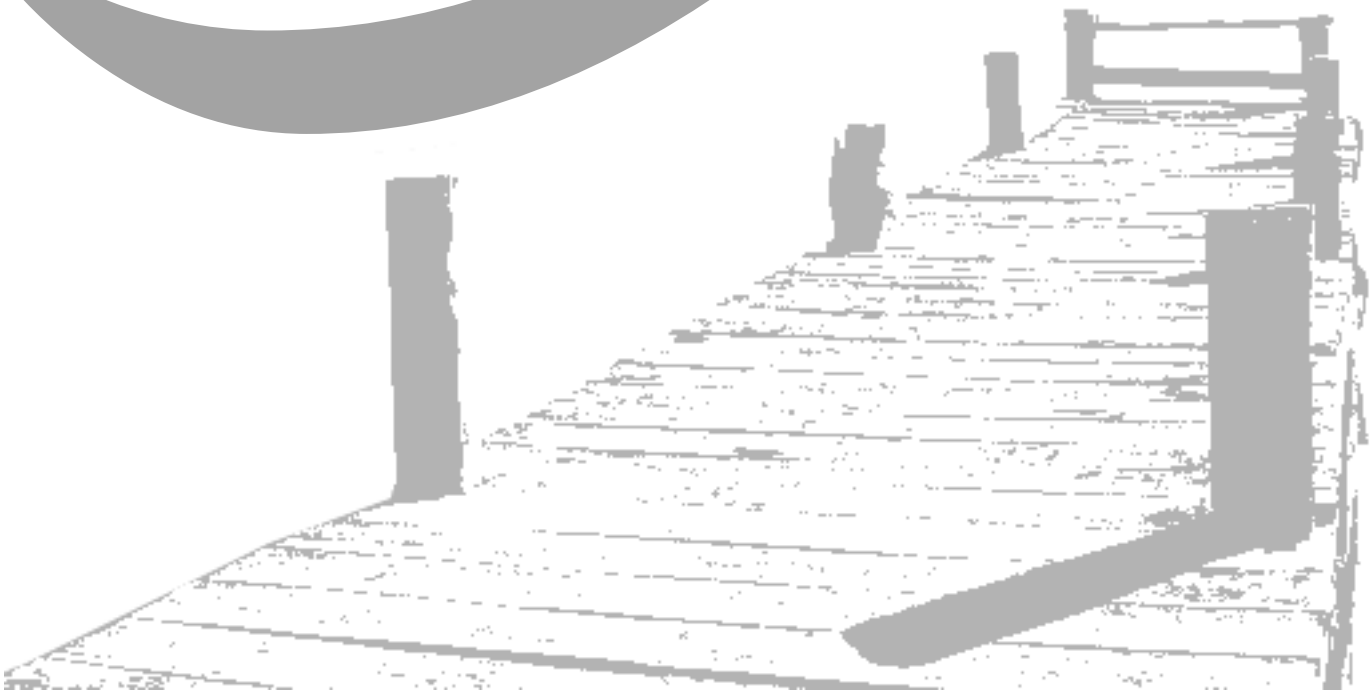
GCE
AS and A Level

Biology

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 1:
Specimen question paper

Version 2.0



Surname		Other Names	
Centre Number						Candidate Number				
Candidate Signature										

For Examiner's Use

General Certificate of Education
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY **BIOL1**
Biology and disease

Specimen Paper

In addition to this paper you will require
- a ruler with millimetre measurements
- you may use a calculator

Time allowed: 1 hour 15 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. Answers written in margins will not be marked
- Do all rough work in this book. Cross through any work you do not want marked

Information
- The maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.
- Quality of Written Communication will be assessed in all answers

For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
5			
6			
7			
8			

Total (Column 1)	
Total Column 2)	
TOTAL	
Examiner's Initials	

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

1 Lactose is present in milk. It is broken down by lactase into glucose and galactose. This is shown in the equation.

$$\text{lactose} + \text{water} \xrightarrow{\text{lactase}} \text{glucose} + \text{galactose}$$

(a) Name the type of reaction shown in the equation.

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(1 mark)

(b) The molecular formula of galactose is $C_6H_{12}O_6$. What is the molecular formula of lactose?

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(2 marks)

(c) Doctors use a lactose tolerance test to find out if a person is lactose intolerant. In this test, the person is given a solution of lactose to drink. Blood glucose concentration is then measured over the next two hours.

A lactose tolerance test was carried out on a healthy man who was lactose tolerant, and on a man who was lactose intolerant. The results for the first hour are shown in the table.

Time/minutes	**Blood glucose concentration/mmol dm^{-3}**	
	Healthy, lactose tolerant man	**Lactose intolerant man**
0	3.8	3.8
15	4.7	3.9
30	6.1	3.8
45	6.6	3.9
60	6.2	3.9

(i) The blood glucose concentration changed in the healthy man after he had taken the test. Describe how.

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(2 marks)

(ii) Explain the results for the lactose intolerant man.

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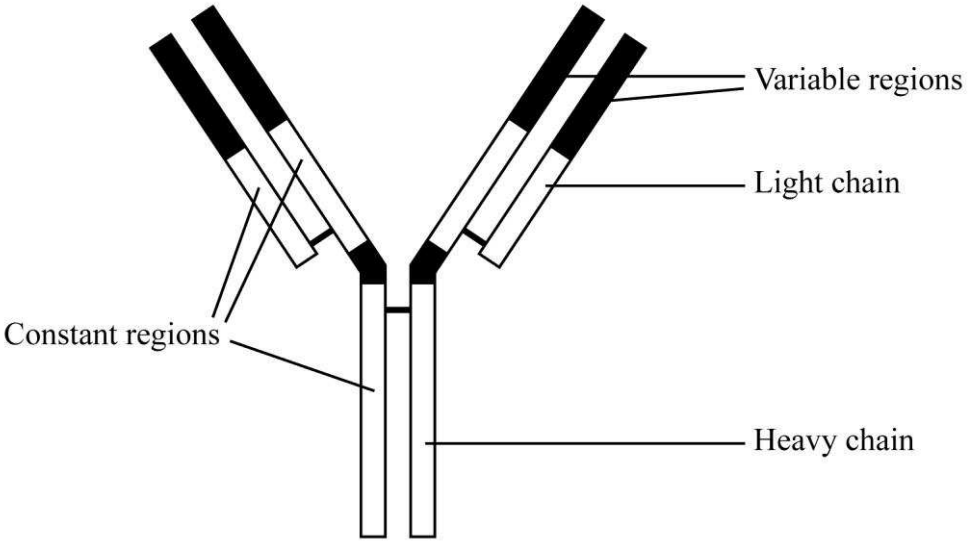
(3 marks)

8

2 Antibodies are proteins. The diagram shows an antibody.



(a) Name

(i) the monomers that form the heavy and light chains

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(ii) the chemical bonds that join these monomers.

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(2 marks)

(b) The specificity of an antibody depends on its variable regions. Explain how.

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(2 marks)

(c) In a pregnant woman, some antibodies cross the placenta from the mother to the fetus. These antibodies only provide short-term immunity for newborn babies. Explain why these antibodies only provide short-term immunity.

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(2 marks)

6

3 The photographs show sections through alveoli of healthy lung tissue and lung tissue from a person with emphysema. Both photographs are at the same magnification.

Question 3(a) is not reproduced here due to third party copyright constraints

(b) People with emphysema may find it difficult to climb stairs. Explain why.

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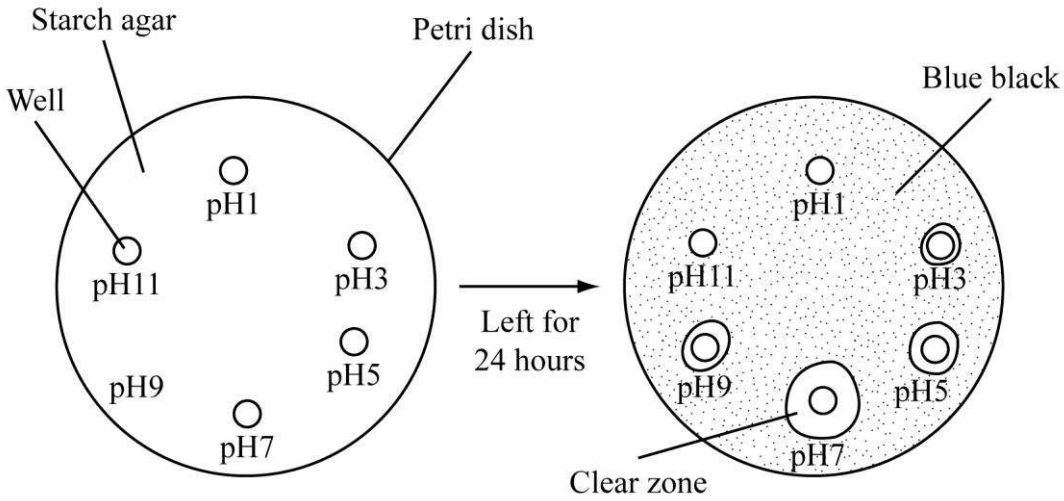
(3 marks)

5

4 Amylase is an enzyme that breaks down starch. A student investigated the effect of pH on amylase activity by using a starch agar plate. Six circular wells were cut into the agar plate. Each well contained the same concentration and volume of amylase, and a buffer solution of different pH. The agar plate was then left for 24 hours. The diagram shows the results



Result after plate is flooded with iodine solution then rinsed with water

(a) Describe how the student could have used these results to compare the activity of the enzyme at different pH values.

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(2 marks)

(b) The student concluded that the optimum pH for amylase activity was 7. This conclusion may not be valid. Explain why.

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(1 mark)

(c) Using your knowledge of enzyme structure, explain the result obtained at pH 11.

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(2 marks)

(d) Describe a control that would be necessary for this investigation.

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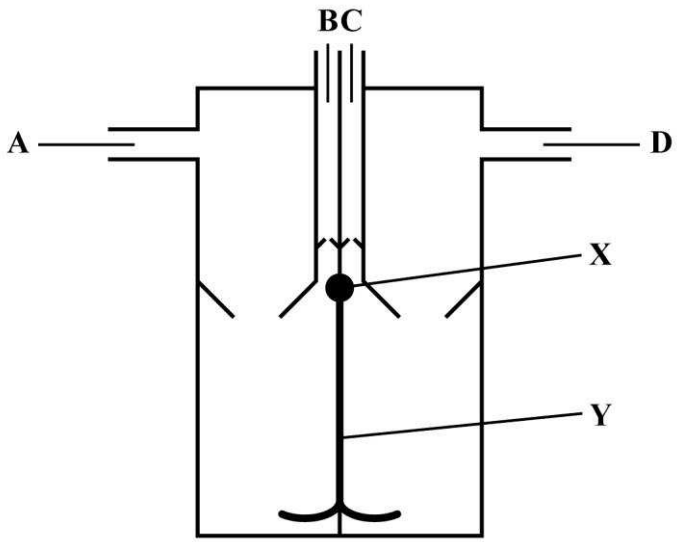
(2 marks)

7

Turn over for the next question

5 The diagram shows a human heart seen from the front.



(a) (i) Which **one or more** of vessels **A** to **D** contains oxygenated blood?

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(1 mark)

(ii) During a cardiac cycle, the pressure of blood in vessel **C** is higher than the pressure of blood in vessel **B**. Explain what causes this difference in pressure.

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(1 mark)

(b) What does the diagram suggest about the pressure in the atria compared to the pressure in the ventricles at the stage in the cardiac cycle shown?
Explain your answer.

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(2 marks)

(c) The wave of electrical activity which coordinates the heart beat is delayed slightly at part **X**. It then passes along part **Y** to the base of the ventricles.

Explain the importance of

(i) the slight delay at part **X**

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(2 marks)

(ii) the electrical activity being passed to the base of the ventricles.

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(2 marks)

8

Turn over for the next question

6 (a) Pulmonary tuberculosis is spread from one person to another by droplet infection. Explain how tuberculosis is spread by droplet infection.

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(2 marks)

(b) The table shows the number of cases of tuberculosis in different regions of England between 2000 and 2005

Region	**Number of cases of tuberculosis per 100 000 of the population**				
	2000	**2001**	**2002**	**2003**	**2004**
East Midlands	10.6	11.1	11.9	7.9	9.9
West Midlands	13.7	13.1	14.9	15.0	16.2
North East	5.7	7.7	6.4	6.1	6.7
North West	10.0	10.0	9.4	9.0	9.3
South East	6.1	6.6	7.3	7.4	7.3
South West	4.6	4.0	4.8	4.5	5.3

(i) The number of cases of tuberculosis varies between different regions. Suggest **two** reasons for this.

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(2 marks)

(ii) Calculate the percentage increase on the number of cases of tuberculosis in the south west region of England from 2000 to 2004. Show your working.

Answer.....

(2 marks)

6

Turn over for the next question

7 Read the following passage

Cholera is a water-borne disease. It is caused by a bacterium. The bacterium produces a toxin which acts on the epithelial cells of the small intestine and causes changes in membrane permeability. The cholera toxin affects the movement of ions through the intestinal wall. It causes the loss of chloride ions from the blood into the lumen of the small intestine. This prevents the movement of sodium ions from the lumen of the small intestine into the blood. The resulting high concentration of ions causes diarrhoea.

Vaccination can produce immunity to cholera. A new vaccine appears to provide better immunity and has fewer side effects than previously available vaccines. This vaccine is taken orally. For long-term immunity, a booster dose is required after two years.

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

(a) The cholera toxin only affects the epithelial cells of the small intestine (line 2). Suggest why.

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(3 marks)

(b) (i) Sodium ions normally enter the blood from cells of the intestinal wall against a concentration gradient. Describe how.

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(3 marks)

(ii) The high concentration of ions in the small intestine of a person with cholera causes diarrhoea. (lines 6-7). Explain why.

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(2 marks)

(c) The new vaccine for cholera is taken orally (line 10) but some vaccines are not taken orally. Suggest **one** reason why some vaccines are not taken orally.

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(1 mark)

(d) A booster dose of vaccine is required to provide long-term immunity. Suggest why.

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(1 mark)

10

Turn over for the next question

8 (a) Explain the link between atheroma and the increased risk of aneurism.

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(4 marks)

(b) Cigarette smoking and a diet high in saturated fat increase the risk of myocardial infarction. Explain how.

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(6 marks)

10

END OF QUESTIONS

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