Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1071/01

BIOLOGY/HUMAN BIOLOGY – BY1

A.M. WEDNESDAY, 21 May 2014

1 hour 30 minutes

Suitable for Modified Language Candidates

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**11**	
2.	**6**	
3.	**6**	
4.	**10**	
5.	**6**	
6.	**9**	
7.	**12**	
8.	**10**	
Total	**70**	

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INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use pencil or gel pen. Do not use 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 continuation pages at the back of the booklet, taking care to number the question(s) correctly.

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.

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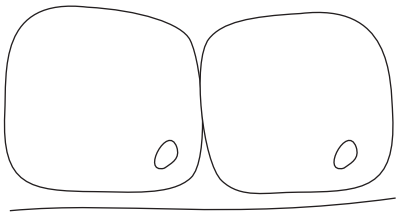
Answer **all** *questions.*

1. *(a)* Samples of epithelial tissue were examined using a light microscope. Drawings of cells from these tissues are shown below. Identify the type of epithelial tissue shown, and suggest from where in the body the samples were taken.

(i) [2]



Tissue type .....

Where found in body .....

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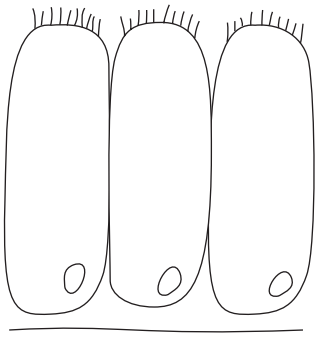
(ii) [2]



Tissue type .....

Where found in body .....

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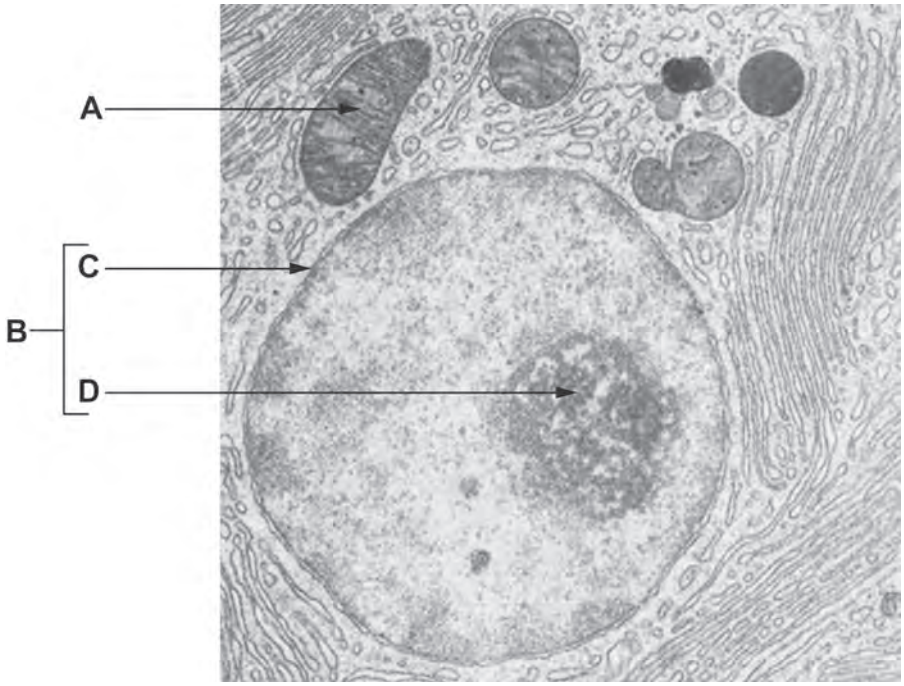
The electron micrograph below shows part of a typical animal cell.



(b) Complete the table below. Name the structures and organelles shown in the electron micrograph above. Describe their functions. [4]

Letter	Organelle / Structure	Function
B	nucleus	
C	nuclear pores	
D		

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(c) The nucleus has pores in the envelope that surrounds it, whereas organelle **A** does not. Describe **one** *other* difference between the membranes that surround organelle **A** and those that surround the nucleus. [1]

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(d) Describe **two** differences between the ribosomes found in animal cells and those found in prokaryotic cells. [2]

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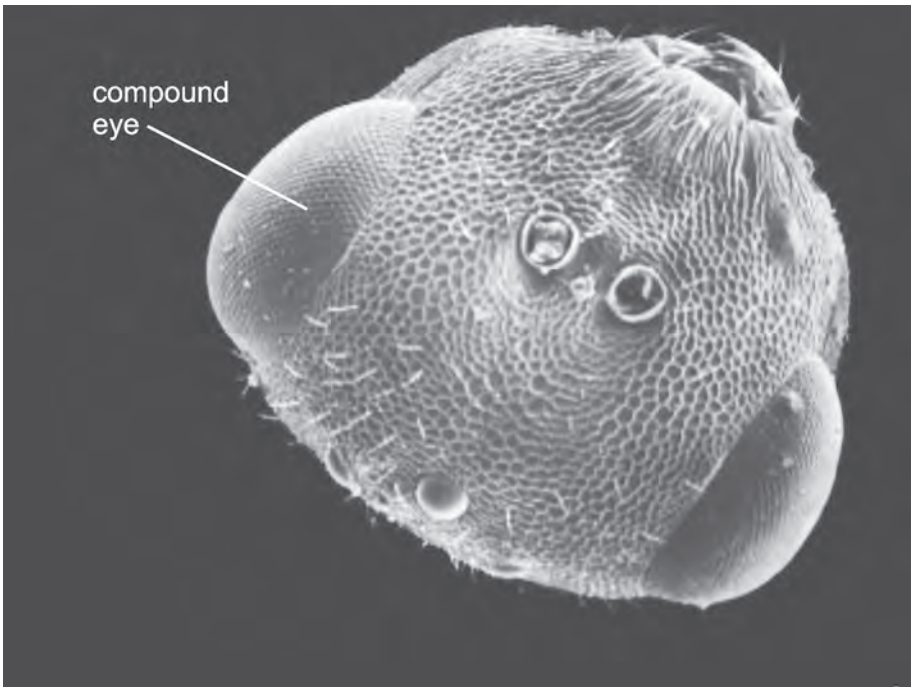
2. The photograph below shows the head of a parasitic wasp, *Chlorocytus* species, taken using a scanning electron microscope.



(a) The photograph shows two compound eyes, which are regarded as organs. State what is meant by the term *organ*. [2]

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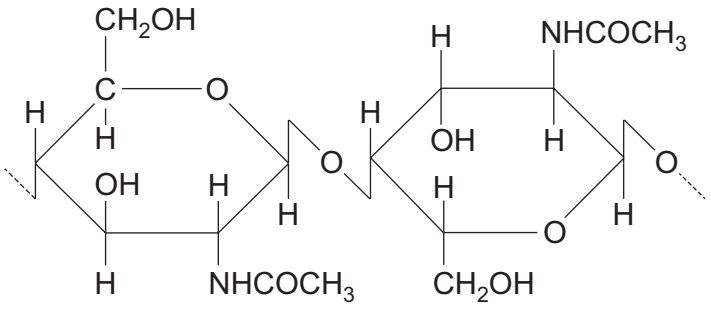
(b) The exoskeleton of insects contains the molecule shown below.



(i) Name the **group** of biological molecules to which the molecule shown above belongs. [1]

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(ii) Explain how the molecule shown gives strength to the exoskeleton. [2]

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(iii) Some OH groups in the molecule above have been replaced with $NHCOCH_3$ groups. Name **one** *other* group of biological molecules that contain nitrogen. [1]

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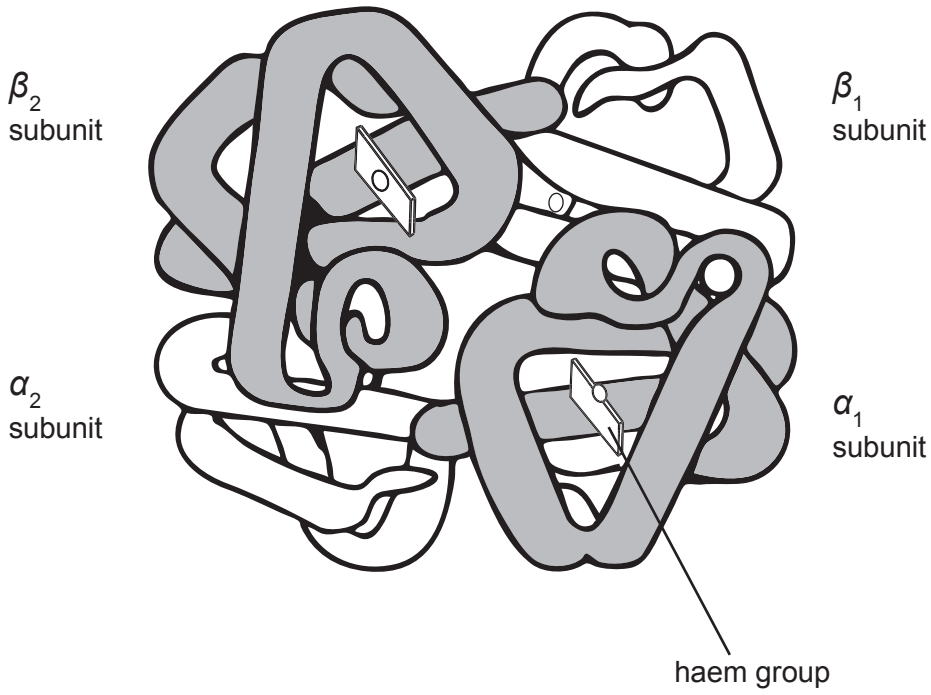
3. The diagram below shows a molecule of haemoglobin.



(a) State the inorganic ion present in the haem group. [1]

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(b) Using the diagram above, explain why this molecule is regarded as having a quaternary structure. [2]

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(c) Describe the biochemical test that could be performed to test for a protein. [2]

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(d) Suggest how the concentration of a specific protein could be measured in a sample of urine. [1]

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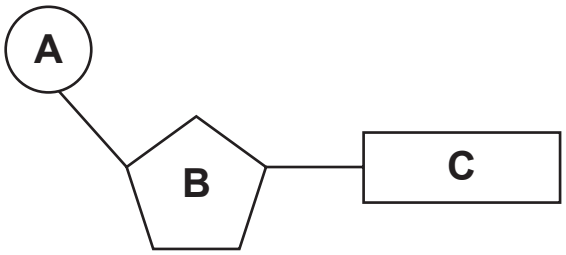
4. The diagram below shows a component of **DNA**.



(a) Name the parts **A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) Describe how a polymer of DNA would be different from a polymer of RNA. [2]

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(c) (i) Name the stage in the cell cycle where DNA replication occurs. [1]

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(ii) Vincristine is a drug which prevents the spindle fibres from shortening. Name the stage in the cell cycle which would be affected. [1]

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(iii) State **three** differences between daughter cells produced by the process of mitosis and those produced by meiosis. [3]

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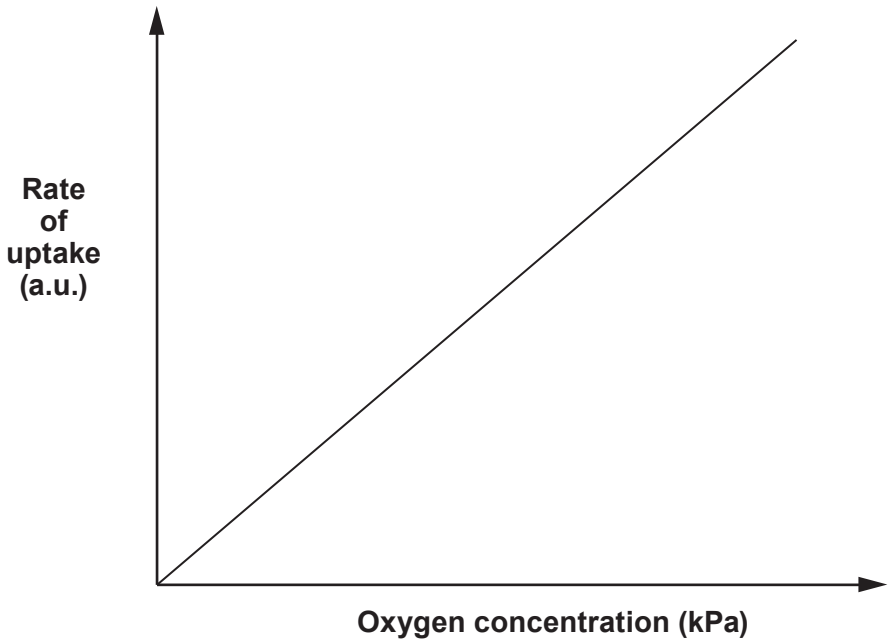
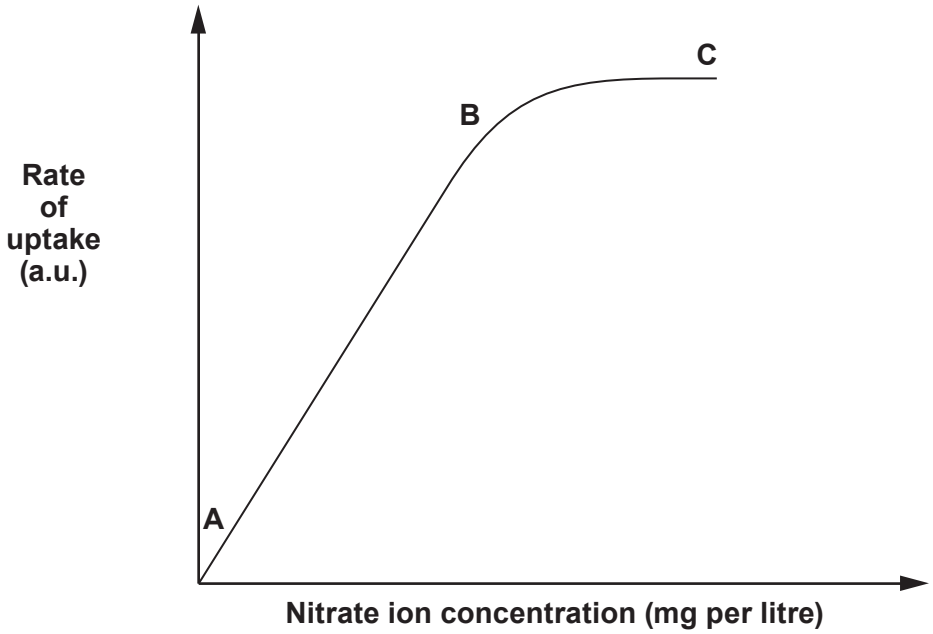
5. The graphs below show the uptake of different molecules into the roots of plants.

I. Oxygen



II. Nitrate ions



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(a) Using graph **I**, name the process by which oxygen is absorbed by the roots. Give a reason for your answer. [2]

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(b) Explain why the rate of uptake of nitrate ions increases between points **A** and **B** shown on graph **II**. [1]

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(c) In the presence of a respiratory inhibitor such as cyanide, the rate of nitrate uptake falls to zero. Name the process by which nitrate ions are taken up. [1]

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(d) Water enters root hair cells by osmosis. Calculate the solute potential (Ψ_S) of the root hair cell, when there is no net movement of water, the water potential of the soil water is –100 kPa and the pressure potential (Ψ_P) inside the root hair cell is +200 kPa. Use the formula $\Psi = \Psi_S + \Psi_P$.

Show your working and units. [2]

Answer .....

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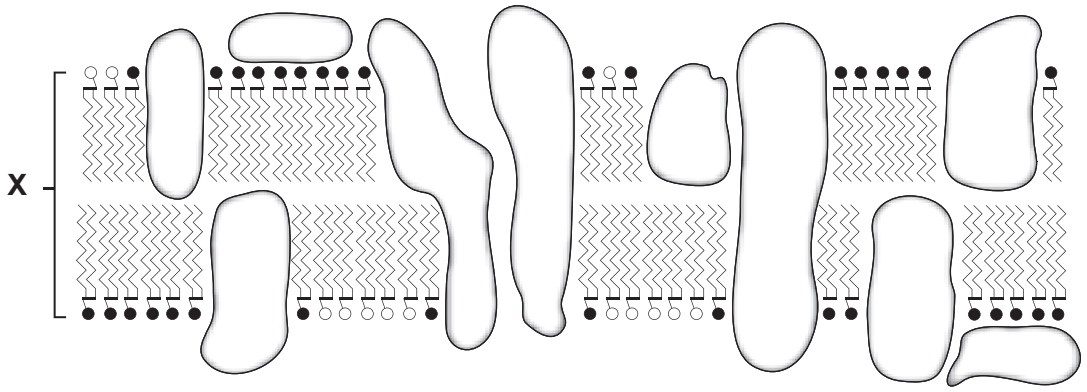
6. The diagram below shows the fluid mosaic model proposed by Singer and Nicolson in 1972.



(a) The width of the membrane as shown by **X** has been measured using transmission electron microscopes. Membrane width does not vary greatly between different organisms. State a value for this width. [1]

Membrane width = ...

(b) Glucose is water soluble. Vitamin A is lipid soluble. Describe and explain how each molecule crosses the membrane shown above. [4]

Vitamin A

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Glucose

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(c) Beetroot vacuoles contain a red pigment called *betacyanin*. When beetroot discs are cut and immersed (soaked) in a solution of 70% ethanol (an organic solvent) at 15°C, the red pigment begins to leak out of the cells into the ethanol turning it red.

(i) Use your knowledge of the structure of cell membranes. Explain why this pigment leaks out of the cells.

[2]

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(ii) When the experiment was repeated at 30°C, the time taken for the ethanol to turn red decreased. Explain why. [2]

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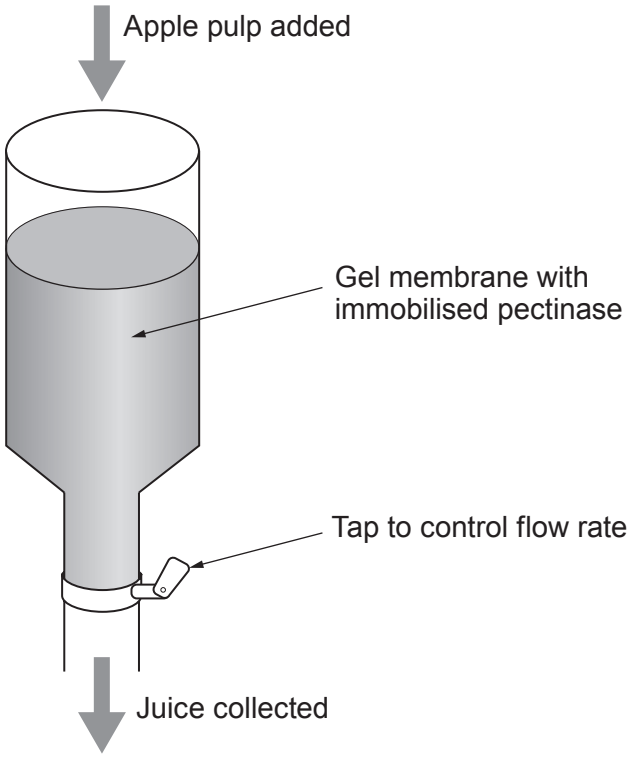
7. Pectin is a structural polysaccharide found in the cell walls of plant cells. It is also found in the middle lamella between cells, where it helps to bind cells together. Pectinases are enzymes that are routinely used in industry to increase the volume and clarity of fruit juice extracted (taken) from apples. The enzyme is immobilised onto the surface of a gel membrane. This is then placed inside a column. Apple pulp is added at the top, and juice is collected at the bottom. The process is shown in the diagram below.



(a) Immobilising enzymes can increase the temperature range over which they can be used. Describe **two** *other* advantages of immobilising pectinases. [2]

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(b) Suggest why reducing the flow rate of material through the column would result in an increased volume of juice being collected. [2]

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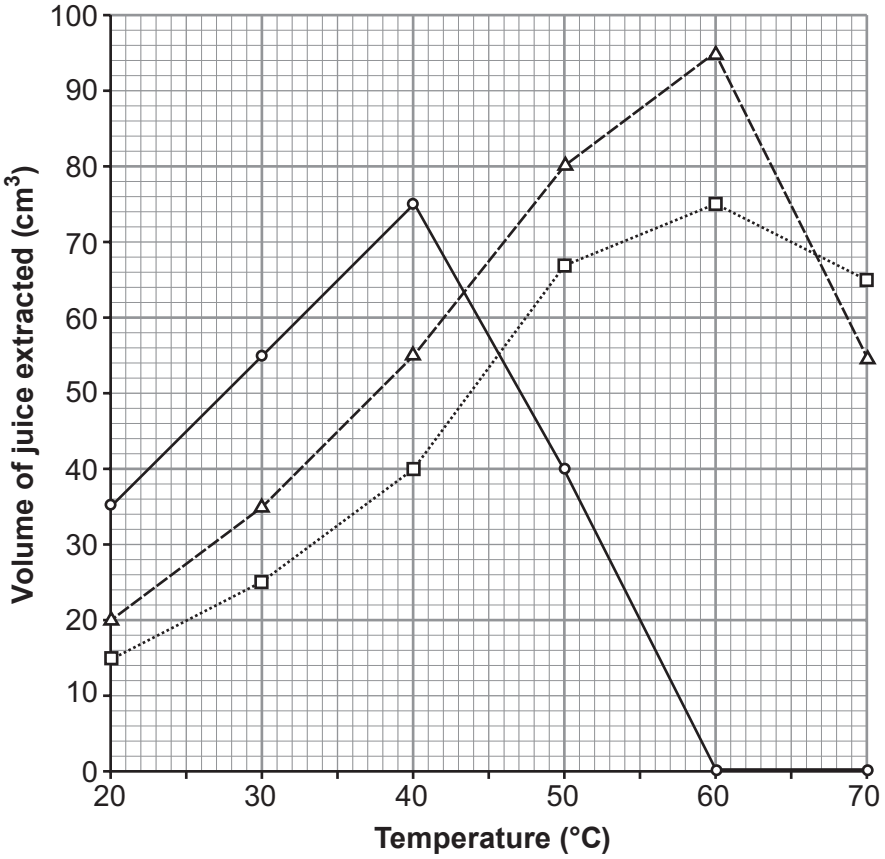
(c) The extraction of juice using pectinase was compared using equal volumes and concentrations of free enzyme, enzymes bound to the surface of a gel membrane and enzymes immobilised inside alginate beads. The results are shown in the graph below.



Using the graph and your own knowledge of enzymes, answer the following questions.

(i) Describe and explain the results for the free enzyme at temperatures above 40°C. [4]

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(ii) Explain why more juice was obtained when using free enzyme between temperatures of 20°C and 40°C than when using immobilised enzyme. [2]

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(iii) Suggest a reason for the differences seen in the results for the enzymes bound to the gel membrane surface with those immobilised inside the beads, between temperatures of 20°C and 60°C. [2]

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8. Answer **one** of the following questions.
Any diagrams included in your answers must be fully annotated.

Either, *(a)* Using examples, describe the functions of carbohydrates and lipids in living organisms. [10]

Or *(b)* Describe the structure and function of the rough endoplasmic reticulum, Golgi body and lysosomes. [10]

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END OF PAPER

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