

Surname	Centre Number	Candidate Number
Other Names		2



GCE AS/A level

1071/01



S15-1071-01

BIOLOGY/HUMAN BIOLOGY – BY1

P.M. THURSDAY, 21 May 2015

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	10	
2.	6	
3.	9	
4.	11	
5.	9	
6.	15	
7.	10	
Total	70	

ADDITIONAL MATERIALS

In addition to this examination paper, you may need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

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

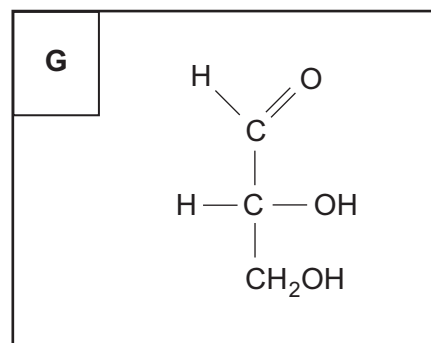
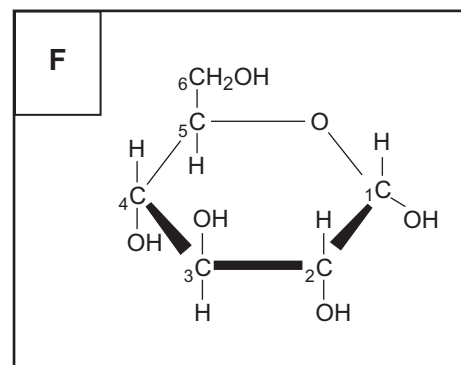
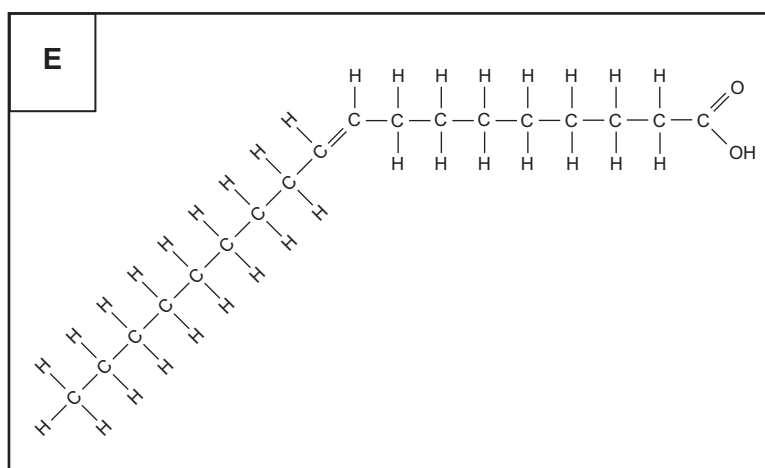
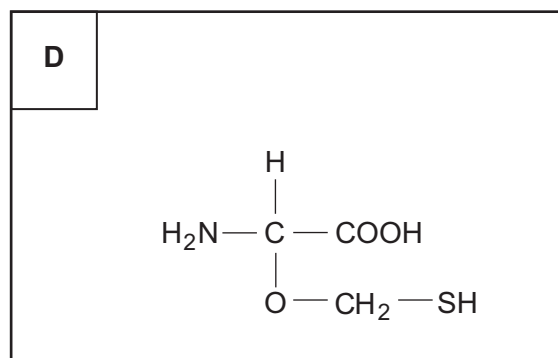
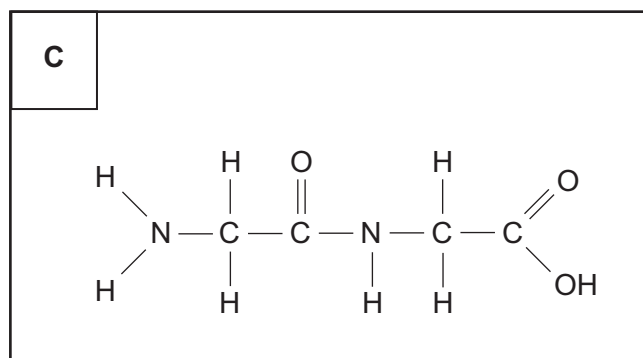
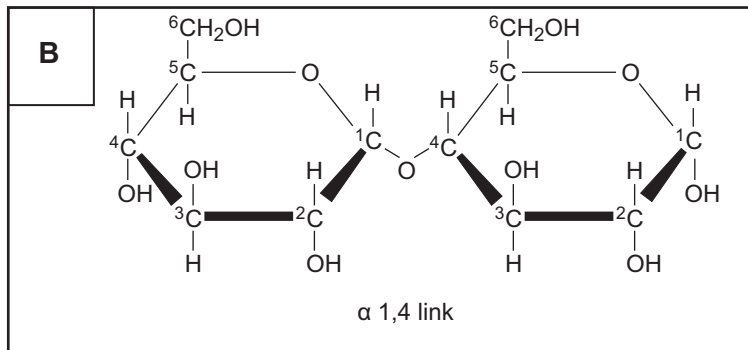
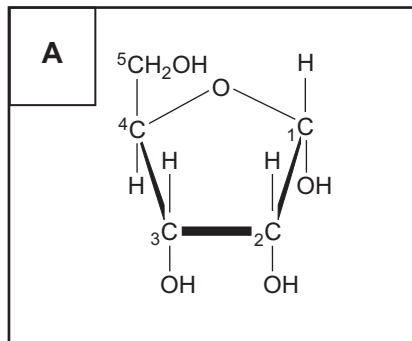
The quality of written communication will affect the awarding of marks.



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Answer all questions.

1. The following diagrams represent the structure of some common organic molecules.



- (a) Using letters **A-G**, complete the table below. You may use each letter once, more than once or not at all. [7]

Statement	Letter(s)
is a monosaccharide	
is a dipeptide	
would be found in nucleic acids	
contains C=C bonds	
contains a glycosidic bond	
is a triose sugar	

- (b) (i) Describe a biochemical test for the presence of glucose in a solution. [2]

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- (ii) Explain why a positive result is seen with glucose but not for sucrose. [1]

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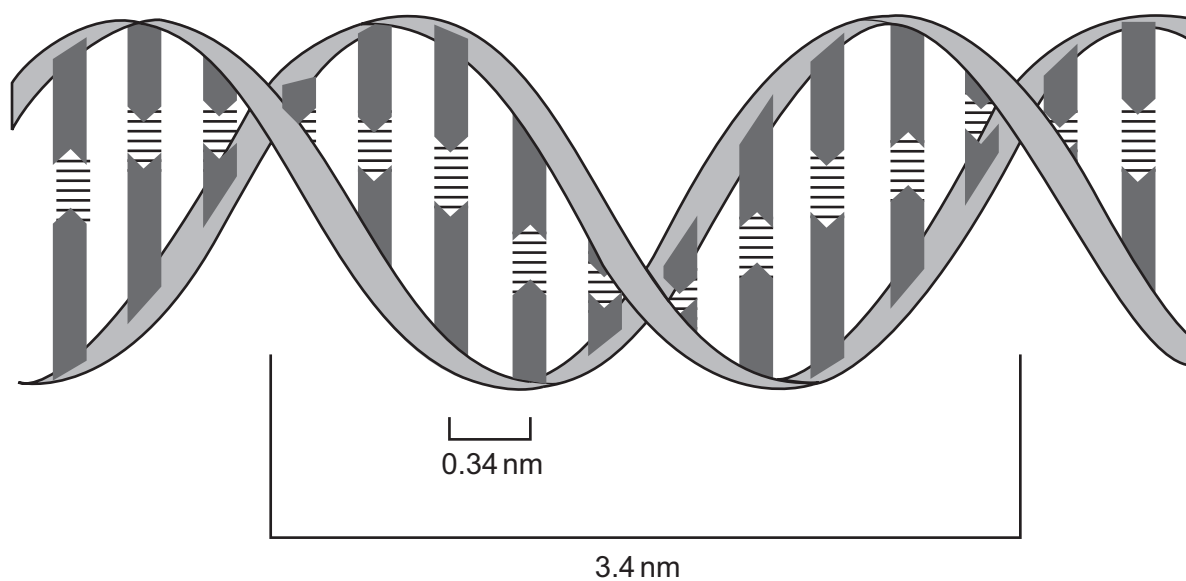
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2. The diagram below shows the DNA structure proposed by Watson and Crick in 1953.



- (a) If the double helix takes 3.4 nm to make one complete turn and base pairs are 0.34 nm apart, how many base pairs would you expect to find in five complete turns? Show your working. [2]

Answer =

- (b) Give a reason why the diagram **shown** above must be DNA rather than RNA. [1]

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- (c) The table below shows the bases guanine and cytosine as percentages of the total nucleotides present in three different micro-organisms.

Micro-organism	Base composition (%)	
	G	C
yeast	18.7	17.1
bacteria	36.0	35.7
virus	42.0	13.9

- (i) Suggest which type of nucleic acid is present in the virus shown in the table. Explain your answer. [2]

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- (ii) State the type of base to which cytosine belongs. [1]

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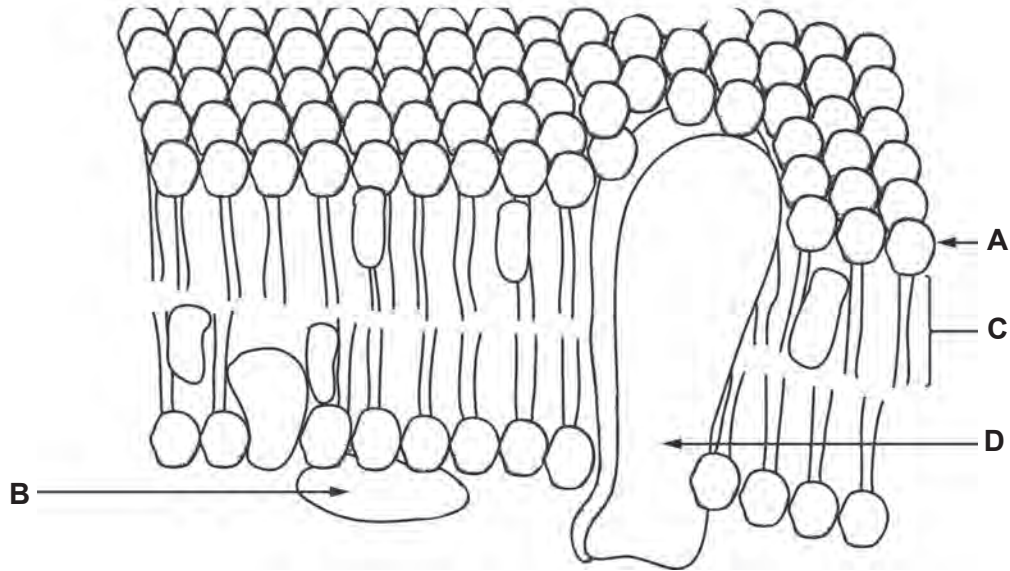


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3. The diagram below shows part of the plasma membrane from an animal cell.



(a) Complete the table below to identify the structures **A-D** shown in the diagram. [4]

Structure	Name
A	
B	
C	
D	

(b) Describe how structure **D** would transport a molecule against a concentration gradient. [2]

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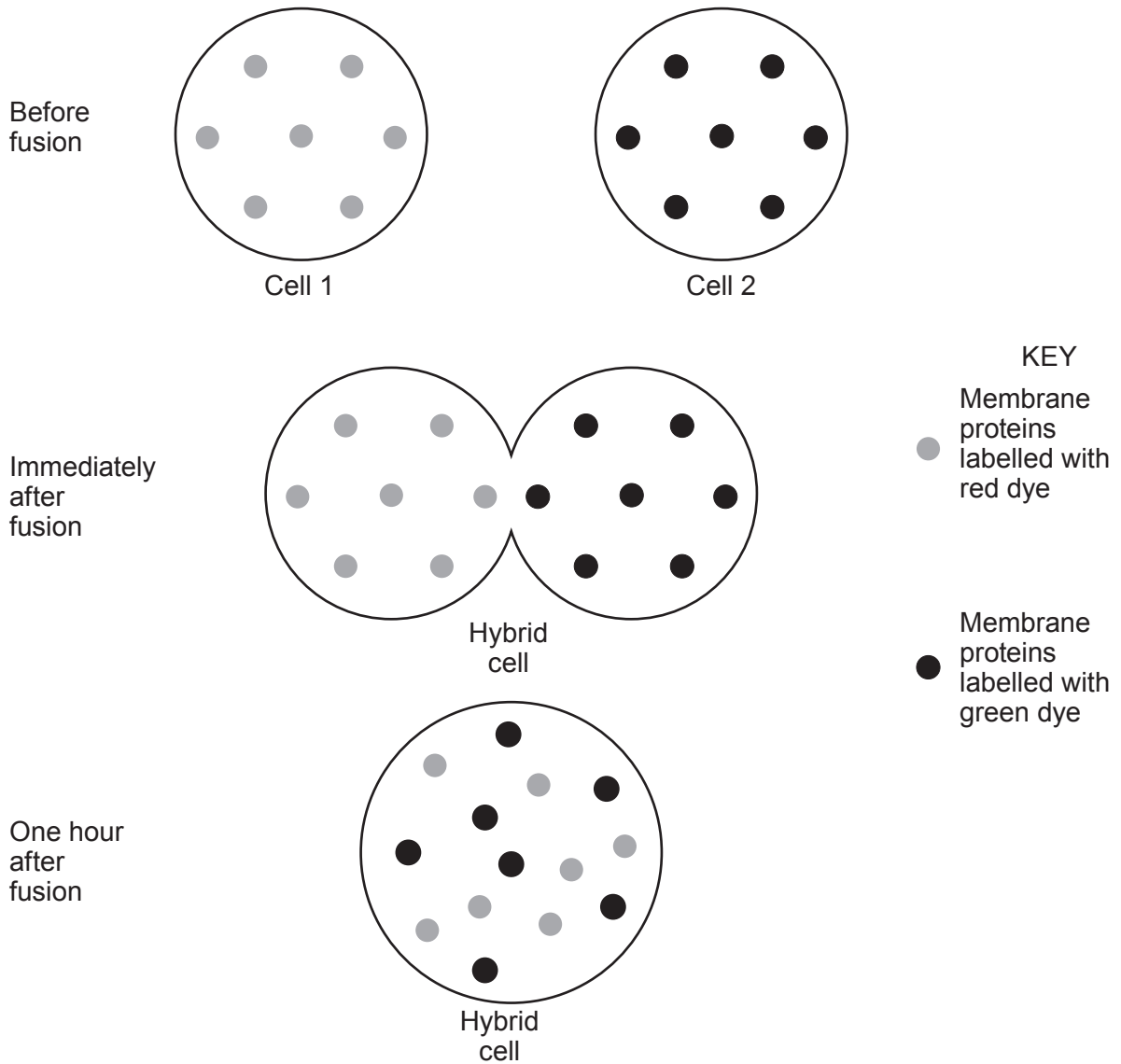
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- (c) In an experiment to determine the structure of the plasma membrane, scientists labelled the membrane proteins from two different cells using coloured dyes. One cell had its membrane proteins labelled with a red dye, whilst a second had its membrane proteins labelled with a green dye. The two cells were then fused to become a hybrid cell. This cell was viewed immediately after fusion and again after one hour. The results are shown below.



Use your knowledge of the structure and properties of plasma membranes to explain the results seen one hour after fusion. [3]

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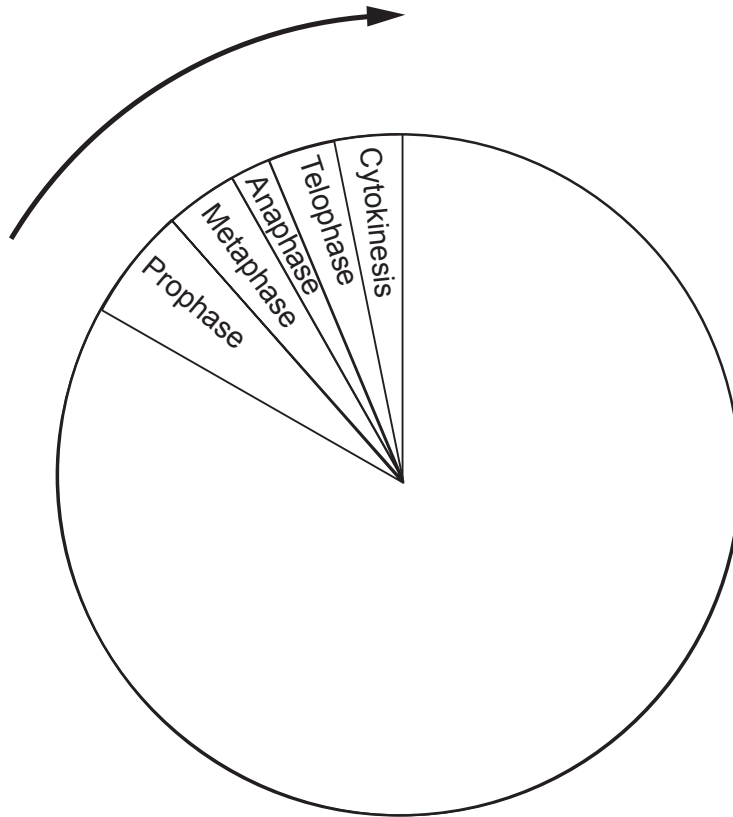
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4. The diagram below shows the relative lengths of the cell cycle in actively dividing cells taken from the root tip of a garlic plant.

Mitosis



(a) Describe the changes that occur to a plant cell during prophase.

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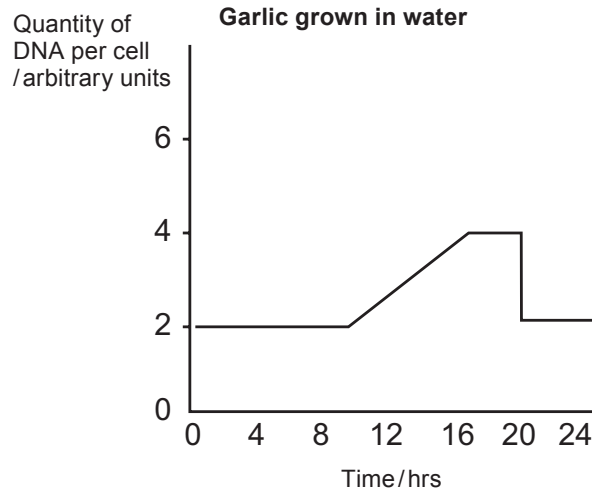
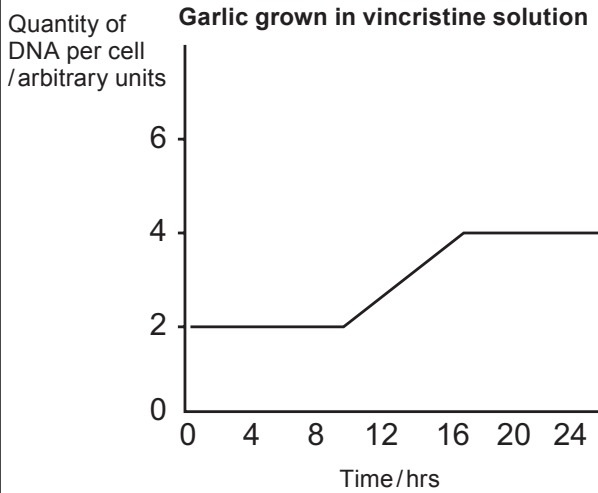


- (b) The percentage of cells in each stage of the cell cycle is proportional to the length of that stage. Using a microscope, a student observed 100 cells and found 5 undergoing prophase. If the total length of the cell cycle is 24 hours, calculate the length of prophase in minutes. Show your working. [2]

Answer = minutes



(c) Vincristine is a chemical which inhibits mitosis by preventing the formation of the spindle fibres. Garlic bulbs were grown in a solution of vincristine and the quantity of DNA present in a cell from the root tip was measured over the 24 hour length of the cell cycle. The results are shown below together with the results from garlic bulbs grown in water.



Using your knowledge of the cell cycle, explain how the results of this experiment show that vincristine inhibits mitosis. [3]

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(d) Meiosis produces four daughter cells, whereas mitosis only produces two daughter cells. Describe **two other** ways in which the cells produced by meiosis would differ from those produced by mitosis. [2]

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5. (a) Define the term *water potential*.

[2]

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A student prepared a microscope slide containing a piece of red onion epidermis which had been soaked in a 0.4 M sucrose solution for 30 minutes. The slide was viewed under high-power and the following drawing was made.

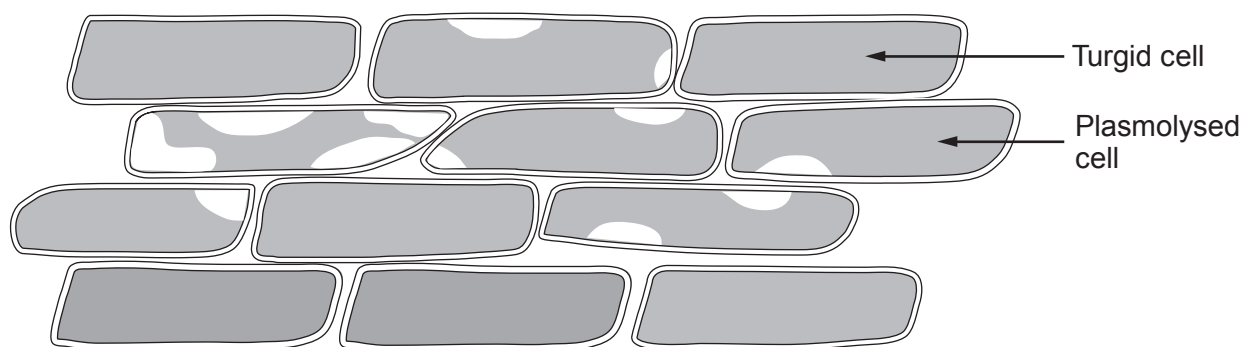


Table to convert molarity to solute potential (kPa).

Molarity of sucrose solution (M)	Solute potential kPa
0.05	-130
0.10	-260
0.15	-410
0.20	-540
0.25	-680
0.30	-860
0.35	-970
0.40	-1120
0.45	-1280
0.50	-1450
0.55	-1620
0.60	-1800



(b) The student concluded that the water potential of the epidermal tissue was -1120 kPa . Using all the information provided, explain why. [4]

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(c) Explain the role of the cell wall in maintaining turgidity. [3]

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6. A new biological washing powder has been developed containing three protease enzymes (**A**, **B** and **C**), each removing different protein based stains. The manufacturer claims their revolutionary new washing powder works “best at 35°C, but offers superior removal of tough protein stains at higher temperatures”.

(a) Enzymes are biological catalysts. Describe what is meant by the term *biological catalyst*. [2]

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Graph showing protease activity

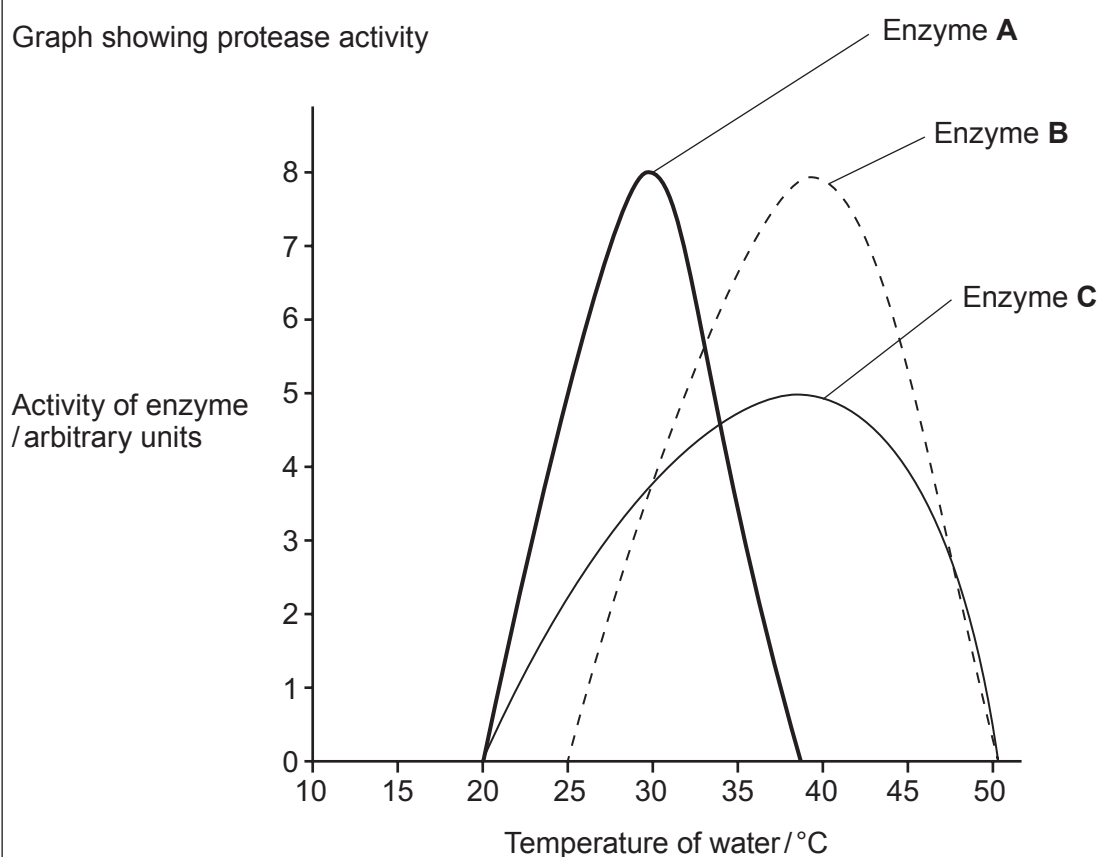


Table showing type of food stain removed

Protease enzyme	Food stain removed		
	Blood	Meat	Egg
A	Yes	No	No
B	No	Yes	No
C	No	No	Yes



(b) Using the graph and table, together with your knowledge of enzymes, answer the following questions.

(i) Explain why the washing powder works best at 35°C. [1]

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(ii) Which stain would not be removed when washing at 40°C? [1]

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(iii) Suggest why three different enzymes are needed to remove blood, meat and egg stains. [2]

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(iv) Explain fully why washing at 60°C would not be recommended for removing protein stains when using this washing powder. [4]

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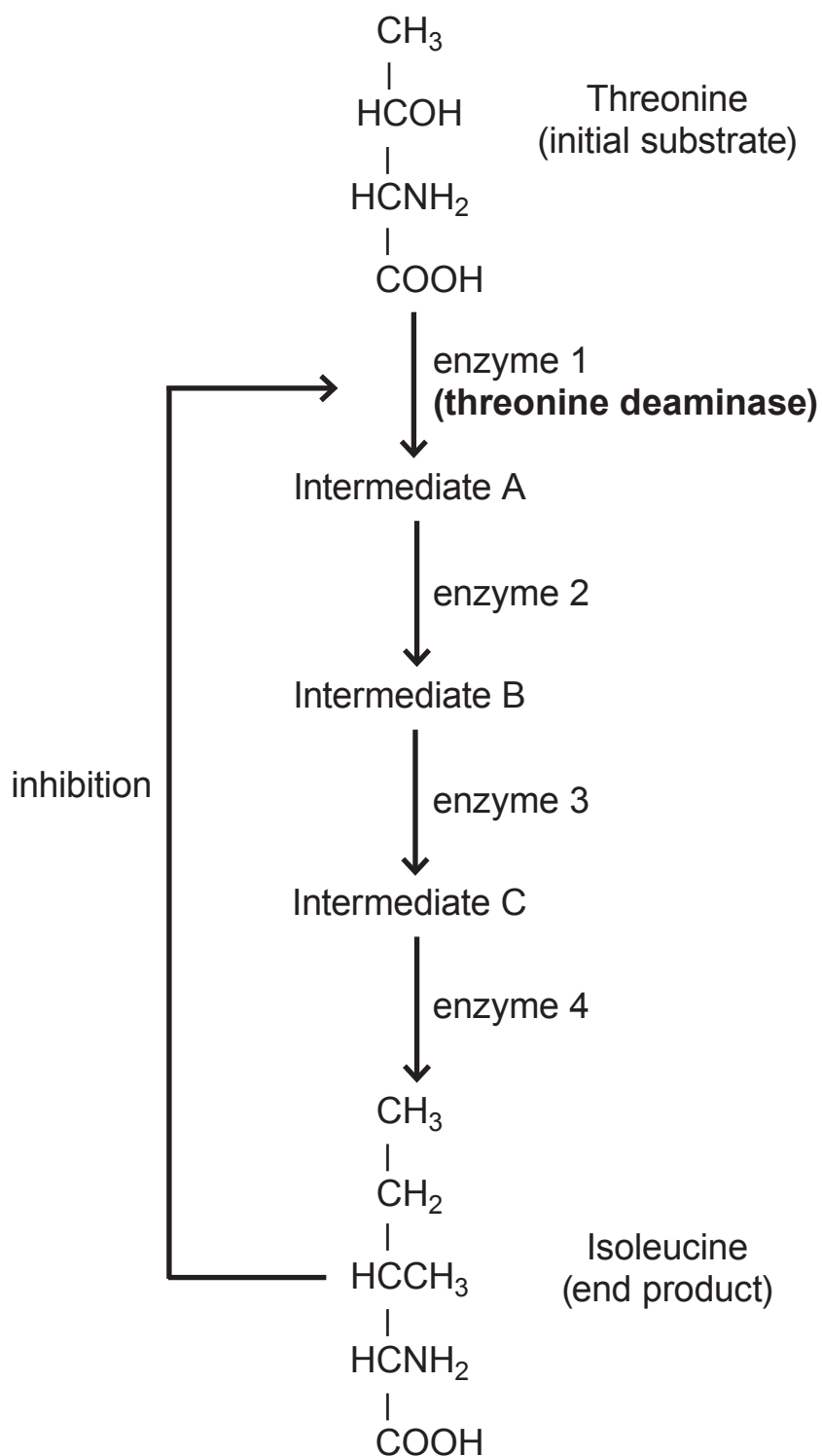
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- (c) Many metabolic pathways are switched off by their end products which act as competitive inhibitors of the first enzyme in the pathway. In the example below, the end product isoleucine inhibits threonine deaminase.



(i) Explain how isoleucine works as a **competitive inhibitor**.

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(ii) Suggest a reason why this might be useful to the cell.

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