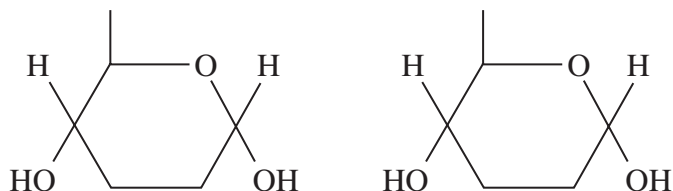
For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
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7			
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			



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

**1** **Figure 1** shows two molecules of  $\alpha$  glucose.

**Figure 1**



**1** (a) (i) On **Figure 1**, draw a box round the atoms that are removed when a glycosidic bond is formed. (1 mark)

**1** (a) (ii) Name the chemical reaction involved in the formation of this bond.

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(1 mark)

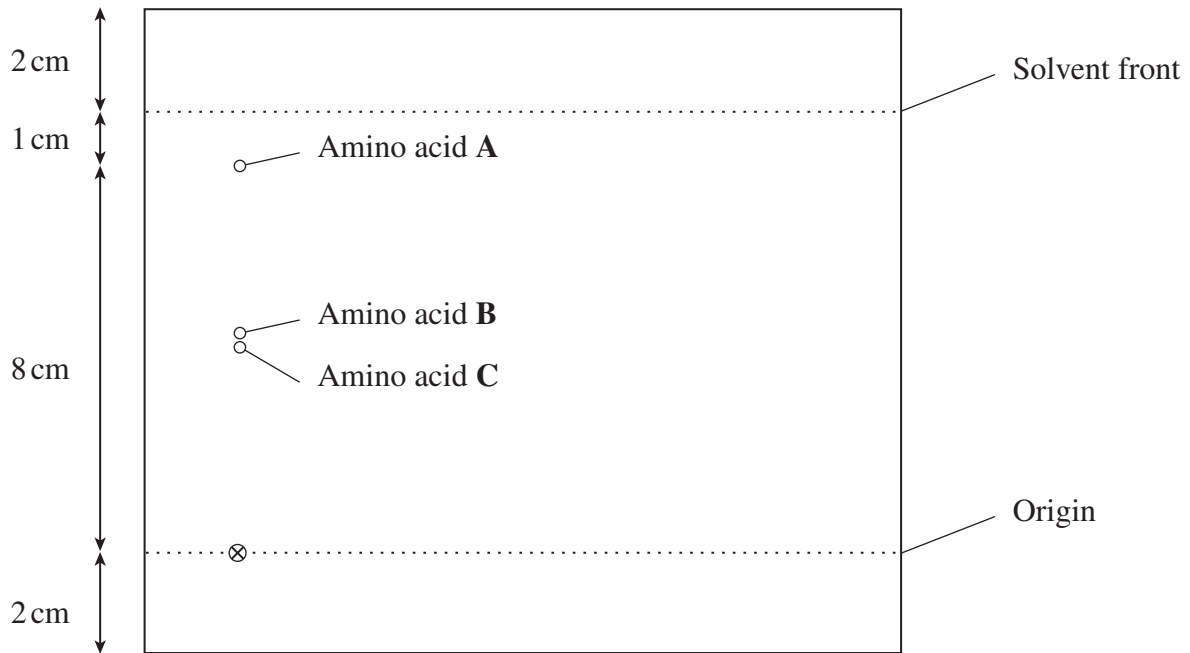
**1** (b) Describe how a molecule of  $\beta$  glucose is different from a molecule of  $\alpha$  glucose.

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 (2 marks)



Some students used chromatography to investigate the amino acids in a mixture. **Figure 2** shows the chromatogram they produced.

**Figure 2**



- 1 (c) Use the measurements written at the side of **Figure 2** to calculate the  $R_f$  value of amino acid **A**. Show your working.

$R_f$  value = ..... (2 marks)

- 1 (d) The students then carried out two-way chromatography using a second solvent.

- 1 (d) (i) Label **Figure 2** with the letter **S** to show the side of the chromatography paper that should be put in the second solvent. (1 mark)

- 1 (d) (ii) Explain the advantage of carrying out two-way chromatography in this investigation.

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 .....

(1 mark)



- 2 (a) The table shows some features that may or may not be present in different cells. Complete the table with either a tick if the feature is present or a cross if it is not present.

Feature	Cell			
	Red blood cell	Leaf cell	Bacterium	Epithelial cell from alveolus
Nucleus				
Plasma membrane surrounding cell				
Cell wall				

(4 marks)

- 2 (b) Some of the cells in the pancreas make large amounts of enzymes. These cells contain many ribosomes and many mitochondria. Explain the importance of these cells containing

- 2 (b) (i) many ribosomes

.....  
 .....

(1 mark)

- 2 (b) (ii) many mitochondria.

.....  
 .....

(2 marks)



2 (c) Cells from a potato contain starch grains. Describe how you could show that the starch in a potato cell was in grains.

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(2 marks)

9

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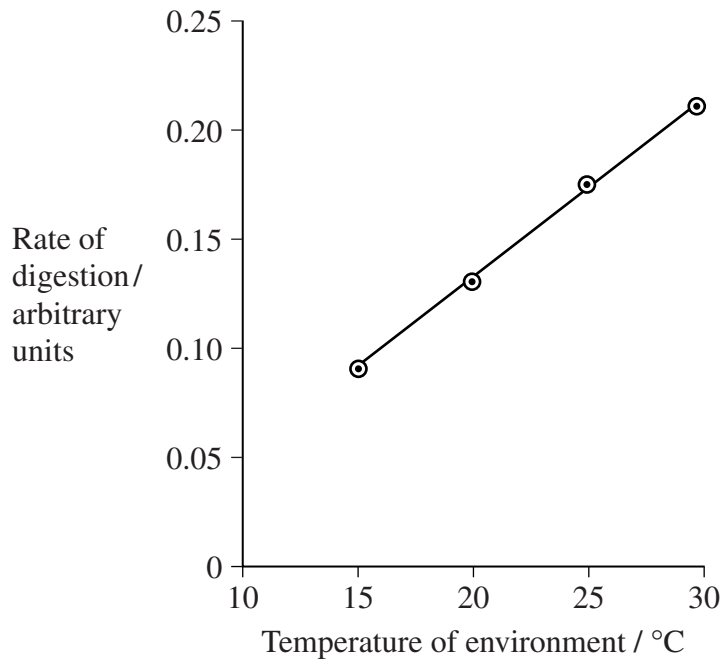


3 During the process of digestion, enzymes in the gut break polymers down into the monomers from which they are made.

3 (a) Proteins are polymers. Name the monomers from which proteins are made.

.....  
(1 mark)

3 (b) The body temperature of a crocodile is very similar to that of its environment. The graph shows the effect of environmental temperature on the rate of digestion of food in a crocodile.



Explain the shape of the curve between 15 °C and 30 °C.

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(3 marks)  
(Extra space) .....

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3 (c) (i) The primary structures of different proteins are different. Describe how.

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(1 mark)

3 (c) (ii) A crocodile can digest most of the proteins in its food but it cannot digest all of them. Use your knowledge of the way in which enzymes work to explain why a crocodile cannot digest some of the proteins present in its food.

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(3 marks)

(Extra space) .....

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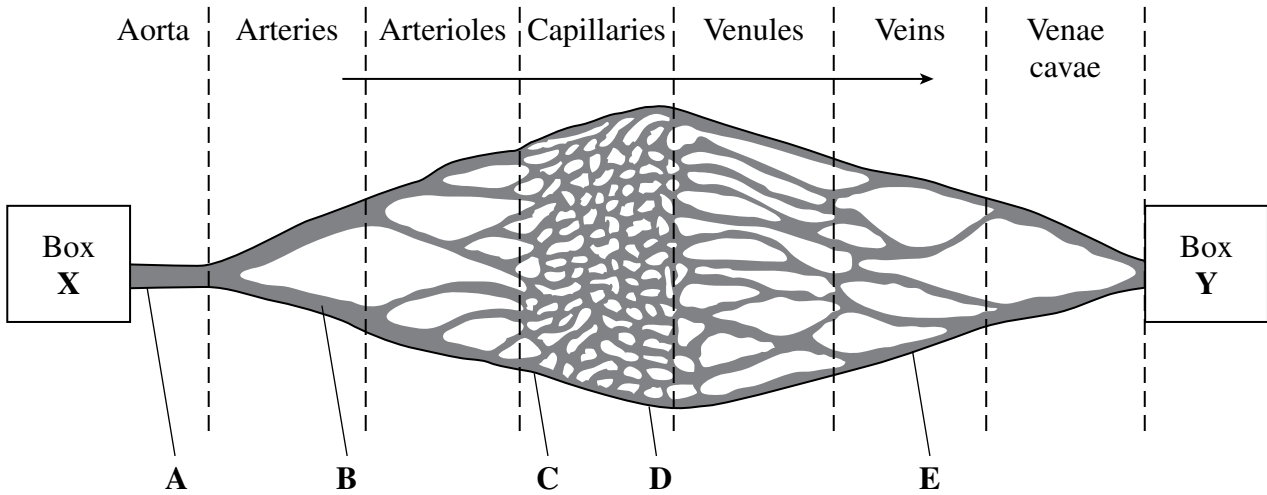
8

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4 The diagram shows part of the human blood system.



4 (a) (i) At which of points **A** to **E** would the mean blood pressure be lowest?

.....  
 (1 mark)

4 (a) (ii) Which chamber of the heart is represented by Box **Y**?

.....  
 (1 mark)

4 (b) There is less variation in blood pressure at point **B** than there is at point **A**. Explain how elastic tissue in the walls of the blood vessels helps to smooth out the pressure between points **A** and **B**.

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 .....  
 (2 marks)





4 (c) The walls of the arterioles contain muscle. Explain how this muscle is important in controlling blood flow.

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(2 marks)

4 (d) Blood flows more slowly through the capillaries than it does through the aorta. Use the diagram to help explain what causes the blood to flow more slowly through the capillaries.

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(2 marks)

8

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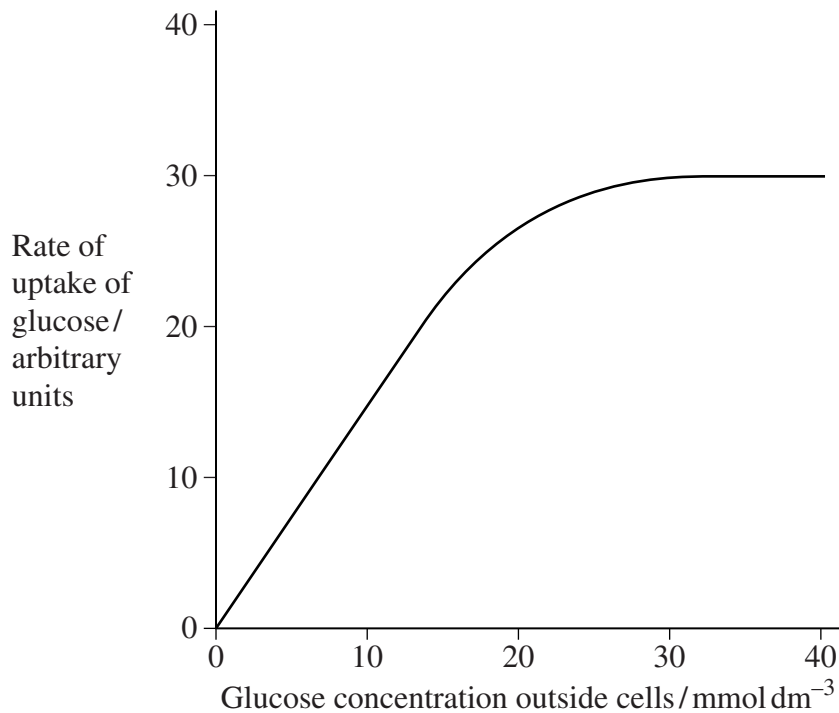


- 5 (a) Complete the table to give **two** ways in which facilitated diffusion is different from active transport.

Facilitated diffusion	Active transport
1 .....	.....
.....	.....
2 .....	.....
.....	.....

(2 marks)

Glucose enters red blood cells by facilitated diffusion. Some biologists put red blood cells in a buffer solution containing glucose. They investigated the effect of changing the concentration of glucose in the buffer solution. The graph shows the results of the investigation.



5 (b) (i) The rate of uptake of glucose between glucose concentrations of 0 and 15 mmol dm<sup>-3</sup> is limited by the glucose concentration. Give the evidence from the graph that supports this statement.

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

5 (b) (ii) Explain the shape of the curve above a glucose concentration of 30 mmol dm<sup>-3</sup>.

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(2 marks)

5 (c) Explain why a buffer solution was used in this investigation.

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(2 marks)

7

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ANSWER IN THE SPACES PROVIDED**



**6** (a) Explain how movement of the diaphragm results in air entering the lungs during inspiration.

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*(2 marks)*

**6** (b) Describe how the concentration of oxygen in the alveoli is different from the concentration of oxygen in atmospheric air. Give the reason for your answer.

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*(1 mark)*

**6** (c) The air in the alveoli is saturated with water vapour. Describe how molecules of water pass from the blood into the air in the alveoli.

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*(2 marks)*

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**Turn over for the next question**

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7 Read the following passage.

A seal can dive and remain under water for a long time. It has a much greater blood volume per kilogram of body mass than a mammal that is not adapted for diving. A seal has 150 cm<sup>3</sup> of blood per kilogram of body mass, twice that of a human. In addition, each cubic centimetre of seal blood has 1.6 times as much haemoglobin as each cubic centimetre of human blood.

5

During a long dive, nerves cause a seal’s heart rate to fall to as little as 15 beats per minute. Blood flow to the seal’s heart muscle and to the brain remains constant. Arteries to other parts of the body become narrower and blood flow to the skeletal muscles, skin and intestines is reduced by about 90%. This is very different from the changes in the blood supply when a human exercises.

10

Use information from the passage and your own knowledge to answer the questions.

7 (a) (i) The seal’s blood volume is given per kilogram of body mass (lines 2–3). Explain the advantage of giving the blood volume in this way.

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(2 marks)

7 (a) (ii) A seal could carry more oxygen in its blood than a human with the same body mass. Use the figures in the passage to calculate how many times more. Show your working.

Answer = ..... times more (2 marks)



7 (b) (i) When a human heart beats, the atria contract first, then the ventricles. Describe how these events are controlled.

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(6 marks)

(Extra space) .....

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7 (b) (ii) During a long dive, nerves cause a seal’s heart rate to fall (line 6). Explain how.

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(2 marks)

**Question 7 continues on the next page**

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7 (c) (i) The change in blood supply to a seal's organs during a dive is different from the change when a human exercises (lines 9–10). Describe how.

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.....

(1 mark)

7 (c) (ii) Explain how the changes in the blood supply to the skeletal muscles, skin and intestines (lines 8–9) are an advantage to a seal when it is under water.

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(2 marks)

15





- 8 Students investigated the effect of sucrose concentration on the lengths of strips cut from daffodil flowers. They measured the strips and put them in different sucrose solutions. After two hours they measured the strips again. The table shows their results.

Sucrose concentration / mol dm <sup>-3</sup>	$\frac{\text{Initial length}}{\text{Final length}}$
0.2	0.6
0.3	0.7
0.4	0.9
0.5	1.2
0.6	1.4
0.7	1.4
0.8	1.4

- 8 (a) The initial length of the strip that was put in the sucrose solution which had a concentration of 0.4 mol dm<sup>-3</sup> was 45 mm. Calculate its final length.

Answer = ..... (1 mark)

- 8 (b) You could use a graph to find the concentration of sucrose that had the same water potential as the daffodil strips. Describe how.

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

- 8 (c) There was no further change in the ratio of initial length to final length in solutions above a concentration of 0.6 mol dm<sup>-3</sup>. Explain why.

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 .....  
 (2 marks)

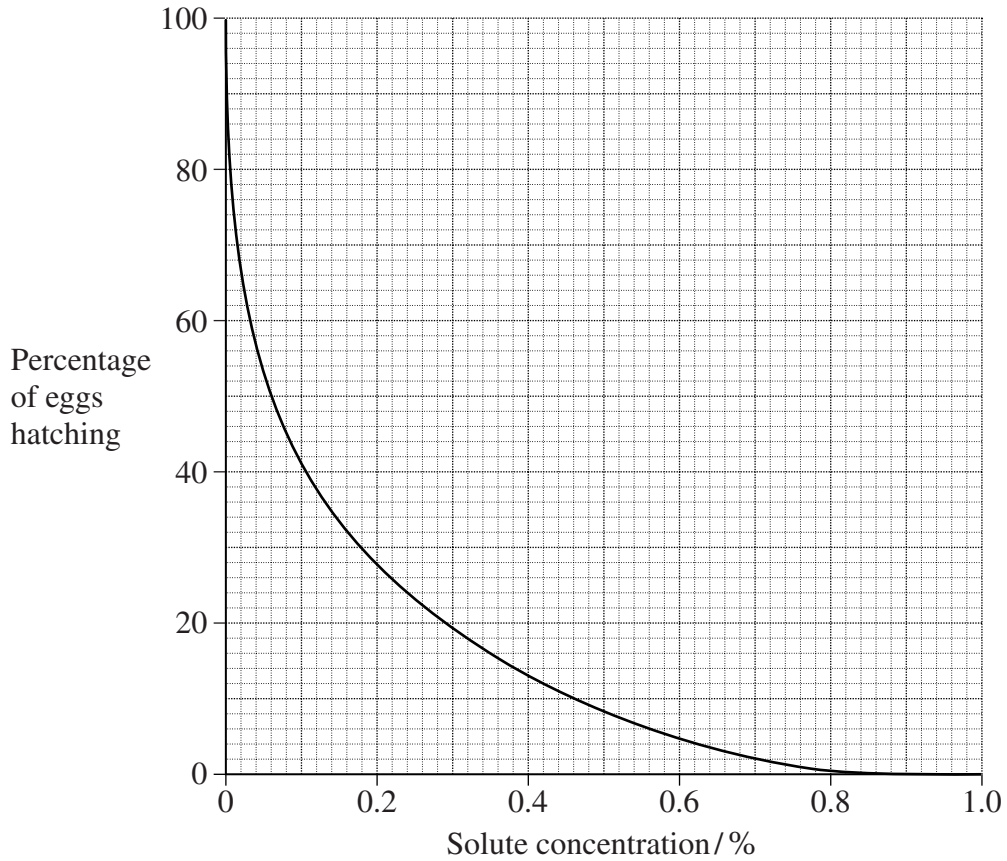
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Some species of blood flukes live inside humans. The adult flukes live in the blood vessels near the bladder. They lay eggs which go through the bladder wall into the urine. These eggs do not hatch in the urine but do hatch when an infected person urinates in fresh water such as a lake or a river.

Scientists studied the hatching of fluke eggs. They investigated the effect of solute concentration on the hatching of the eggs. The graph shows their results.



- 8 (d) During the investigation, the scientists kept the temperature constant. Explain how keeping the temperature constant helps to produce results that are reliable.

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 .....

(1 mark)

- 8 (e) (i) Describe how the solute concentration affects the percentage of eggs hatching.

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(2 marks)



8 (e) (ii) When an egg hatches, the egg shell bursts and the young blood fluke escapes. Use your knowledge of water potential to explain why the egg shell bursts.

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(2 marks)

8 (f) The lungs of a mammal are adapted for gas exchange. Use your knowledge of Fick's law to explain how.

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(6 marks)

(Extra space) .....

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**END OF QUESTIONS**

**15**



