Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	1	0	4	/	0	2	Signature	

Paper Reference(s)

6104/02

Edexcel GCE

Biology

Biology (Human)

Advanced

Unit 4B Core and Option

Food Science

Wednesday 23 January 2008 – Morning

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Paper 21 Total	
6	
7	
8	
9	
Paper 22 Total	
Total	

Materials required for examination
Ruler

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown above. Check that you have the correct question paper.
Answer ALL questions. Write your answers in the spaces provided in this question paper.
Show all the steps in any calculations and state the units. Calculators may be used.
Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for the individual questions and parts of questions are shown in round brackets: e.g. **(2)**.
There are 9 questions in this question paper. The total mark for this question paper is 70.

Advice to Candidates

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account your use of grammar, punctuation and spelling.

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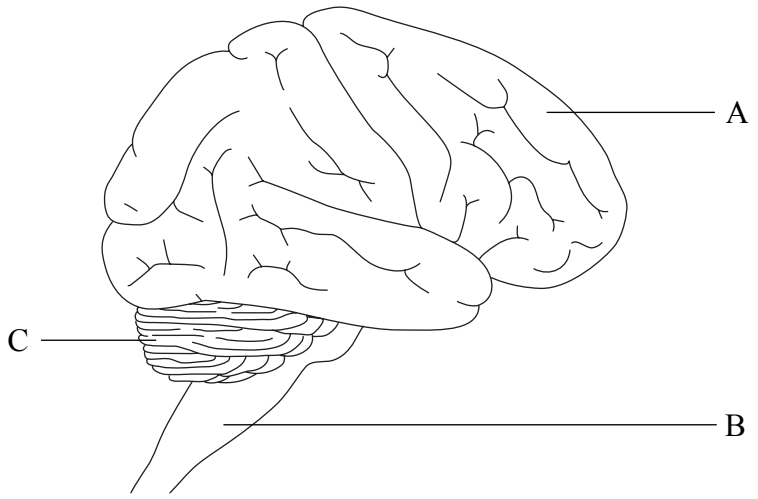
Answer ALL questions in the spaces provided.

1. The diagram below shows a human brain seen from the side.



(a) Name the parts labelled **B** and **C**.

B .....

C .....

(2)

(b) Give **two** functions of the part labelled **A**.

1 .....

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2 .....

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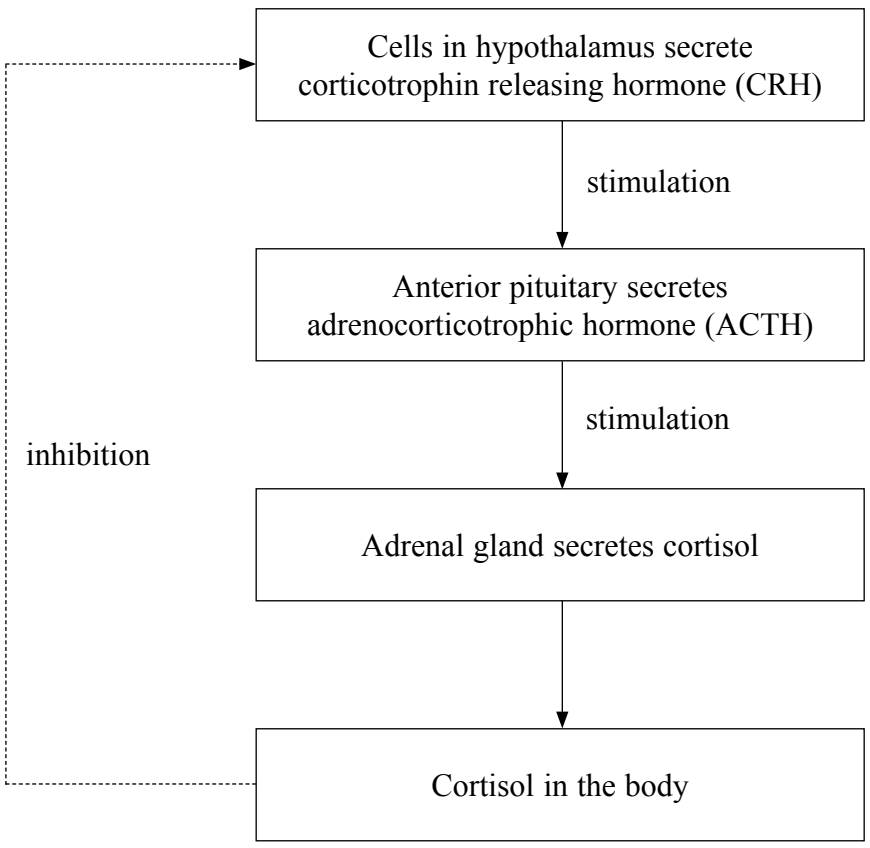
(2) **Q1**

(Total 4 marks)

Leave blank

2. Cortisol is a hormone secreted by the adrenal gland and has many functions in the body. The diagram below shows how the secretion of cortisol is controlled.



(a) Using the information in the diagram, explain how the control of cortisol secretion illustrates the principle of negative feedback.

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(3)

Leave blank

(b) Name **one** hormone, other than ACTH, released by the anterior pituitary gland.

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(1)

(c) State **three** ways in which hormonal control differs from nervous control.

1 .....

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2 .....

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3 .....

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(3)

Q2

(Total 7 marks)

Leave blank

3. (a) When an action potential arrives at a synaptic knob, acetylcholine is released. Describe how acetylcholine is released into the synaptic cleft.

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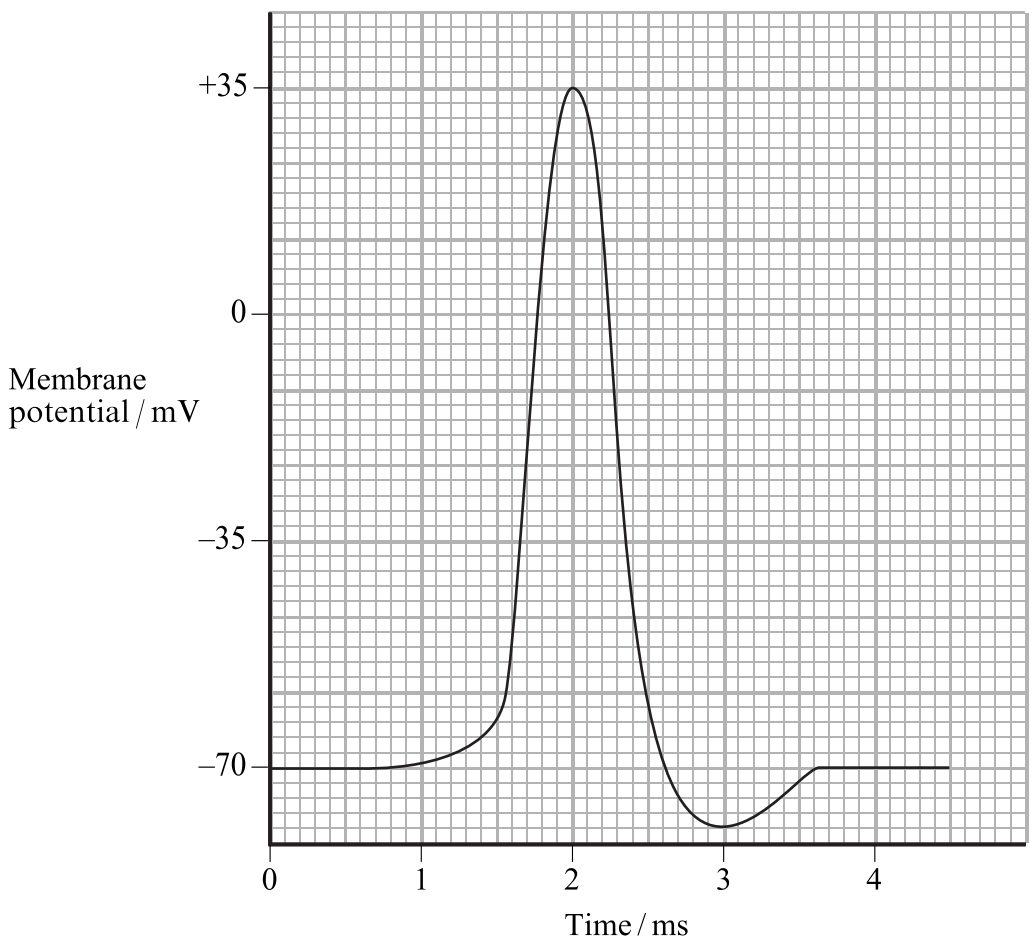
(3)

(b) The graph below shows a recording of an action potential produced after the binding of acetylcholine to receptors on a post-synaptic membrane.



(i) Use the graph to state the time at which the sodium channels open to allow an increased flow of sodium ions into the neurone.

..... ms

(1)

Leave blank

(ii) Use the graph to state the time at which the hyperpolarisation is at its greatest.

..... ms
(1)

(iii) Calculate the number of action potentials that could occur in one second if the stimulus is maintained. Show your working.

Answer ..... action potentials per second.
(2)

(c) When a transmitter substance called gamma-aminobutyric acid (GABA) is released at a synapse, it causes chloride ion (Cl^-) channels and potassium ion (K^+) channels to open in the post-synaptic membrane. This results in chloride ions moving into the post-synaptic neurone and potassium ions moving out.

Explain why an action potential is less likely to develop when GABA is released at the same time as acetylcholine.

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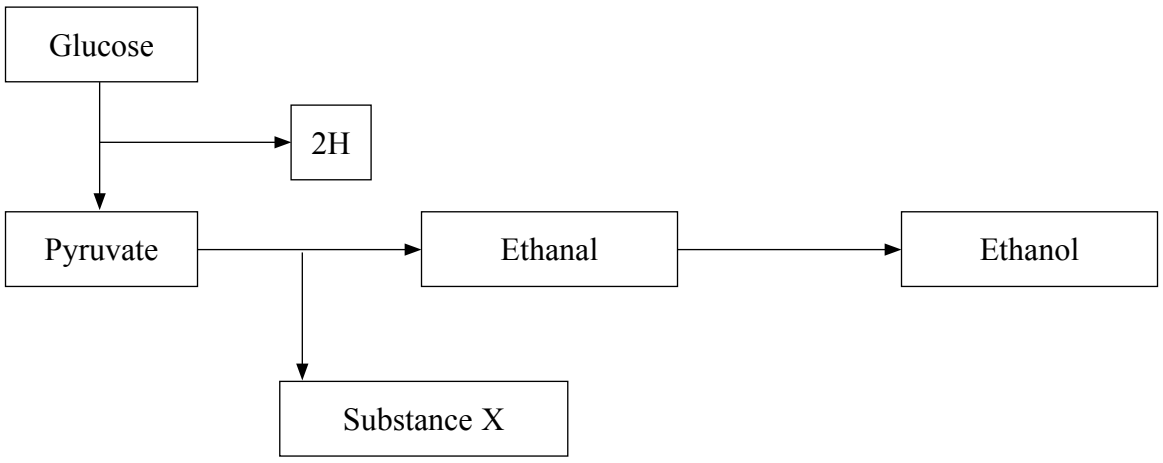
(2)

Q3

(Total 9 marks)

Leave blank

4. (a) The diagram below shows an outline of anaerobic respiration in a yeast cell.



(i) Name substance X.

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(1)

(ii) Explain why it is necessary for the cell to convert ethanal to ethanol.

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(2)

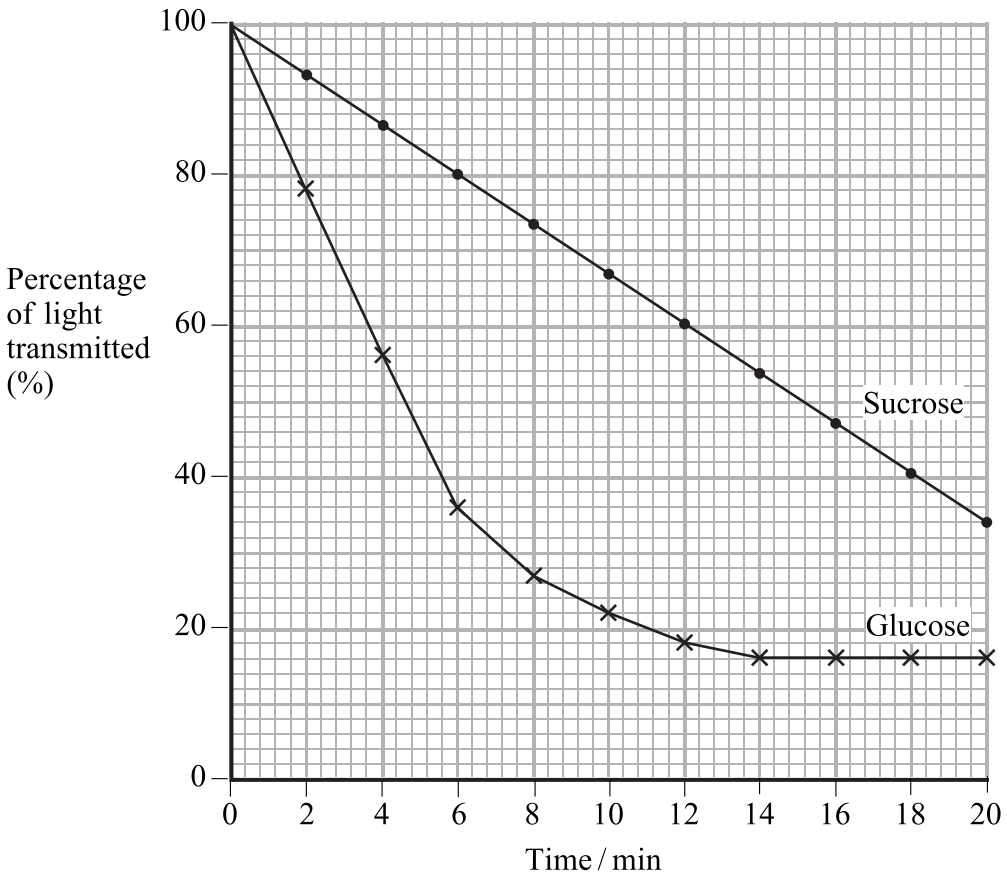
Leave blank

(b) A student carried out an investigation into the effect of glucose and sucrose on the rate of respiration of yeast cells. Triphenyl tetrazolium chloride (TTC) is an artificial hydrogen acceptor, which is colourless in the oxidised form and red when reduced. A colorimeter is an instrument used to measure the percentage of light transmitted through a liquid. In this investigation, when the TTC is fully oxidised 100% of the light is transmitted through the liquid. The darker the red colour of the TTC solution becomes, the lower the percentage of light transmitted.

Yeast cells were suspended in 0.5% glucose solution. The student set up a tube containing 10 cm^3 of this suspension and 1 cm^3 of TTC solution. The tube was covered and placed in a water bath for 20 minutes. During this time, the percentage of light transmitted through the solution was measured at two-minute intervals.

The experiment was repeated using yeast cells suspended in 0.5% sucrose solution.

The results of the investigation are shown in the graph below.



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(i) Describe the rate of respiration of yeast in the glucose solution during the 20 minutes of this investigation.

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(3)

(ii) State **one** way in which the rate of respiration of yeast in the sucrose solution differs from the rate in the glucose solution.

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(1)

(iii) Explain why the tubes were covered during this investigation.

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(2)

Leave blank

(iv) Explain why the student placed the tubes in a water bath.

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(2)

Q4

(Total 11 marks)

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5. Ultrafiltration and reabsorption occur in a mammalian kidney.

(a) Describe and explain the process of **ultrafiltration**.

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(4)

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(b) Describe and explain how solutes are reabsorbed from the proximal convoluted tubule.

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(5) **Q5**

(Total 9 marks)

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Option B: Food Science

6. The table below refers to the industrial uses of enzymes in the processing of food. Complete the table by writing the most appropriate word or words in the boxes.

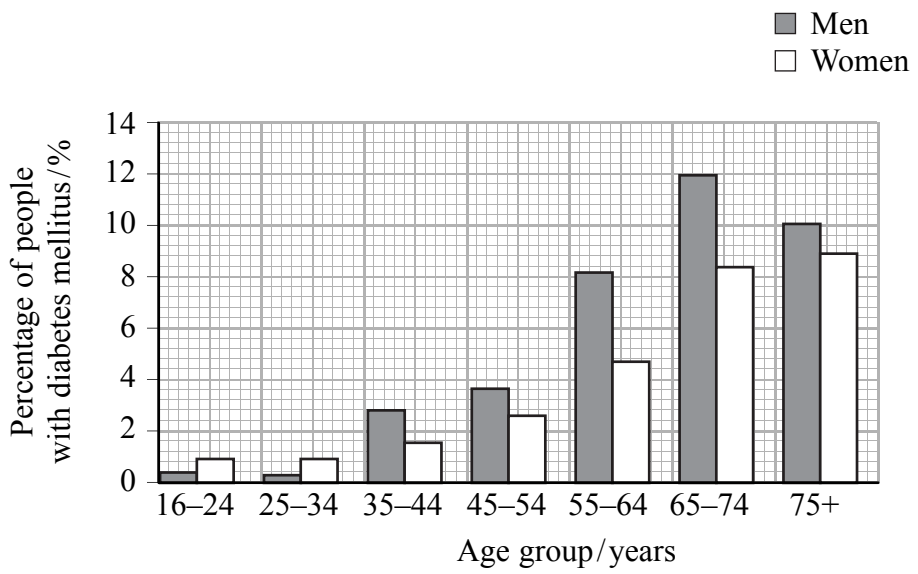
Enzyme	Enzyme substrate	Product(s) of the reaction	Industrial use
Glucose isomerase	Glucose		
Amyloglucosidase		Glucose	
Lactase	Lactose		

Q6

(Total 6 marks)

Leave blank

7. The graph below shows the percentage of men and women in each age group affected by diabetes mellitus.



(a) Describe the effect of age and gender on the percentage of diabetes mellitus in the population.

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(3)

(b) State **two** causes of diabetes mellitus.

1. .....

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2. .....

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(2)

Q7

(Total 5 marks)

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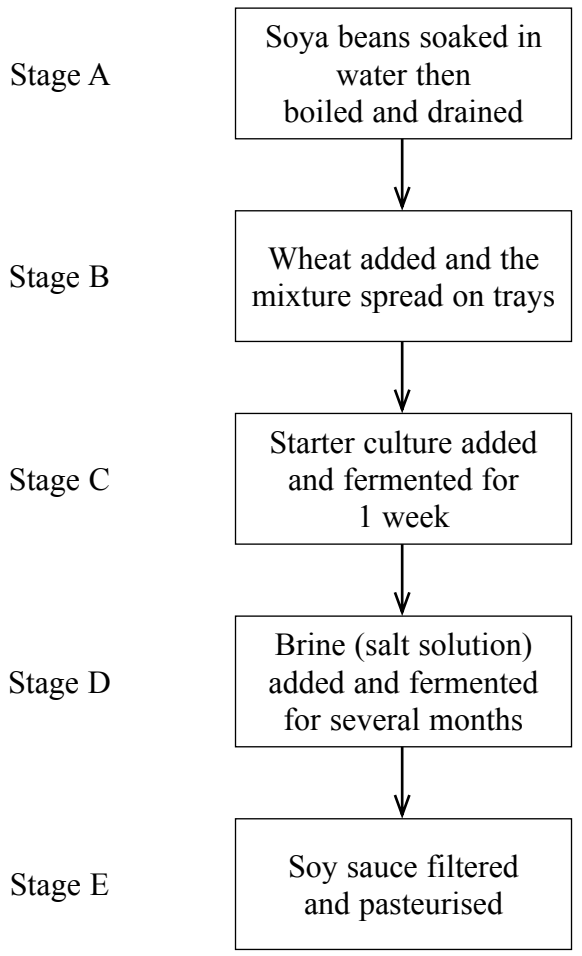
8. The flow diagram below shows some of the stages in the production of soy sauce.



(a) Suggest why wheat is added at stage B.

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(1)

(b) Name the types of microorganisms in the starter culture added at stage C.

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(2)

Leave blank

(c) Describe the changes that occur in the mixture during the fermentation at stage C.

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(3)

(d) An experiment was carried out to investigate some of the changes that occurred within the soy sauce mixture during stage D. The table below gives details of the concentration of acids and pH changes during the first three days of fermentation.

Day	pH	Concentration of acids / g dm^{-3}
0	6.4	0.07
1	6.3	0.31
2	6.1	0.53
3	5.8	0.73

(i) Calculate the percentage increase in the concentration of acids over the three days.
Show your working.

Answer .....%

(2)

(ii) Name **one** acid produced by the microorganisms during fermentation that contributes to the change in pH.

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(1)

Q8

(Total 9 marks)

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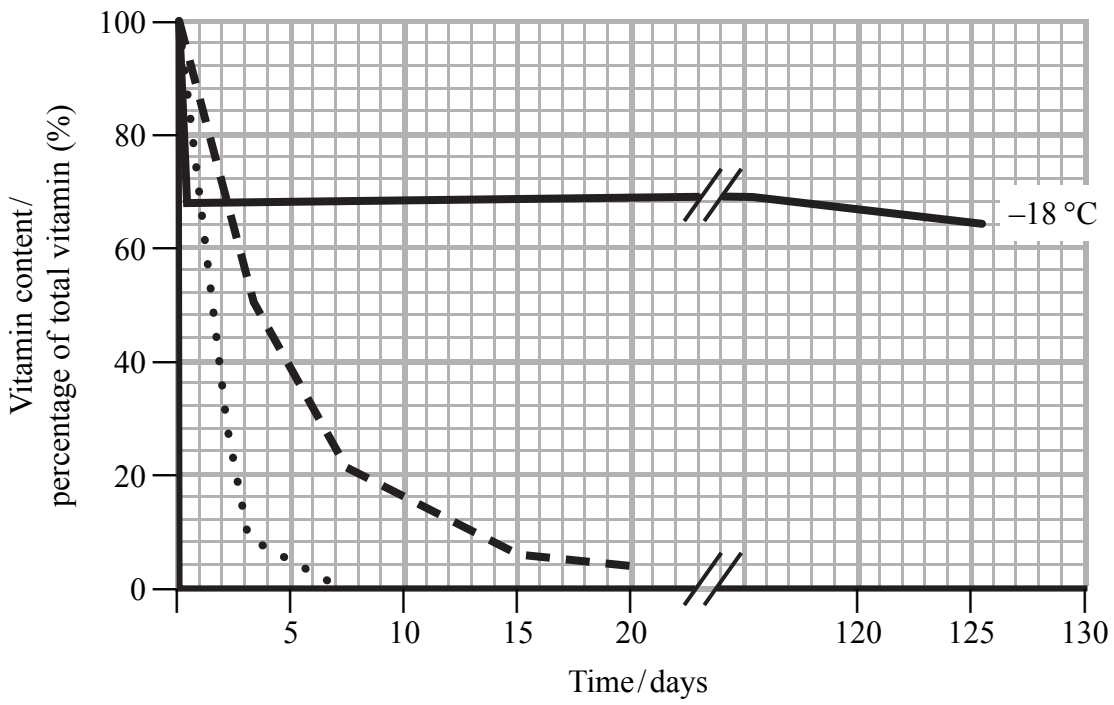
9. The graph below shows the effect of storage temperature on the vitamin C (ascorbic acid) content of vegetables.



(a) (i) Compare the vitamin C content of the chilled vegetables with the vitamin C content of the vegetables kept at room temperature during the first 20 days.

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(3)

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(ii) Using the information in the graph and your own knowledge suggest how vegetables that are to be consumed within 2 days should be stored. Explain your answer.

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(3)

(b) DCPIP can be used to estimate the concentration of ascorbic acid of vegetables. Explain why DCPIP can be used in this estimation.

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(2)

QUESTION 9 CONTINUES OVERLEAF

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(c) Explain the use of ascorbic acid as a food additive.

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(2)

Q9

(Total 10 marks)

TOTAL FOR PAPER: 70 MARKS

END