Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1071/01

BIOLOGY/HUMAN BIOLOGY – BY1

A.M. MONDAY, 14 May 2012

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**4**	
2	**6**	
3	**10**	
4	**12**	
5	**16**	
6	**12**	
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 require any additional space for your answers, continuation pages can be found at the back of this booklet. Please indicate clearly any continued answers.

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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1. *(a)* Name the following:

(i) A device containing an enzyme that can be used to detect a specific compound in a fluid. [1]

.....

(ii) An aggregation of similar cells carrying out the same function. [1]

.....

(b) Give **one** structural difference between each of the following:

(i) prokaryotic and eukaryotic cells; [1]

.....

.....

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(ii) chloroplasts and mitochondria. [1]

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(Total 4 marks)

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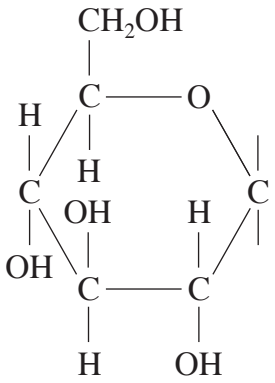
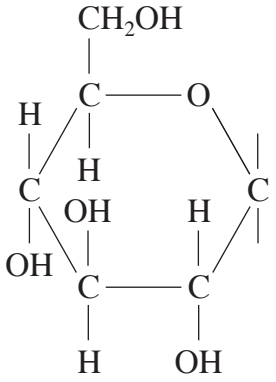
2. Carbohydrate molecules contain the chemical elements carbon, hydrogen and oxygen only.

(a) The diagrams below show structural formulae of two isomers of glucose. Complete the drawings to distinguish between the α and β isomers. [1]



α glucose



β glucose

(b) (i) Starch and cellulose are both polymers of glucose, but they are formed from different isomers. State the isomer which is found in: [1]

Cellulose ..... Starch .....

(ii) Explain how the structures of starch and cellulose are related to their functions as storage and structural molecules respectively. [4]

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(Total 6 marks)

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Turn over.

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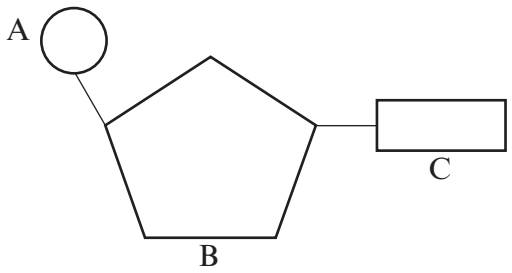
3. *(a)* The diagram below shows a unit which makes up nucleic acids.



(i) Name the structural unit shown. [1]

.....

(ii) Name component **A**. [1]

.....

(iii) Name component **B** in DNA and RNA. [1]

DNA .....

RNA .....

(iv) Name the **four** components found in DNA, represented by **C**. [2]

.....

.....

(b) Describe how the structural units, drawn in part *(a)*, are arranged in DNA molecules. [4]

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(c) Describe the function of DNA molecules in cells. [1]

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(Total 10 marks)

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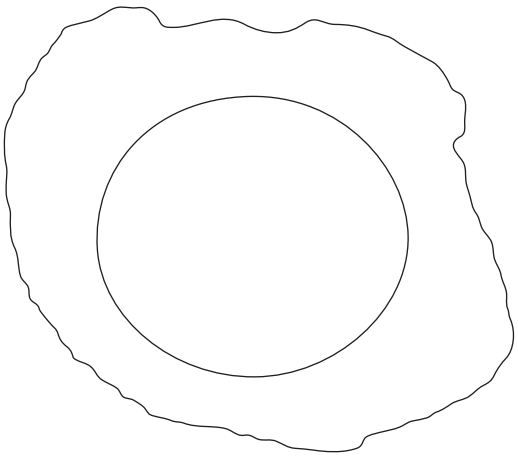
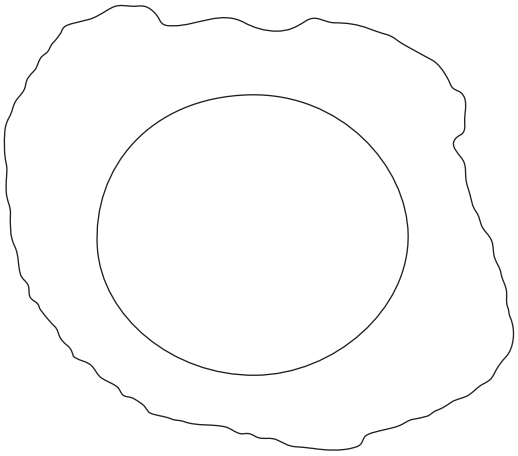
4. An Australian ant, *Myrmecia pilosula*, carries all its genetic information in a **single pair** of homologous chromosomes. Female worker ants are **diploid**, males are **haploid**.

(a) Complete the drawings of the ant body (somatic) cells below, using drawings similar to structure **A** shown below to represent a single chromosome. [2]

A



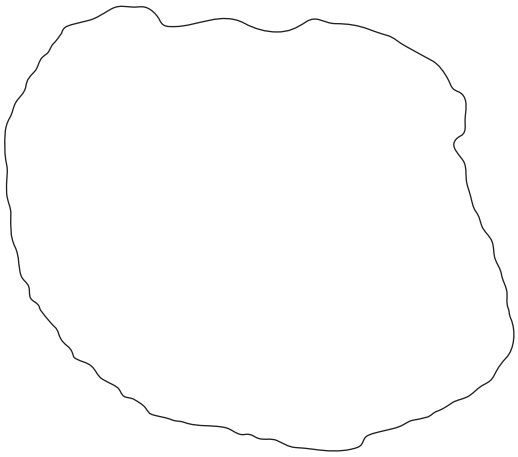
Female worker ant body cell



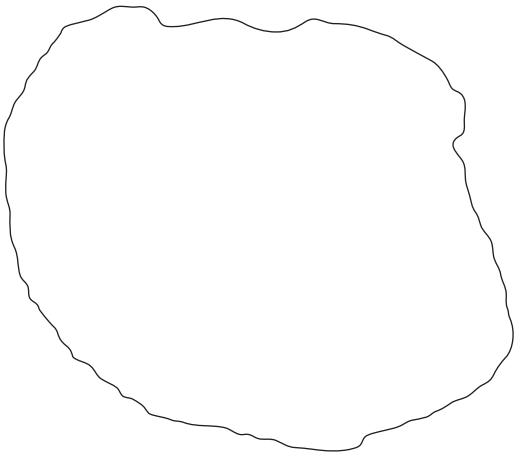
Male ant body cell

(b) Using the cell outlines provided below, make **labelled** drawings to show the appearance of the **female** worker ant cells at the following stages. [4]

(i) **metaphase** of mitosis,



(ii) **anaphase** of mitosis.



(iii) Adult ants emerge from pupae fully grown. Describe the purpose of mitosis in female worker ants. [2]

.....

.....

(iv) Suggest the additional purpose of mitosis in fully grown male ants. [1]

.....

(v) In ant colonies only some ants, called 'queens', produce egg cells and lay eggs. Name the type of cell division that the 'queens' use to produce haploid egg cells. [1]

.....

(vi) What is the significance of the queens producing **haploid** egg cells? [1]

.....

.....

(c) During a mating flight the queen collects sperm cells from male ants, which she stores in an organ called the spermatheca. The haploid egg cells from the queen's ovaries pass the spermatheca as they are laid. Some eggs are fertilised as they pass out, some eggs pass out unfertilised.

How will the ants that develop from fertilised egg cells differ from the ants that develop from unfertilised egg cells? [1]

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(Total 12 marks)

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5. The diagram below shows two molecules which are sub-units of proteins.

(a) (i) Complete the diagram above to show how a reaction takes place to join the two molecules. [3]

(ii) Name the type of reaction involved. [1]

.....

(iii) Name the type of bond formed. [1]

.....

(b) (i) Why is the model of the structure of biological membranes described as 'fluid mosaic'? [2]

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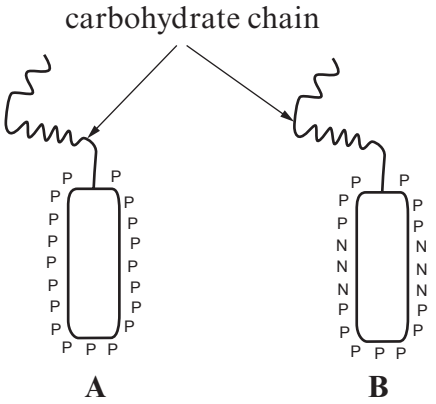
The diagrams below represent two glycoprotein molecules found in the plasma membranes of mammalian cells.

N = non-polar group
P = polar group



(ii) Which of the molecules **A** or **B** will form an **intrinsic** protein in the plasma membrane? [1]

Molecule .....

(iii) Draw a **labelled** diagram of the plasma membrane using the diagrams above to show the correct positioning of glycoproteins **A** and **B**. [2]

(iv) Give **one** function of the carbohydrate chains on the glycoproteins. [1]

.....

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(c) Some diseases are caused by abnormal proteins called prions. Some prions have a higher proportion of β pleated sheet in place of the normal α helix structure.

(i) What level of protein structure is described by the terms α helix and β pleated sheet? [1]

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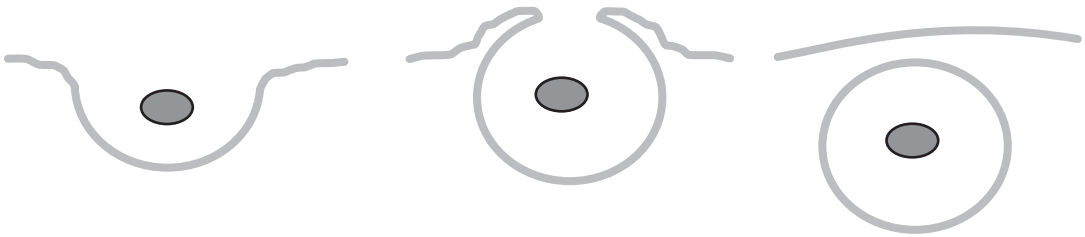
(ii) Which organelles are involved in synthesising proteins? [1]

.....

(d) The following diagram shows one way that prions may pass into cells.



1. Plasma membrane folds inwards.

2. Plasma membrane continues to fold engulfing the material.

3. Plasma membrane fuses to enclose the material.

(i) Name the process shown in the diagram above. [1]

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(ii) Name **two** *other* ways in which substances might pass into the cell. [2]

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(Total 16 marks)

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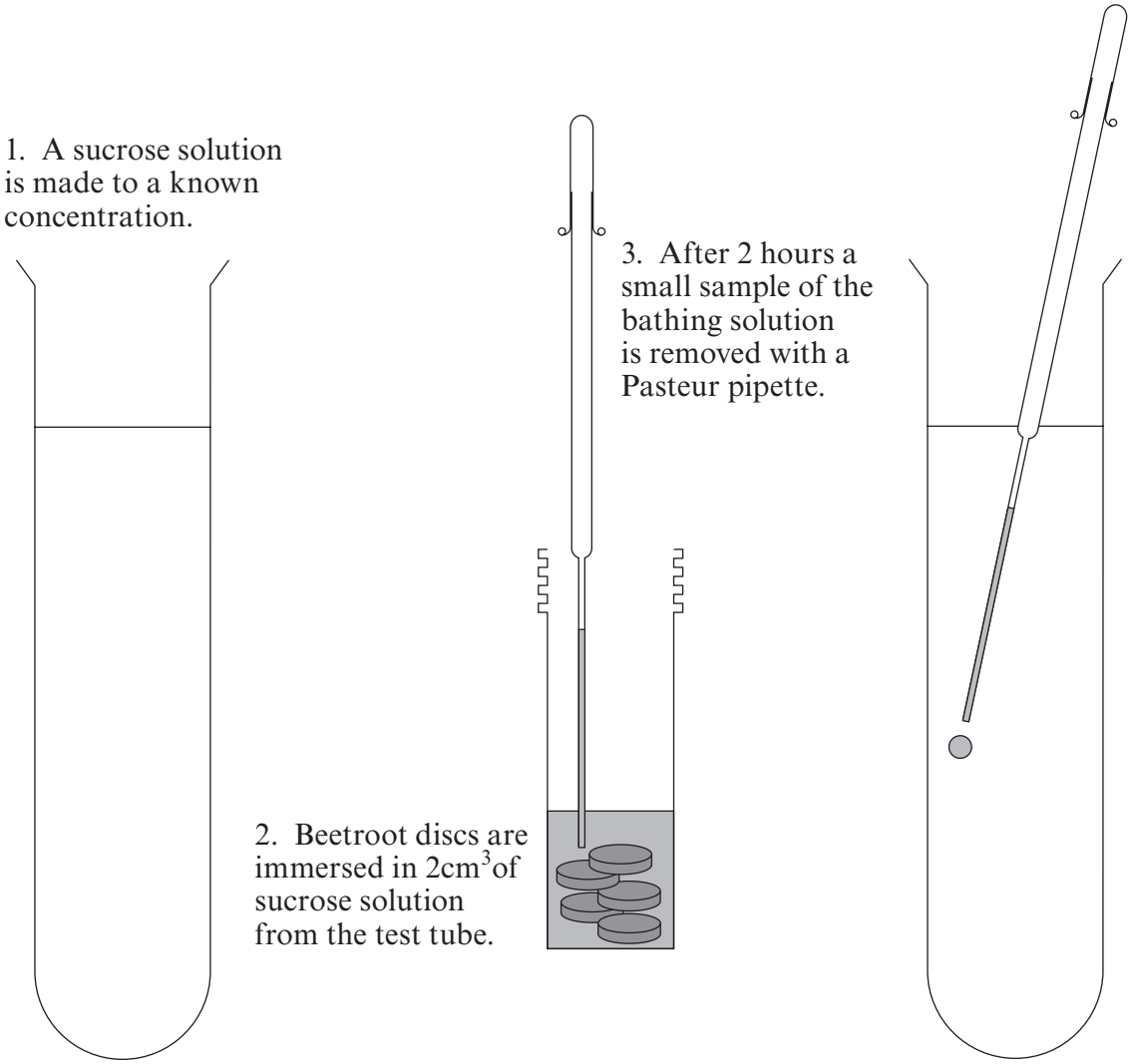
6. The diagram below summarises a technique used to measure the water potential of beetroot cells.



(a) The table shows the results of an experiment carried out by some students.

Concentration of sucrose solution (M)	*Direction droplet moved (number of arrows indicates speed of movement)*
0.1	↓↓↓
0.2	↓↓
0.3	↓
0.4	↔
0.5	↑
0.6	↑↑
0.7	↑↑↑

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(i) According to these results which concentration of sucrose has the same water potential as the beetroot cells? [1]

.....

(ii) Use the table below to find the water potential (Ψ_{cell}) of the beetroot cells.

Concentration of sucrose solution (M)	*Solute potential, Ψ_s (kPa)*
0.1	–269
0.2	–526
0.3	–790
0.4	–1052
0.5	–1322
0.6	–1596
0.7	–1882

water potential (Ψ_{cell}) of the beetroot cells = ... [1]

(b) Explain why the drop of bathing solution rose in the 0.6 M solution. [4]

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(c) The solute potential (Ψ_s) of the contents of the beetroot cells was known to be –1100kPa. Use the equation below to calculate the pressure potential (Ψ_p) of the beetroot cells when they were at equilibrium in the 0.3 M sucrose bathing solution. Show your workings. [2]

$$\Psi_{cell} = \Psi_s + \Psi_p$$

.....

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(d) (i) In the space below, draw a **labelled** diagram of a single beetroot cell from the 0.7 M sucrose bathing solution, to show how it would have appeared under a light microscope. [3]

(ii) What term is used to describe cells in this condition? [1]

.....

(Total 12 marks)

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

Either, *(a)* Some cells produce and secrete digestive enzymes. Describe the part played by each of the organelles involved in the production and secretion of the enzymes. [10]

Or *(b)* Describe and explain how different factors affect the rate of enzyme catalysed reactions. (Effects of enzyme inhibitors are not required.) [10]

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(Total 10 marks)

Question number	Write the question numbers in the left-hand margin

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