Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Time 1 hour 20 minutes

Paper reference **WBI13/01**

Biology

International Advanced Subsidiary / Advanced Level
UNIT 3: Practical Skills in Biology I

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- **Show all your working out** in calculations and **include units** where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions.

Write your answers in the spaces provided.

1 Plant foods in the diet contain antioxidants, such as vitamin C. Storage time and conditions affect the concentration of vitamin C in these foods.

(a) Explain how increasing the quantity of plant foods that contain vitamin C in the diet may protect against heart disease.

(3)

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(b) The effect of storage time and temperature on the vitamin C content of four foods was investigated.

(i) Describe a method to allow a quantitative comparison of the vitamin C content of two of these foods.

(5)

(ii) State the independent variable in this investigation.

(1)

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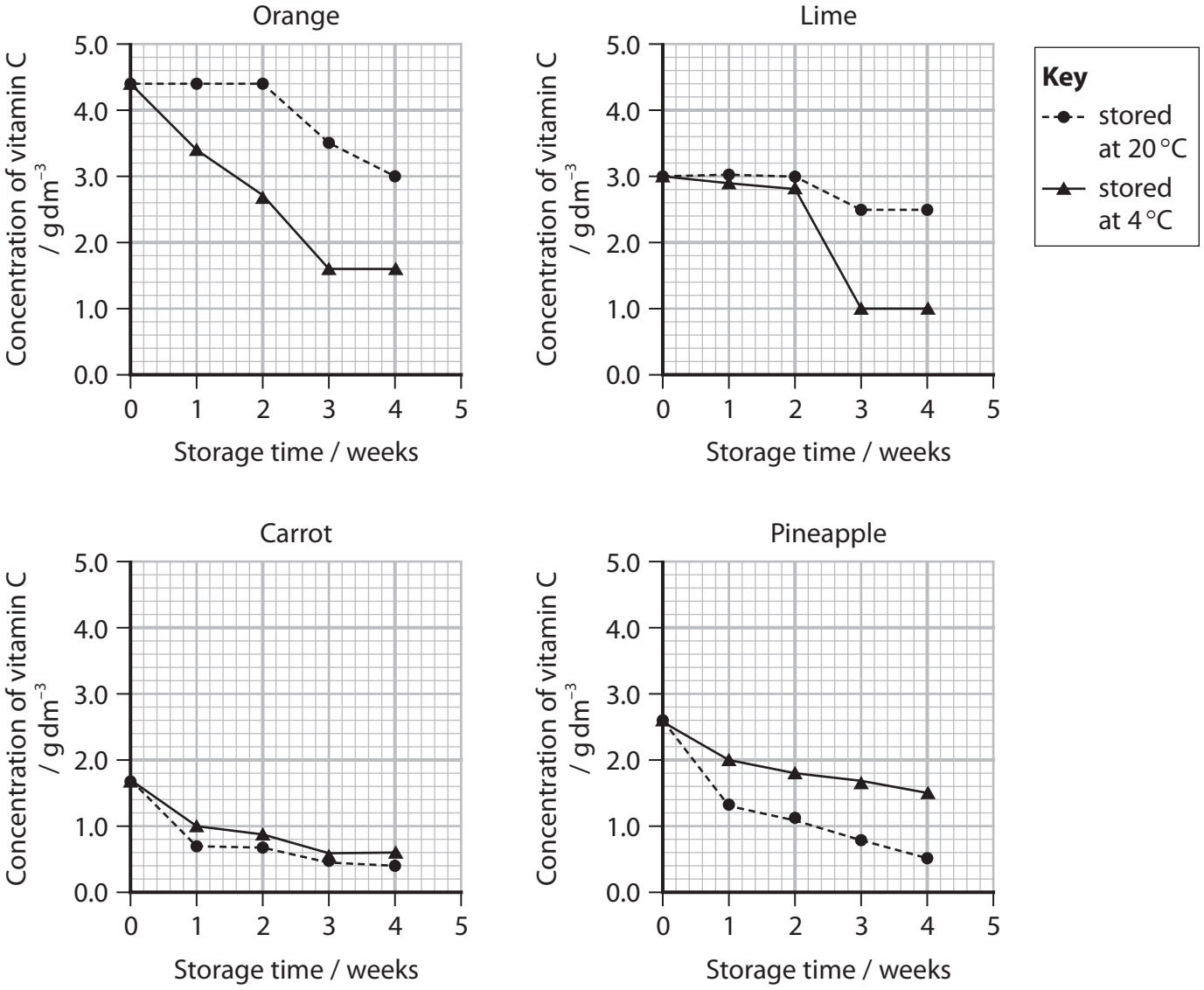
(c) The effect of storage time and storage temperature on the concentration of vitamin C in different foods was investigated.

The juice from four foods was stored at 4 °C and 20 °C for four weeks.

The vitamin C concentration was measured each week.

The graphs show the results of this investigation.



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(i) Calculate the rate of change of vitamin C content in oranges for the first 3 weeks of storage at 4 °C.

Give your answer to 2 significant figures.

(2)

Answer ..... g dm^{-3} $week^{-1}$

(ii) Comment on the effects of storage time and temperature on the vitamin C content of these juices.

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(Total for Question 1 = 15 marks)

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2 Pineapple plants contain the enzyme bromelain that breaks down proteins such as casein.

(a) (i) Name the bond between amino acids that is broken by this enzyme.

(1)

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(ii) Name the process that breaks the bond between amino acids.

(1)

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(b) The digestion of casein by bromelain was investigated.

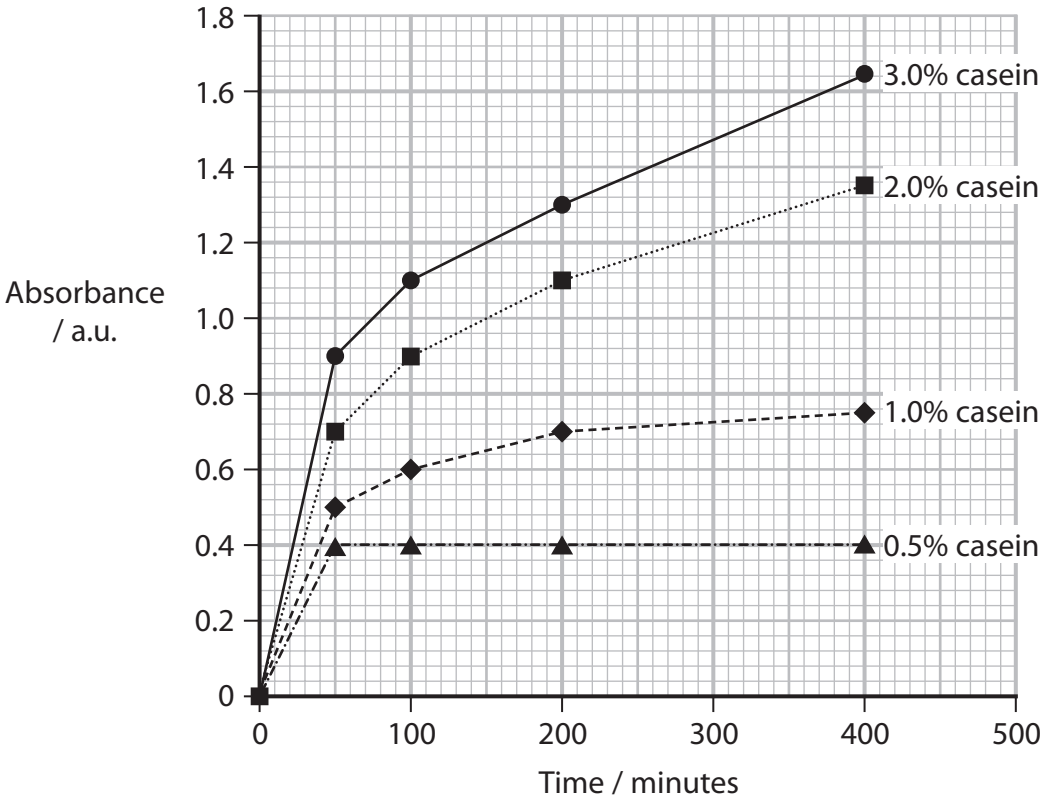
The amino acids in casein, a milk protein, were stained blue.

Four concentrations of this casein were used.

A colorimeter was used to measure the absorbance by the blue amino acids released in this reaction.

The more digestion that occurred, the more blue amino acids were released and the higher the absorbance reading on the colorimeter.

The graph shows the results of this investigation.



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The initial rates of reaction can be obtained from this graph.

The table shows the initial rates of this reaction.

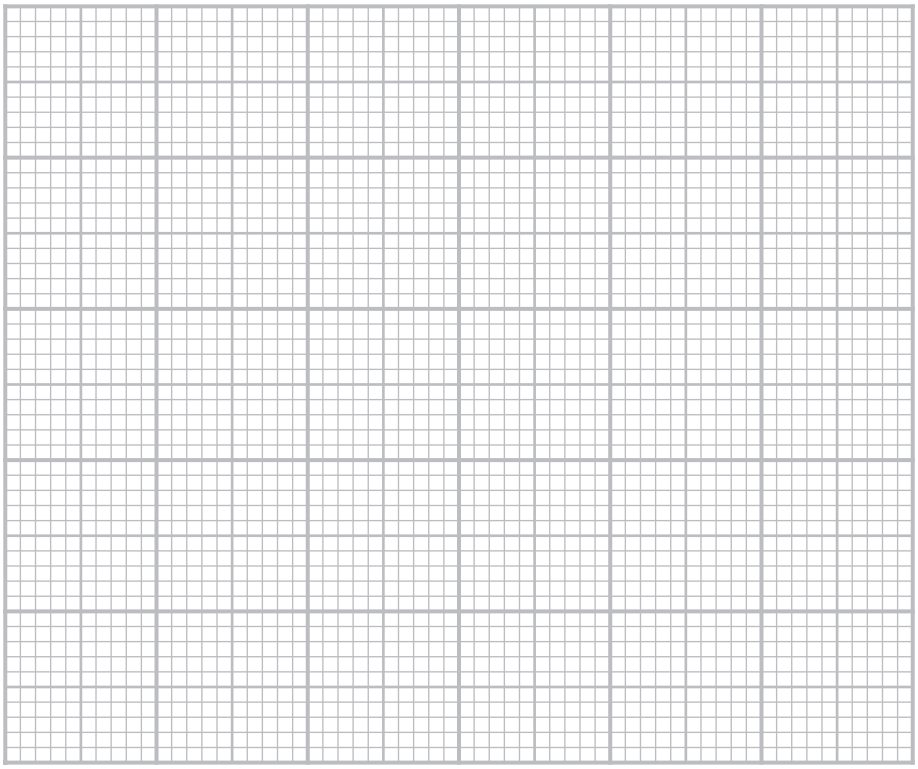
Substrate concentration (%)	Initial rate of reaction / a.u. min^{-1}
0.5	0.008
1.0	0.010
2.0	0.014
3.0	

(i) Complete the table by calculating the initial rate of reaction when a 3.0% concentration of casein was used.

(1)

(ii) Plot a suitable graph to show the effect of substrate concentration on the initial rate of reaction.

(4)



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(iii) Calculate how many times faster the initial rate of reaction is for a casein concentration of 2.0% than a casein concentration of 0.5%.

Give your answer to 2 significant figures.

(1)

Answer .....

(iv) Explain the shape of the graph you have plotted in (ii).

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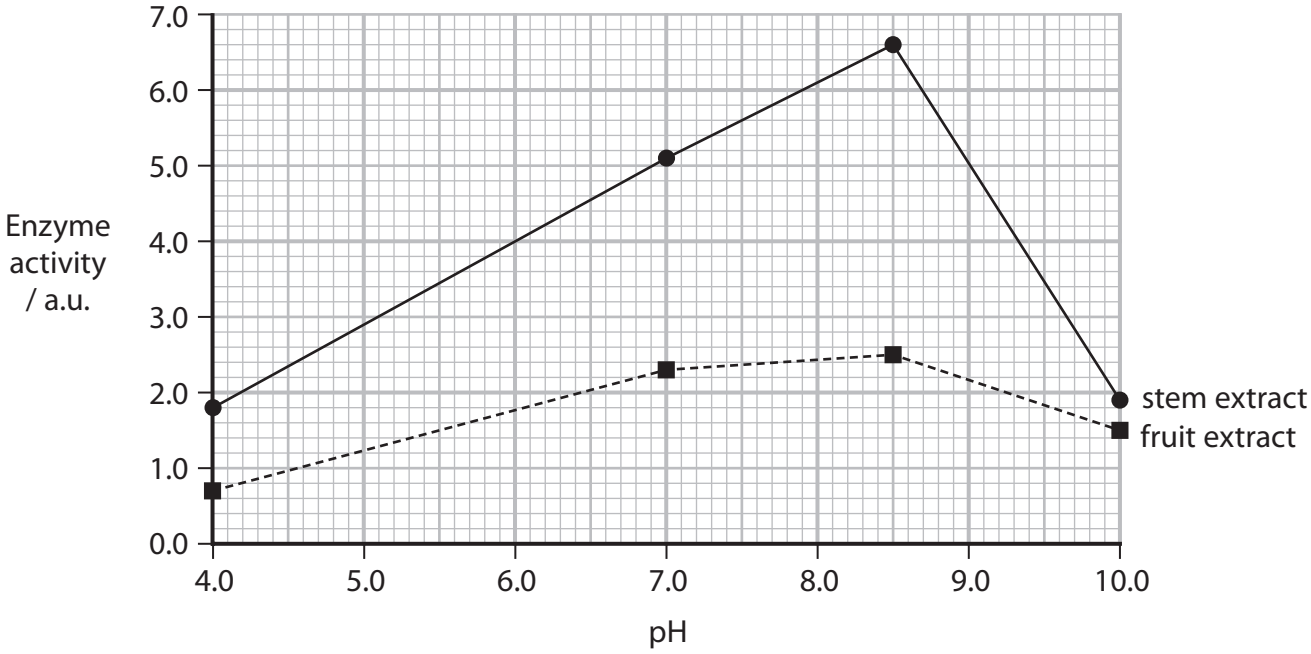
(c) Bromelain can be used to prevent apple juice from going brown.

Bromelain can be extracted from the stem and from the fruit of a pineapple.

The effect of pH on these extracts was investigated.

The graph shows the results of this investigation.



(i) Draw a suitable table to show the results of this investigation.

(3)

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(ii) Determine which of these extracts is most useful for preventing apple juice from going brown.

(3)

(Total for Question 2 = 17 marks)

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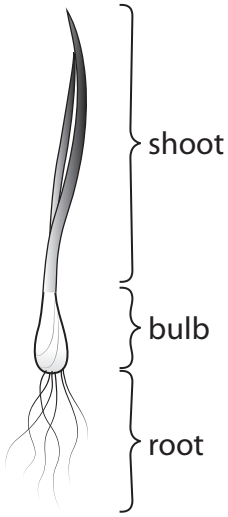
3 Onion plants can be grown in a laboratory in a complete mineral ion solution. This solution contains all the mineral ions required for healthy growth.

The diagram shows a young onion plant.



(a) The effect of different strength complete mineral ion solutions on the growth of onions was investigated.

Three concentrations of this solution were used: half strength, normal strength, and double strength.

(i) Devise a procedure to provide a valid comparison of the growth of shoots, bulbs and roots of onion plants grown in these three solutions.

(4)

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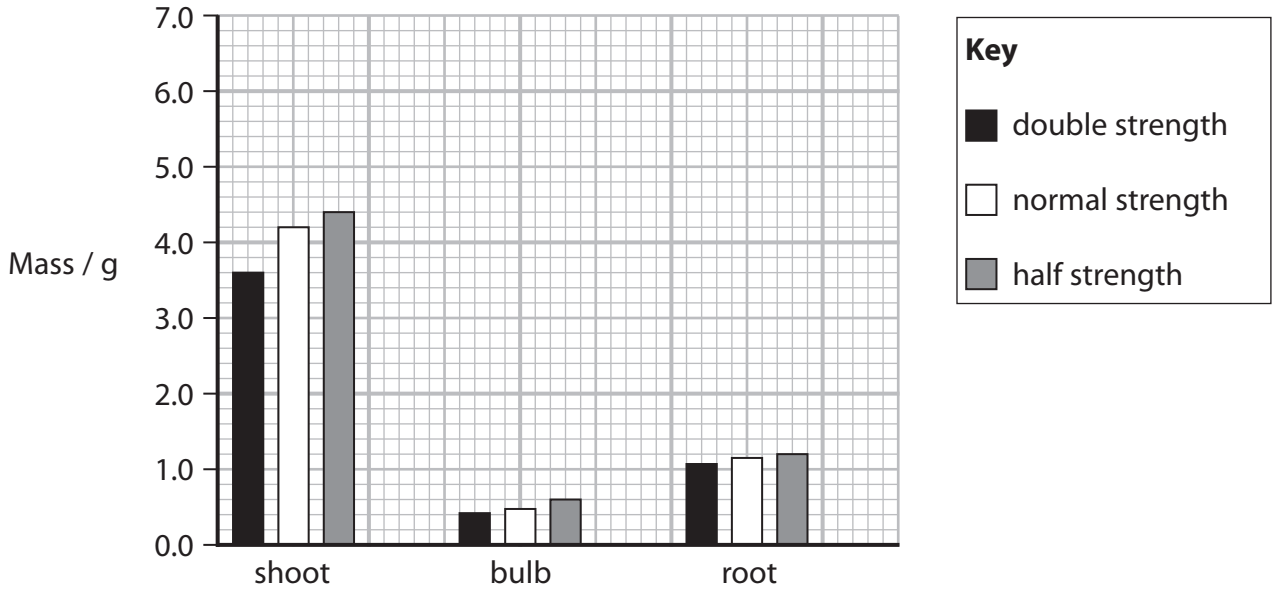
(ii) The graph shows the results of this investigation.



The shoot and the bulb of an onion plant are edible.

The table shows the percentage of the total onion plant that is edible.

Percentage of onion plant that is edible (%)		
when grown in double strength	**when grown in normal strength**	**when grown in half strength**
79.0	80.2	

Complete the table by calculating the percentage of the onion plant mass that is edible in the onions grown in the half strength solution.

(2)

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(iii) Describe **three** conclusions that can be drawn from the results of this investigation.

Use the information in the graph and table to support your answer.

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(iv) Describe the information that is needed to decide if any of the differences seen are statistically significant.

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(b) The table shows the mineral salts used to make a complete mineral ion solution.

Mineral salt formula	Mineral salt name
KNO_3	potassium nitrate
$Ca(NO_3)_2$	calcium nitrate
$MgSO_4$	magnesium sulfate
KH_2PO_4	potassium hydrogen phosphate

The effect of mineral ion deficiencies can be investigated by growing onion plants in solutions that have one mineral ion missing.

Suggest how a complete mineral ion solution could be modified to show the effect of phosphate ions on the growth of onion plants.

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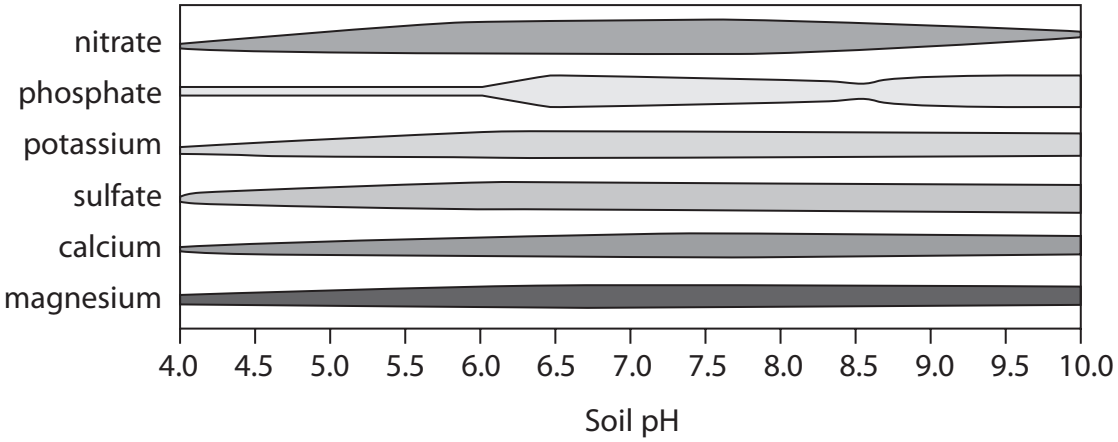
(c) The pH of the soil can affect the uptake of mineral ions by plants.

The chart shows the effect of pH on the uptake of some mineral ions.

The height of the bar for each mineral ion indicates the uptake of that mineral ion.



The optimum pH for the growth of these plants is between 6.5 and 8.0.

Explain why the optimum pH is within this range.

Use the information in the chart to support your answer.

(4)

(Total for Question 3 = 18 marks)

TOTAL FOR PAPER = 50 MARKS

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