

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Monday 6 May 2019

Morning (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

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Instructions

- Use **black** ink or **black** 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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Answer ALL questions.

Write your answers in the spaces provided.

- 1 The stigma of a flower secretes a solution of sucrose. Pollen grains germinate in this solution to produce pollen tubes.

The effect of sucrose concentration on the germination of pollen grains was investigated.

Pollen grains from a single flower were scraped into the cavity of a slide containing sucrose solution.

After one hour, the slide was viewed through the high power of a microscope.

The number of germinating pollen grains was counted together with the total number of grains in the field of view.

This procedure was repeated for each sucrose solution, using pollen grains from the same flower.

The percentage germination of pollen grains was calculated.

- (a) (i) State the independent variable in this investigation. (1)

- (ii) State **one** abiotic (environmental) variable that should be controlled in this investigation. (1)

- (iii) Explain why the results might have been affected if the variable you named in (a)(ii) had not been controlled. (3)

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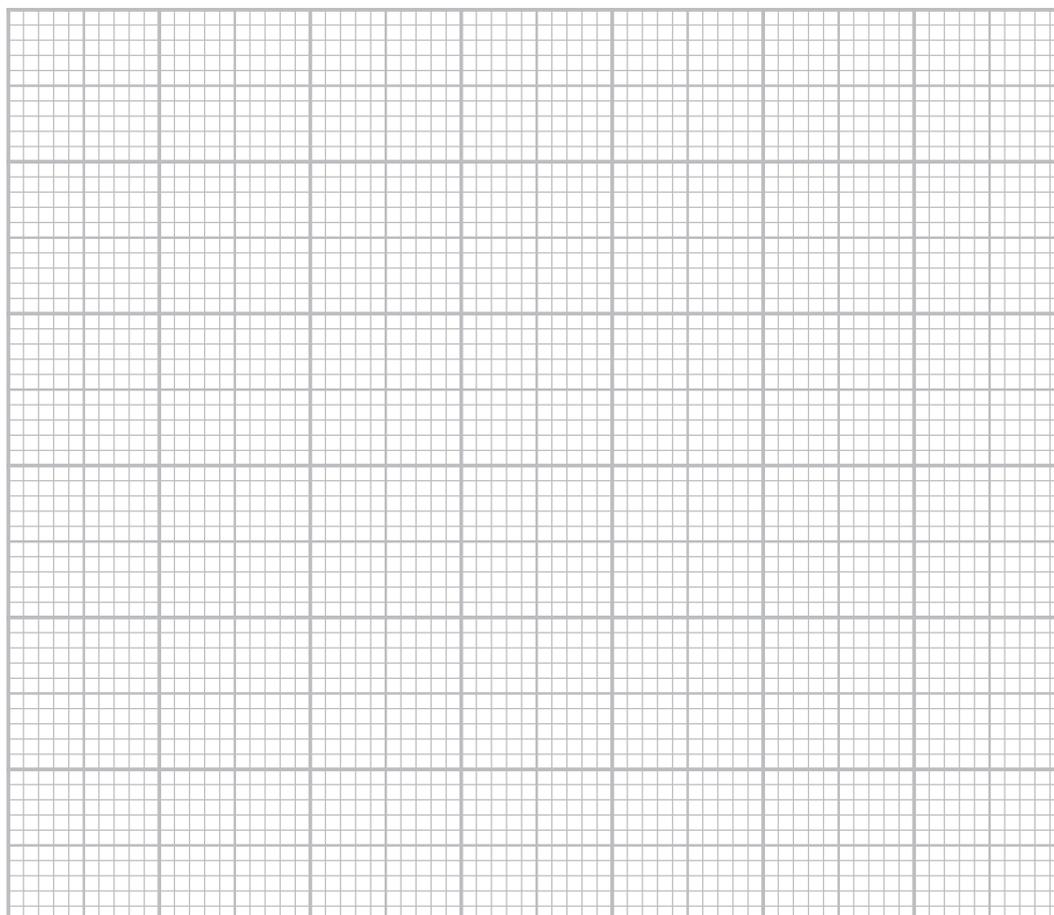


(b) The table shows the results of this investigation.

| Concentration of sucrose solution / g dm ⁻³ | Percentage germination of pollen grains (%) |
|--|---|
| 0 | 10 |
| 20 | 39 |
| 40 | 73 |
| 60 | 50 |
| 80 | 41 |
| 100 | 0 |
| 120 | 0 |

(i) Plot a suitable graph to show the results of this investigation. Join the points with straight lines.

(4)



- (ii) These results suggest that the optimum concentration of sucrose for pollen grain germination is 40 g dm^{-3} .

Explain how the method could be modified to find the actual optimum concentration of sucrose.

(2)

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- (c) The table shows the results of an investigation into the effect of boric acid concentration, in a sucrose solution, on the growth of pollen tubes.

| Boric acid concentration / parts per million (ppm) | Pollen tube length / μm |
|--|------------------------------------|
| 25 | 78 |
| 50 | 126 |
| 100 | 166 |
| 200 | 134 |
| 300 | 112 |
| 400 | 90 |

- (i) Calculate the percentage increase in pollen tube length at 100 ppm compared with that at 25 ppm.

(2)

Answer%

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2 An investigation was carried out to determine the relative concentration of reducing sugars in a range of foods.

In each case, some food was ground up with distilled water. The resulting liquid was filtered to give an extract.

This extract was then tested for the presence of reducing sugars using a reagent.

(a) (i) Describe how a test for reducing sugars is carried out.

(2)

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(ii) Explain how this investigation should be carried out to give a semi-quantitative estimate of the concentration of the reducing sugars by comparing the colour of the precipitate with a colour chart.

(3)

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(iii) It was assumed that the extract contained all the reducing sugars from the food sample.

Suggest how this assumption could be tested.

(2)

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(b) The table shows the results of the investigation.

| Food | Colour of precipitate |
|--------------|-----------------------|
| apple | brick red |
| bread | green |
| cashew nut | no precipitate |
| potato | yellow |
| sweet potato | orange |

Complete the table below by writing the names of the foods in order from the highest concentration of reducing sugars to the lowest concentration.

(2)

highest —————> lowest

| | | | | |
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(c) The reagent used to test for reducing sugars is a blue solution containing soluble copper ions. Reducing sugars react with the copper to form an insoluble precipitate.

After testing, the precipitate formed can be removed. This leaves a solution that is less blue.

(i) Explain which food extract would leave the least blue solution when the precipitate is removed.

(3)

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3 The enzyme urease catalyses the following reaction:



The effect of pH on this reaction was investigated using the following method.

- One test tube containing 5 cm³ of urease solution was placed in a water bath at 40 °C and left for 10 minutes.
- Another test tube containing 5 cm³ of urea solution in a buffer at pH 3.0 was placed in the same water bath and left for 10 minutes.
- After 10 minutes, the contents of both tubes were mixed together in one test tube.
- This test tube was replaced in the water bath.
- The concentration of ammonia was measured after 15 minutes and again after 60 minutes.
- The procedure was repeated for pH values of 4.0, 6.5, 6.8, 7.3, 8.0 and 9.0.

(a) (i) Explain why the urease solution and the urea solution were kept in the water bath at 40 °C before and after being mixed.

(4)

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(ii) Explain how you could determine suitable concentrations of urea and urease solutions to use in this investigation.

(2)

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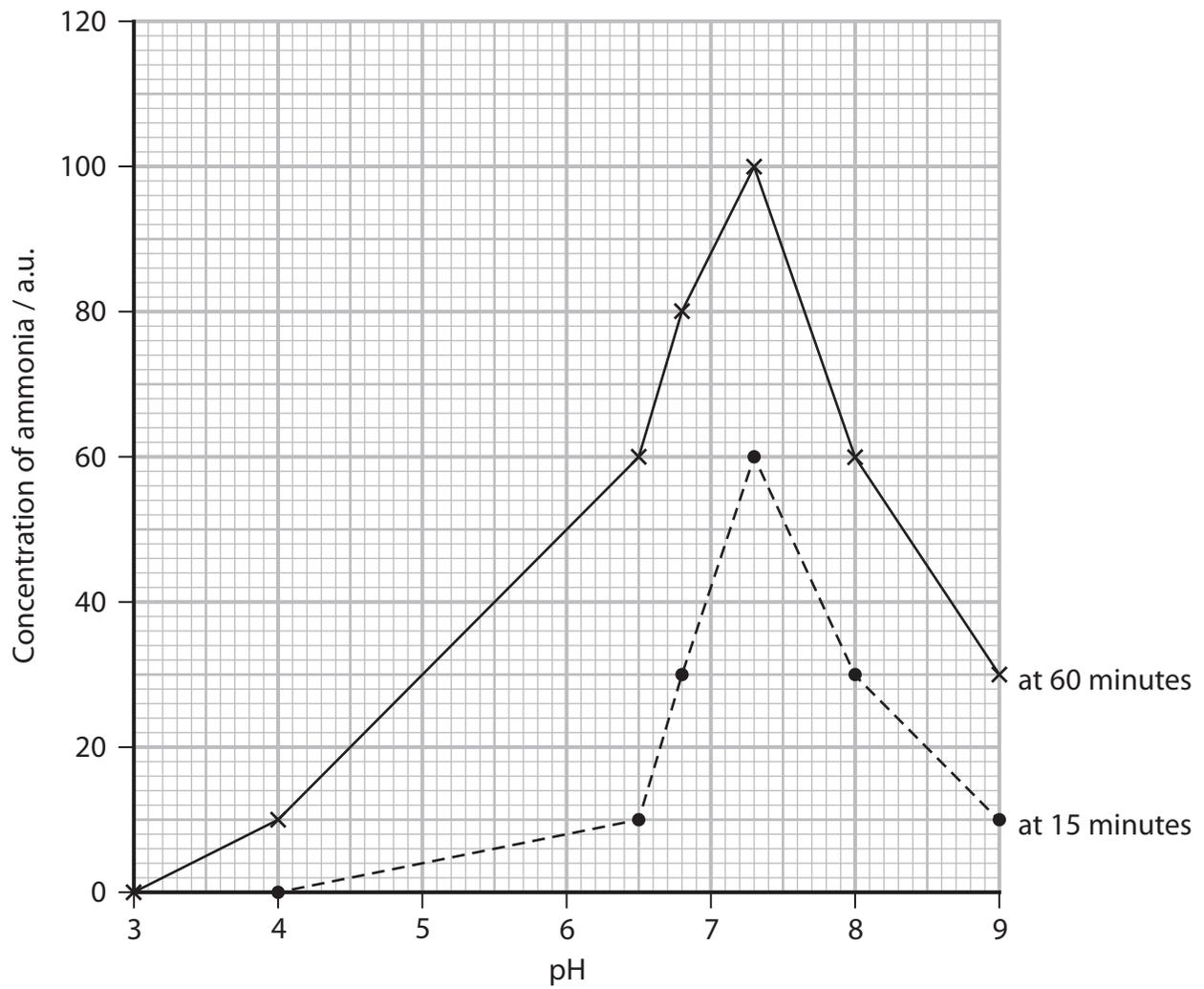
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(b) The graph shows the results of this investigation.



(i) Draw a suitable table to include the results for the experiment at 60 minutes.

(4)



(ii) Calculate the rate of reaction at a pH of 7.3 during the first 15 minutes of this investigation.

Include appropriate units with your answer.

(2)

Answer

(iii) Compare and contrast the results shown in the graph at 60 minutes with those at 15 minutes.

(3)

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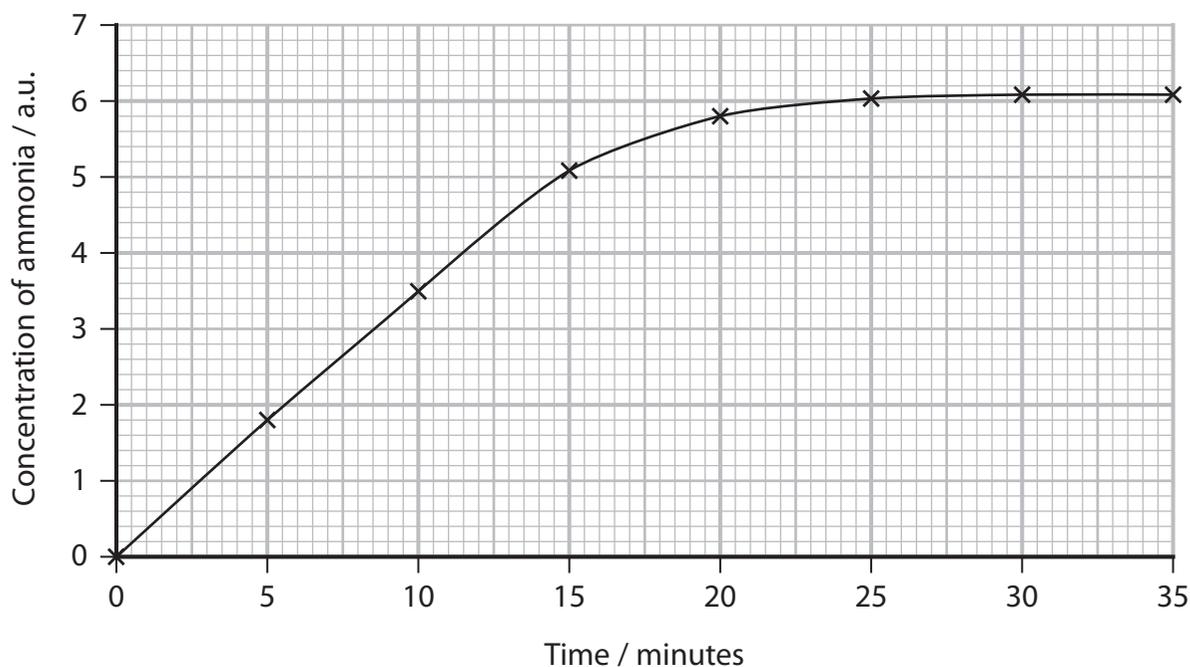
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- (c) In another investigation, the concentration of ammonia was recorded every 5 minutes for 35 minutes, at a pH of 6.0.

The graph shows the results of this investigation.



Calculate the initial rate of this reaction.

Include appropriate units with your answer.

(1)

Answer

(Total for Question 3 = 16 marks)

TOTAL FOR PAPER = 50 MARKS



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