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.*
- **Show all your working in calculations and include units where appropriate.**

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.*

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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Pearson

Answer ALL questions.

Write your answers in the spaces provided.

1 An investigation compared the protein content of some foods.

Each food was crushed in distilled water to produce a suspension. This was filtered and the liquid filtrate was tested for protein.

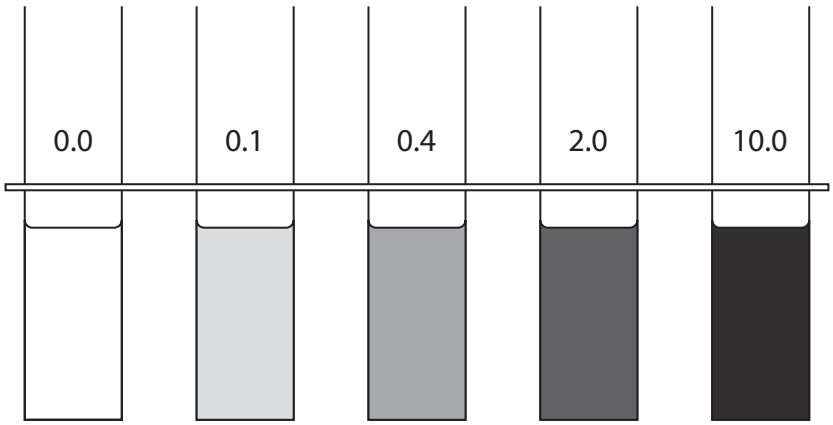
(a) (i) Describe how you could test for protein in this filtrate.

(2)

(ii) Describe how the filtrates should have been prepared to allow a valid comparison of the protein content of these foods.

(3)

(iii) Protein solutions of concentrations from 0.0 to 10.0 mg cm^{-3} were tested using a semi-quantitative method.
The results of the test are shown in the diagram.



Describe the difference between a semi-quantitative and a quantitative test.

(2)

(iv) Explain how the results shown in the diagram can be used to compare the protein concentrations of food extracts.

(2)

(b) Another method used to determine the protein content of food is to measure the total nitrogen content. The total nitrogen content is multiplied by a conversion factor to give protein content.

The table shows data for milk and soya beans.

Food	Total nitrogen content / mg	Conversion factor	Protein content / mg
milk	505	6.38	
soya beans	3600	5.71	20556

(i) Use the information in the table to calculate the ratio of the protein content of soya beans to that of milk.

Give your answer to one decimal place.

(2)

Answer .....

(ii) Some of the total nitrogen content of a food is not due to protein.

Give **one** other type of organic molecule that contains nitrogen.

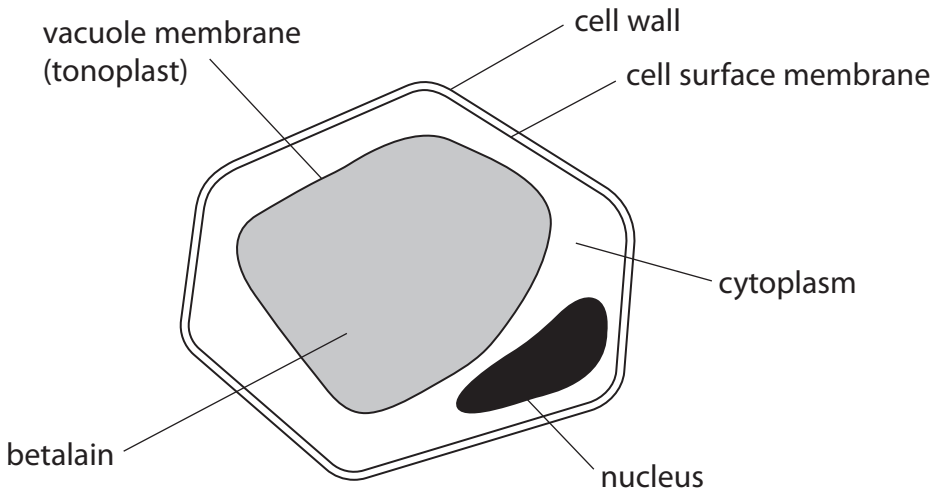
(1)

.....

(Total for Question 1 = 12 marks)

2 Scientists investigated the effect of salts on the permeability of cell membranes of beetroot.

The diagram shows a beetroot cell with a vacuole containing the red pigment betalain.

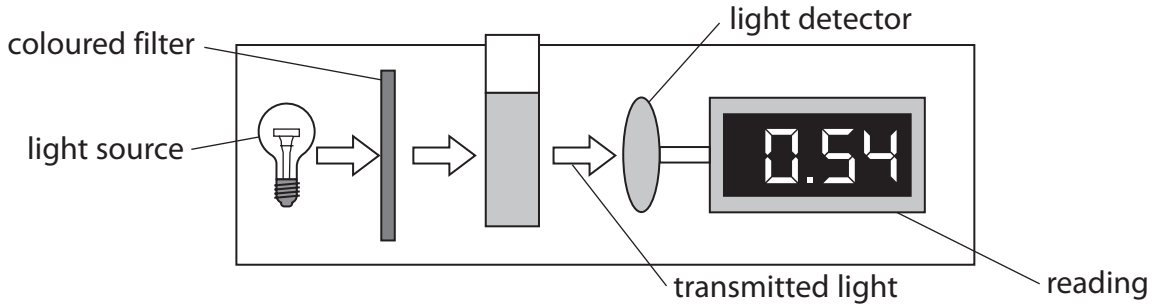


Equal sized discs of tissue were cut from a beetroot.

Twenty of these discs were placed into a beaker containing a calcium chloride solution.
This was repeated for several concentrations of calcium chloride and several concentrations of ammonium sulfate.

Betalain leaked from the discs, changing the colour of the solutions in the beakers.
The intensity of each colour was recorded after 12 hours.

(a) The diagram shows a colorimeter, which is an instrument that can measure the amount of light transmitted through a coloured solution.



The transmission of light through the solution decreases as the intensity of the colour increases.

(i) Explain how using a colorimeter allows valid measurements of light transmitted through the betalain solutions.

(3)

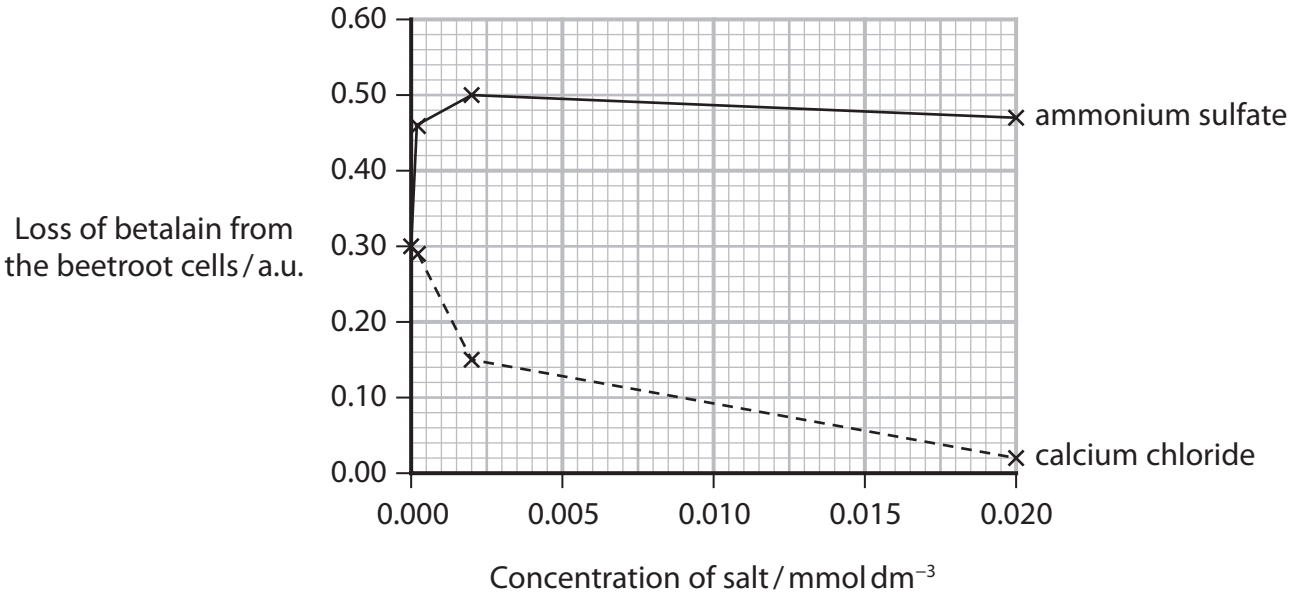
(ii) Temperature and pH affect the rate of leakage of betalain from discs of beetroot.
Describe how each of these variables could be kept constant in this investigation.

(2)

Temperature .....

pH .....

(b) The results of this investigation are shown in the graph.



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

(3)

(ii) Compare and contrast the effect of these two salts on the loss of betalain from the beetroot cells.

(3)

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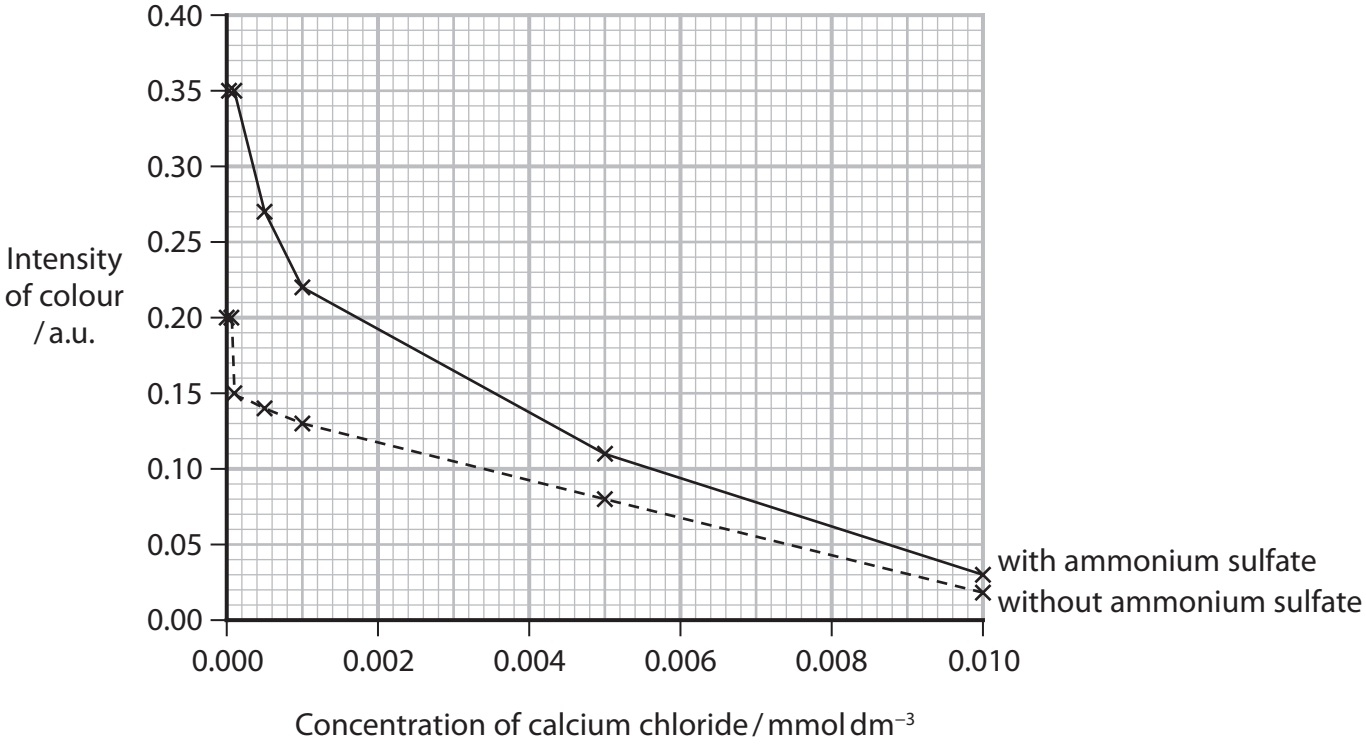
(iii) Calculate the percentage difference in colour intensity between calcium chloride and ammonium sulfate at a concentration of 0.01 mmol dm^{-3}.

(2)

Answer ..... %

(c) In a second investigation, the effect of calcium chloride in the presence and in the absence of ammonium sulfate was studied.

The results are shown in the graph.



(i) Comment on the results shown in the graphs from these two investigations.

(3)

(ii) Explain how you could modify the method to decide if the difference in colour intensity, at a concentration of 0.002 mmol dm^{-3}, is statistically significant.

(3)

(Total for Question 2 = 19 marks)

3 Gelatine is a protein derived from collagen.

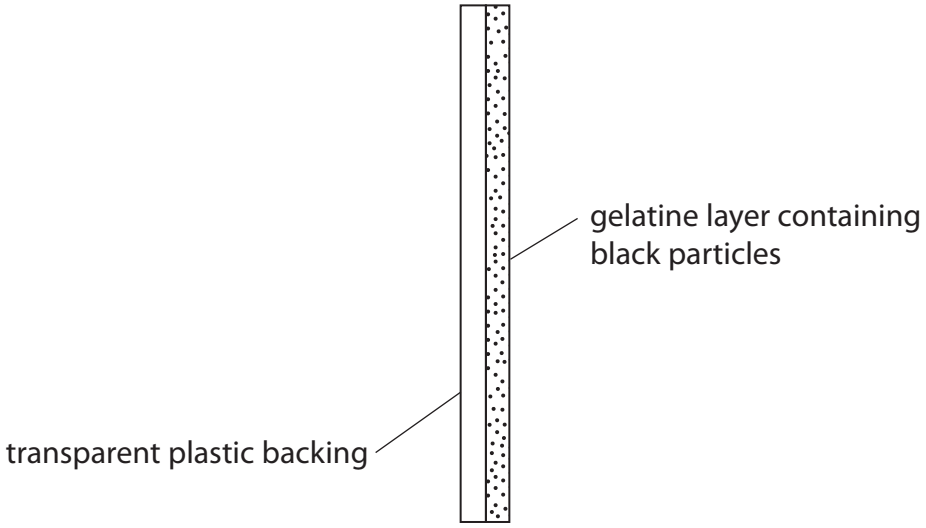
The photograph shows a packet of gelatine capsules containing medicine.

(Source: © PAL)

In the stomach, the capsule is broken down by protease to release the medicine.

The effect of protease concentration on the digestion of gelatine was investigated.

Pieces of photographic film, which have a layer of gelatine containing black particles, were used. As the gelatine is digested, the black particles fall off and the film becomes transparent.



Protease activity was measured by timing how long it took the film to become transparent.

(a) (i) State the dependent variable in this investigation.

(1)

(ii) One of the variables that needs to be controlled in this investigation is pH.

Describe how a suitable pH could be decided on experimentally.

(3)

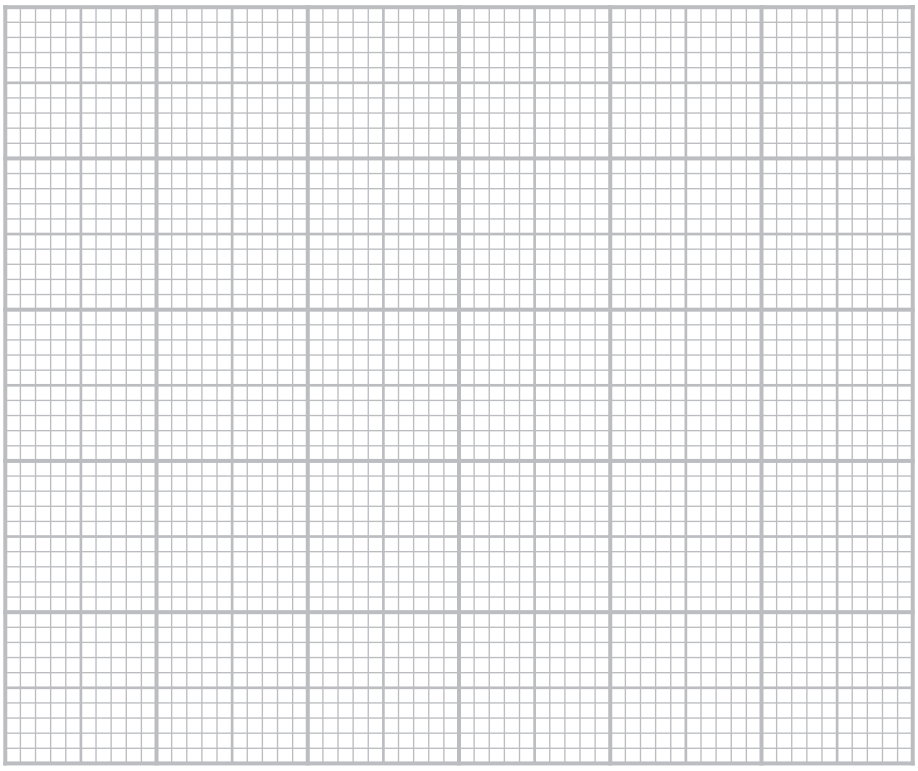
(b) The results of this investigation are shown in the table.

The proportional rate of reaction = $\frac{1}{\text{time}}$

Protease concentration (%)	Time taken for film to become clear / seconds	Proportional rate of reaction / seconds^{-1}
1.0	449	0.0022
1.5	288	0.0035
2.0	252	0.0040
3.0	242	0.0041
4.0	230	0.0044
5.0	236	0.0042

(i) Plot a suitable graph to show the relationship between proportional rate of reaction and protease concentration.
Join the points with straight lines.

(4)



(ii) Explain the relationship shown in the results of this investigation.

(4)

(c) (i) This investigation was criticised because it does not measure the initial rate of reaction.

Explain why it would be better to measure the initial rate of reaction.

(2)

(ii) Suggest how the initial rate of reaction could be measured in this investigation.

(3)

(d) A student repeated the result for the 2% protease solution.

Determine how 1 cm^3 of a 2% solution could be obtained from a 5% stock solution of protease.

(2)

(Total for Question 3 = 19 marks)

TOTAL FOR PAPER = 50 MARKS

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