

Surname	Centre Number	Candidate Number
Other Names		2



GCE AS/A level

1071/01

BIOLOGY/HUMAN BIOLOGY – BY1

A.M. WEDNESDAY, 9 January 2013

1½ hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	8	
2	5	
3	9	
4	10	
5	12	
6	16	
7	10	
Total	70	

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INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional pages at the back of this booklet, taking care to number the question(s) carefully.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

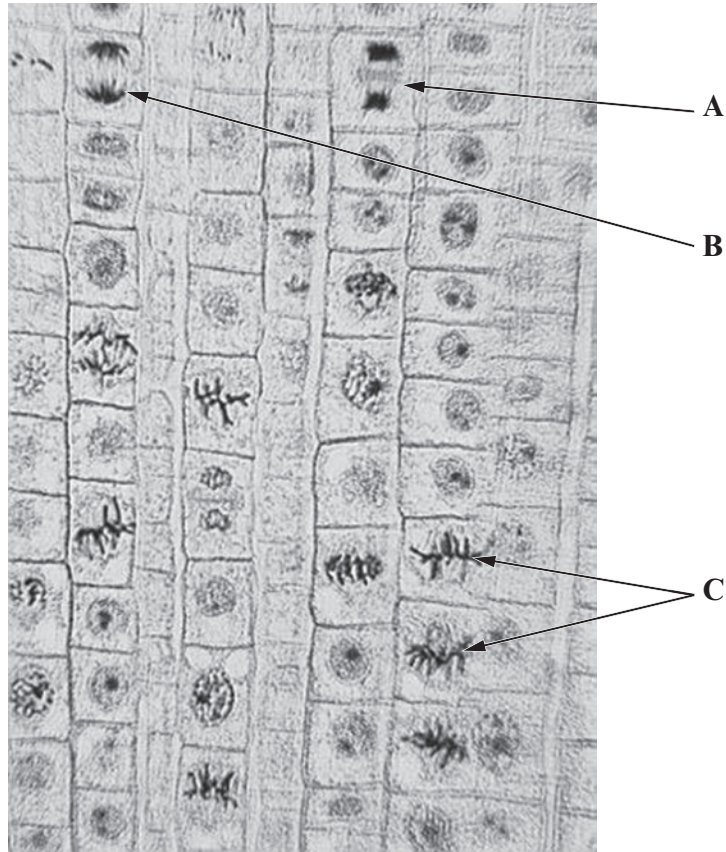
You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.



J A N 1 3 1 0 7 1 0 1 0 1

1. The photograph below shows a preparation of garlic (*Allium sativum*) root tip undergoing cell division – the stages of the cell cycle are clearly visible.



- (a) (i) Name the stages shown in the diagram labelled **A** and **C**. [2]

Stage **A**

Stage **C**

- (ii) Describe and explain the events occurring during the stage labelled **B**. [2]

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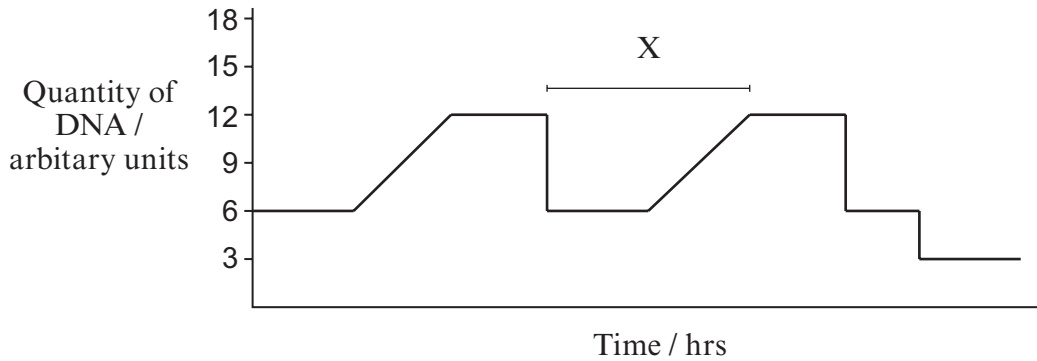
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(b) The graph below shows the relative quantity of DNA in an animal cell during two complete cell cycles.



(i) Name the stage in the cell cycle which is represented by the time period labelled X on the graph above. [1]

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(ii) Using evidence from the graph, give a reason for your answer in part (b)(i). [1]

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(iii) State the type of nuclear division that is shown in the second cell cycle and explain how the evidence in the graph led you to this conclusion. [2]

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(Total 8 marks)

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2. There are 2 types of nucleic acid: DNA and RNA.

(a) Complete the table below to describe **three** differences between the structure of DNA and RNA. [3]

DNA	RNA

(b) A sample of DNA was analysed, 23% of the nucleotides contained guanine. Calculate the percentage of nucleotides which contained adenine. Show your working. [2]

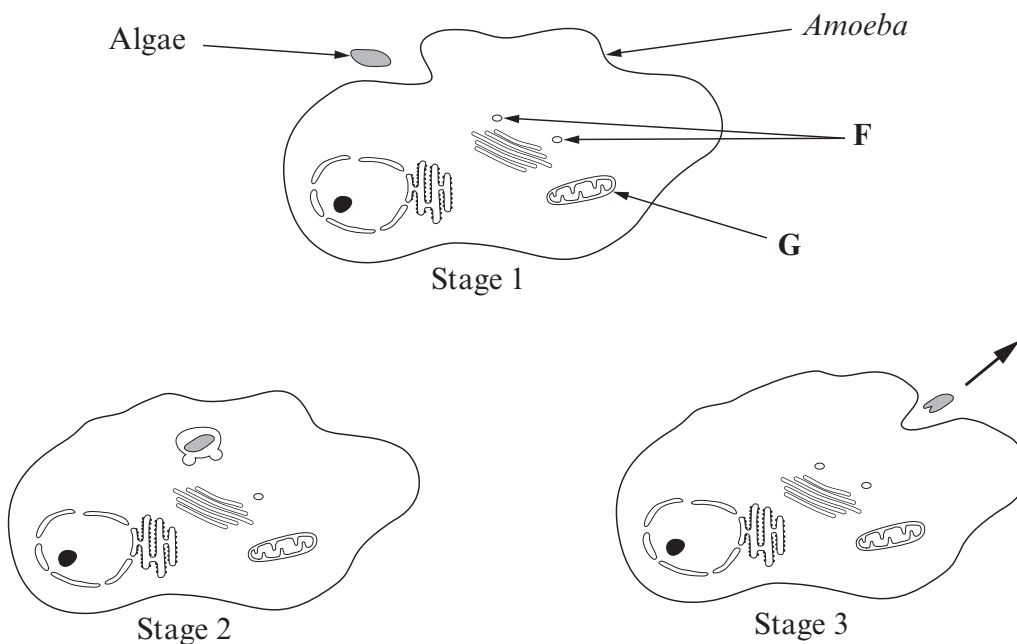
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3. *Amoeba proteus* is a single celled eukaryotic organism that can be found living in shallow freshwater ponds and streams. *Amoeba proteus* feeds on algae and other unicellular organisms. The diagrams below show the sequence of events during feeding.



(a) (i) Name and describe the process that has occurred between stages 1 and 2 on the diagram opposite. [2]

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(ii) Structures F on the diagram opposite are involved in the digestion of the *Amoeba's* food.
Name the organelle where Structures F are formed. [1]

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(iii) State the name of the process occurring at stage 3 on the diagram opposite. [1]

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(b) (i) What is the function of the organelle on the diagram opposite labelled G? [1]

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(ii) Suggest a reason why this organelle is required by *Amoeba* during feeding. [1]

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(c) Describe **three** ways in which the structure of a prokaryotic cell would differ from that of *Amoeba*. [3]

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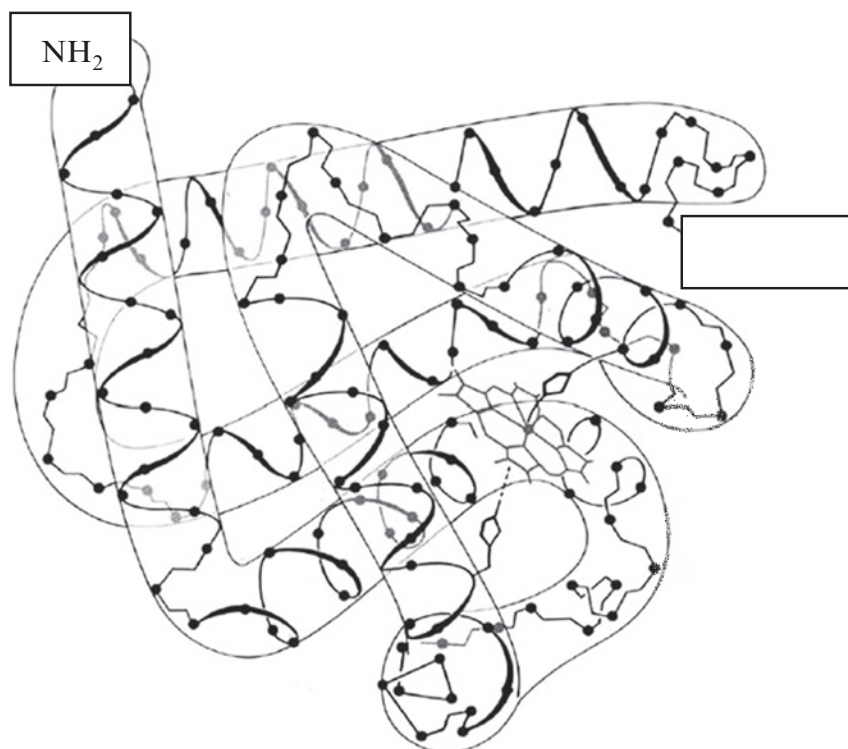


4. Red blood cells are involved with the transport of oxygen around the body. Red blood cells lack internal organelles and their cytoplasm contains haemoglobin. Haemoglobin is a protein that consists of four polypeptide chains linked together.

(a) State the level of protein structure shown by haemoglobin. [1]

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(b) The diagram below shows one of the polypeptide chains from haemoglobin.



(i) On the diagram above, use an arrow to **clearly label** an alpha –helix. [1]

(ii) Complete the diagram above by writing in the empty box, the molecular group that would be present at the end of the polypeptide chain. [1]

(iii) Name **two** types of bonds that would be present to maintain the 3D shape of this polypeptide chain. [1]

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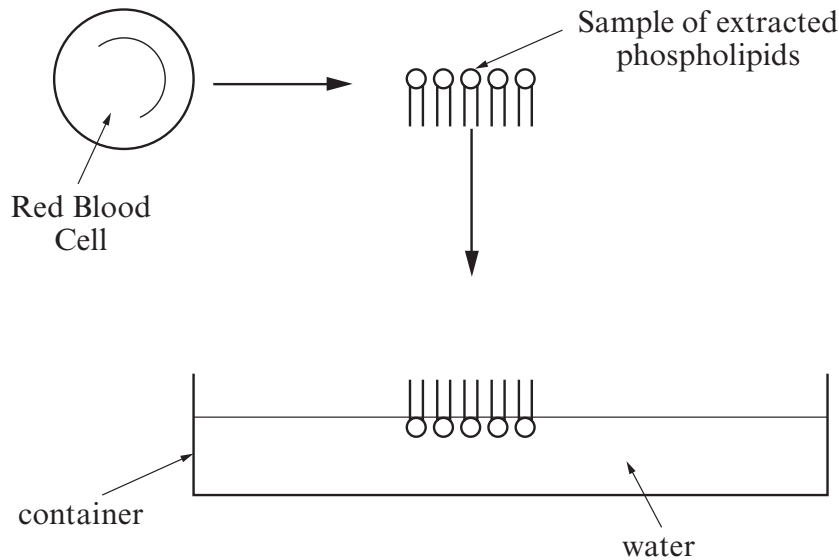
(c) The plasma membrane contains proteins and phospholipids. Describe **two** ways in which the structure of phospholipids differ from triglycerides. [2]

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(d) In 1925, two scientists, Gorter and Grendel investigated the arrangement of phospholipids in the plasma membrane. This involved the removal of the phospholipids from the surface membrane of all the red blood cells in 10cm³ of blood. The phospholipids were then placed on the surface of water and allowed to spread out to form a single layer, called a monofilm.



(i) Explain fully the arrangement of the phospholipid molecules as shown in the container on the diagram above. [2]

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(ii) The area covered by all the phospholipids in the monofilm was found to be 12.2m². The total surface area of the intact red blood cells had been previously measured. Using your knowledge of membrane structure, what would you expect the total surface area of the red blood cells to be? Explain your answer. [2]

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(Total 10 marks)

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5. (a) Oxygen (an uncharged molecule) and phosphate ions are both required by plants. They enter the cells through the plasma membrane. Use your knowledge of the structure of the plasma membrane to explain how each of these molecules enter the cell.

(i) Oxygen: [2]

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(ii) Phosphate ions: [2]

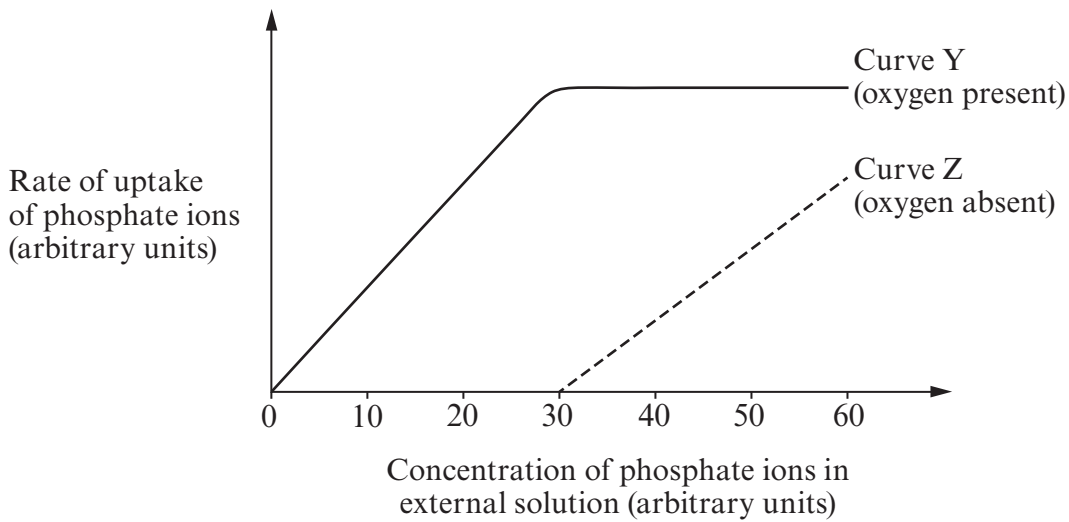
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(b) Phosphate ions are taken up by specialised cells in the roots called root hair cells. The graph below shows the effect of the external concentration of phosphate ions on the rate of uptake of phosphate ions.



- (i) With reference to curve Y opposite, name the process that the cells use to uptake phosphate ions when the external concentration of phosphate ions is between 0 – 30 arbitrary units. Explain your answer. [3]

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- (ii) Explain the shape of curve Y between concentrations of 30 – 60 arbitrary units. [2]

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- (iii) Explain why the rate of uptake increases on curve Z between concentrations of 30 – 60 arbitrary units. [2]

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- (c) State **one** reason (other than as a component of phospholipids) why the plant needs phosphate ions. [1]

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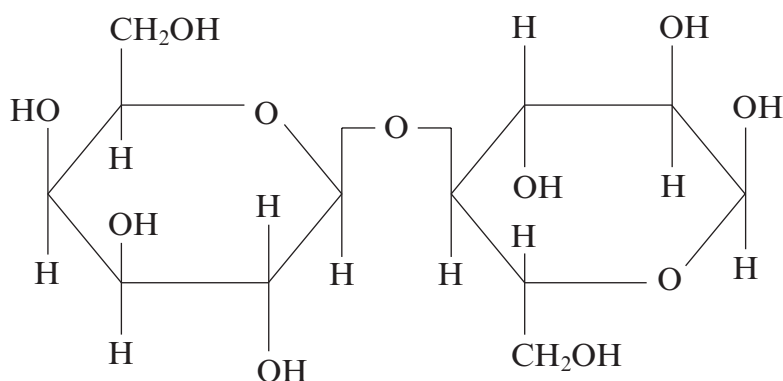
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6. Lactose is a disaccharide found in milk. The diagram below shows the structure of lactose.



(a) Lactose can be broken down into its constituent monosaccharides.

(i) Complete the diagram above to show how lactose is broken down. [2]

(ii) State the type of reaction involved in the breakdown of lactose. [1]

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(iii) Name the bond that is broken during this reaction. [1]

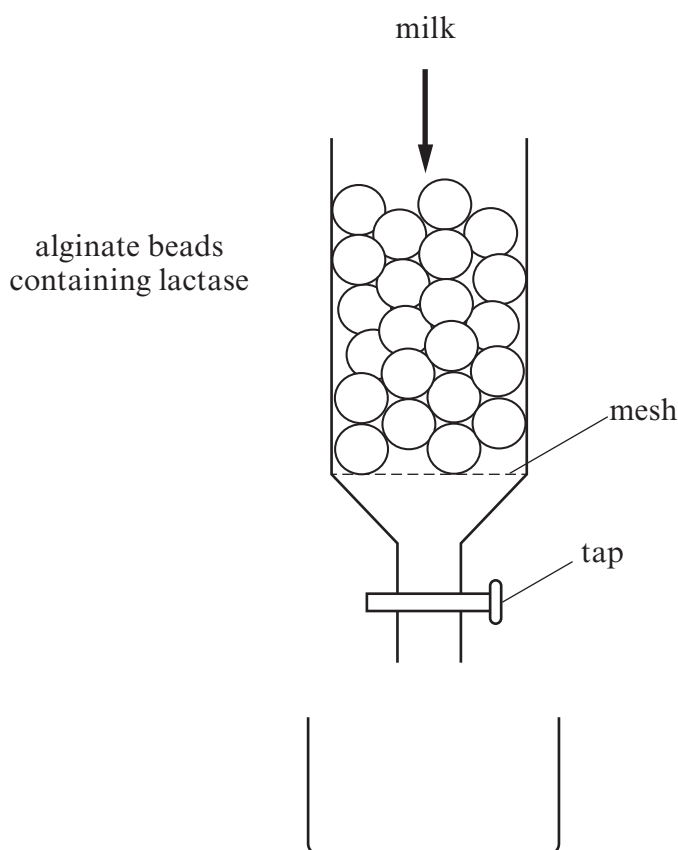
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(iv) Name the molecules produced when lactose is broken down. [1]

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- (b) The enzyme lactase can be used to break down lactose. In an experiment lactase was immobilised inside alginate beads and placed in a column, as shown in the diagram below. Fresh milk was then poured into the column and left for one minute before being allowed to drain into the beaker below. As the milk passes through the column the lactose in the milk is broken down.



- (i) What is meant by the term immobilised enzyme? [1]

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- (ii) Describe **two** advantages of using immobilised enzymes in this way. [2]

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(c) (i) The products produced from the breakdown of lactose are reducing sugars. Describe how you could test for the presence of a reducing sugar. [2]

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(ii) The products produced could also be detected by a biosensor. What is meant by the term biosensor? [1]

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(iii) What would be the main advantage of using the biosensor to detect the products? [1]

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(d) Some bacteria which are found in milk can convert sugars within the milk to lactic acid. Over time the number of these bacteria increase and this eventually causes milk to go sour. The experiment above was repeated with milk that had been left for seven days. State and explain the effect this would have on the concentration of reducing sugars detected. [4]

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(Total 16 marks)



7. Answer **one** of the following questions.
Any diagrams included must be fully annotated.

Either, (a) Describe and explain the effect of inhibitors on enzyme action. [10]

Or (b) Describe and explain the effects of placing animal and plant cells in solutions of differing solute concentration. [10]

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END OF PAPER

(Total 10 marks)



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Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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Question number	<p>Additional page, if required. Write the question numbers in the left-hand margin.</p>
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