Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Wednesday 22 May 2024

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

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.*

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

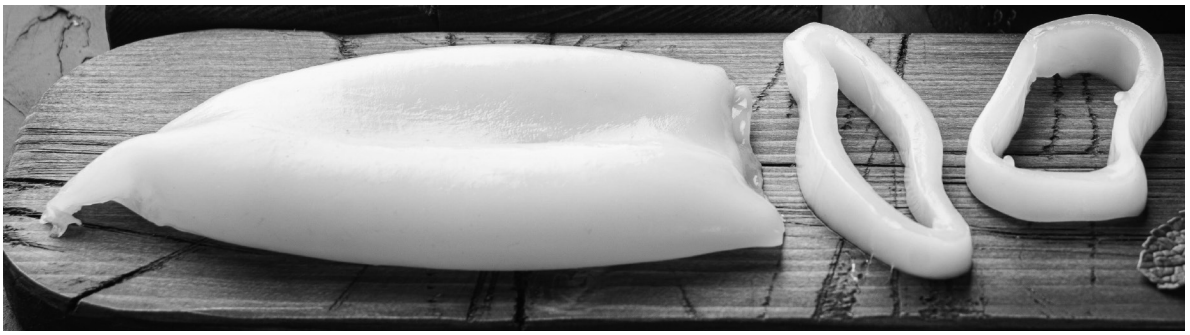
Answer ALL questions.

Write your answers in the spaces provided.

1 Squid is an animal that is eaten in many parts of the world.

The body of the squid is used as meat because it contains a lot of protein.

The photograph shows some squid meat.



(Source: © Ilia Nesolenyi/Alamy Stock Photo)

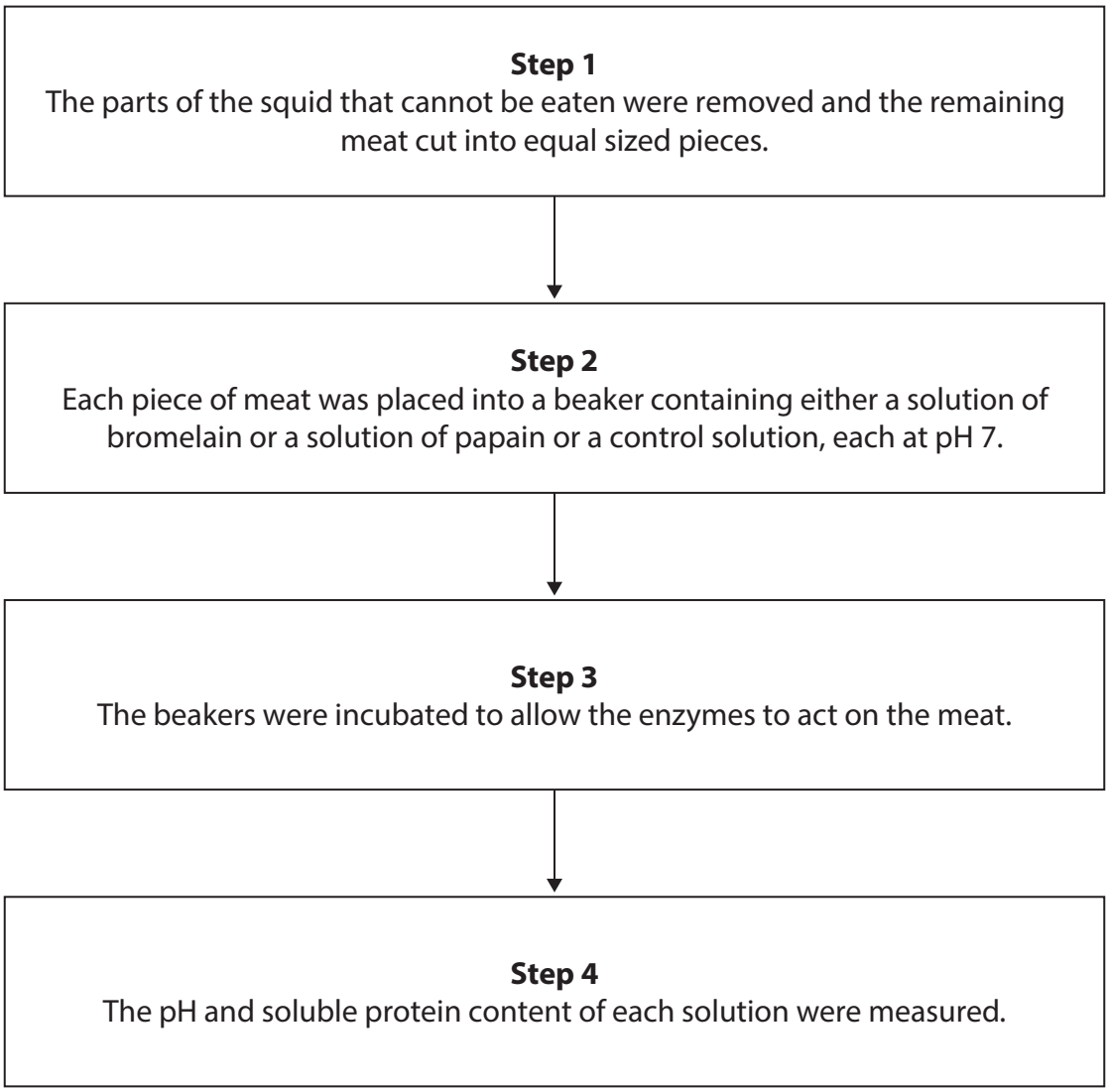
The meat from squid is quite tough and is often treated with enzymes to break down the protein.

Some fruits contain enzymes that can break down protein.

Pineapples contain the enzyme bromelain and unripe papayas contain the enzyme papain.

A study compared the effects of two different concentrations of these two enzymes on the meat from squid.

The flowchart shows some of the steps in the method used in this study.



(a) Explain why, in **step 1**, it is important to cut the squid meat into equal sized pieces.

(2)

(b) (i) Name a suitable control solution that could be used in **step 2**.

(1)

(ii) State the importance of using a control in this study.

(1)

(c) Give **two** variables that need to be controlled in **step 3**.

(1)

1 .....

2 .....

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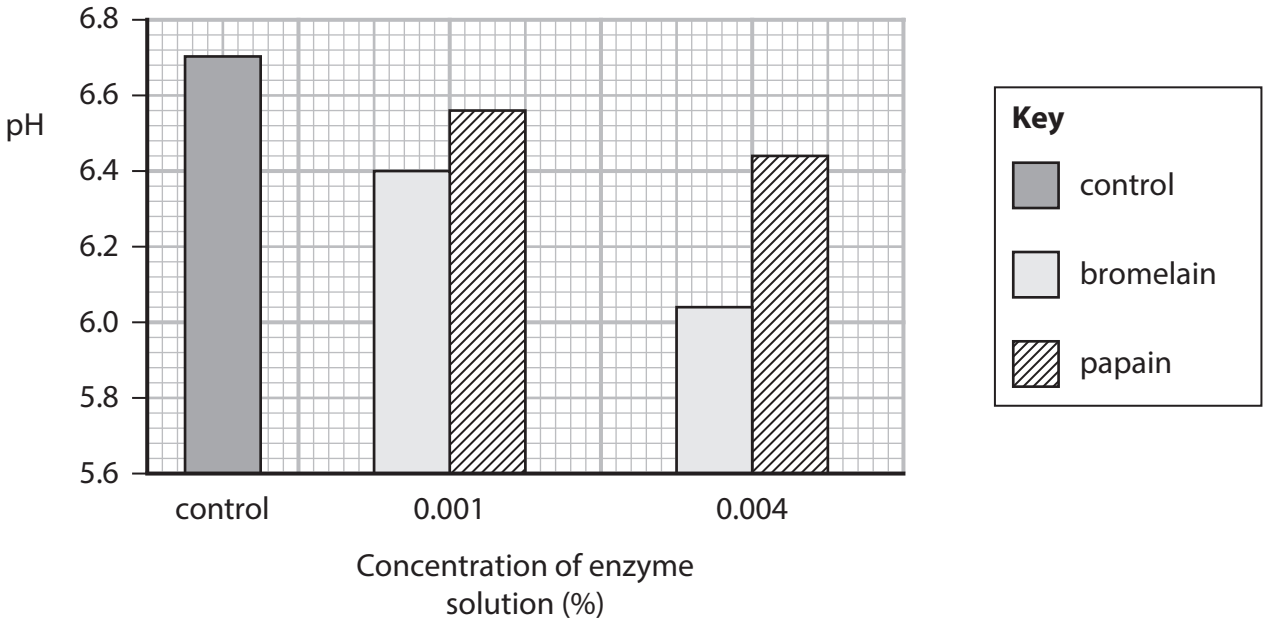
(d) The graph shows the pH of the solutions measured at **step 4**.



(i) The 0.001% enzyme solution was prepared by diluting the 0.004% enzyme solution.

Calculate the volume of the 0.004% enzyme solution needed to make 50 cm^3 of 0.001% enzyme solution.

(1)

Answer ..... cm^3

(ii) State **two** conclusions that can be made from the data shown in the graph.

(2)

1 .....

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2 .....

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(e) Describe a method for estimating the soluble protein concentration in the beakers in **step 4**.

(4)

(Total for Question 1 = 12 marks)

2 Little tunny is a fish found in the Atlantic Ocean.

The photograph shows a little tunny.

Magnification × 0.09

(Source: © Picture Partners/Alamy Stock Photo)

(a) Calculate the actual length of this fish between **X** and **Y**.

Give your answer in metres.

(1)

Answer ..... m

(b) A student wanted to compare the heart of this fish with the heart of a mammal.

The student planned to cut open the fish and remove its heart and to keep the heart in a liquid preservative called formalin.

The student made a risk assessment before the dissection.

The diagram shows part of a safety datasheet about formalin.

HARMFUL

Harmful by inhalation, in contact with the skin or if swallowed.
Irritating to eyes, respiratory system and skin.
Limited evidence of a carcinogenic effect.
May cause sensitisation by skin contact.

The student put the risk assessment into a table.

Complete the table to show **one** hazard for the dissection and **one** for the preservation of the heart.

(4)

Hazard	How to reduce the risk
1	.....
.....	.....
.....	.....
2	.....
.....	.....
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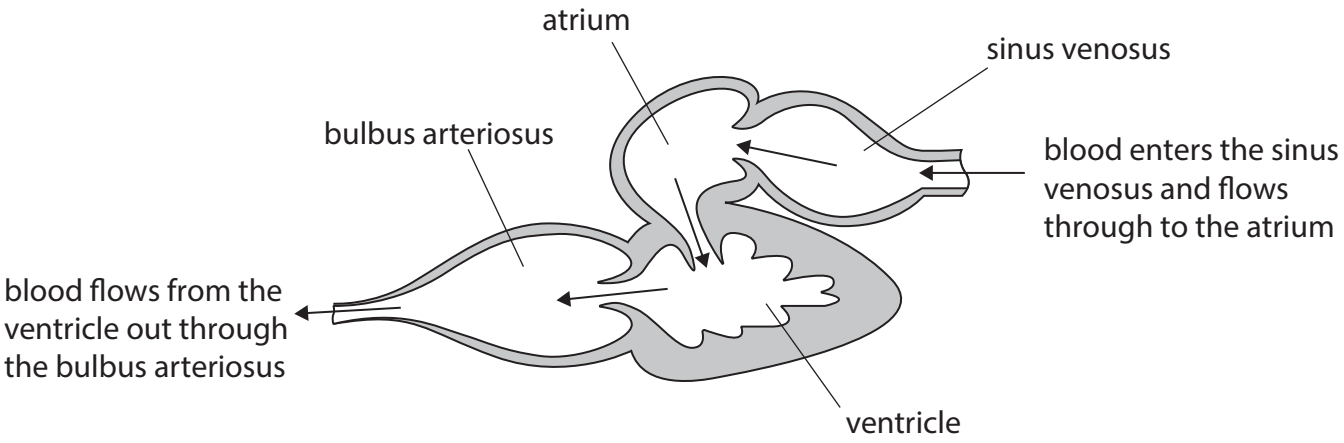
(c) The diagram shows the heart of a fish.



Compare and contrast the structure of the heart of a fish with the heart of a mammal.

(3)

(d) A student suggested that:

The larger a fish is, the larger its heart will be.

Devise a method that could be used to collect and analyse data to test this suggestion.

(6)

(Total for Question 2 = 14 marks)

3 The photograph shows jujube fruits.

(Source: © Aneeta Benwan-edam/Alamy Stock Photo)

Jujube fruits are edible and are native to China.

Jujube fruits do not store well.

An investigation compared the effect of covering the fruit with an edible coating.

One coating was made from chitosan, a polysaccharide obtained from the outer skeleton of shellfish.

Another coating was made from cinnamon oil.

Samples from stored fruit were tested for vitamin C content and antimicrobial activity.

(a) The table shows some of the results of this investigation.

Storage time / days	Vitamin C content in the fruits / a.u.		
	With no coating	Coated with chitosan	Coated with cinnamon oil
0	0.48	0.49	0.48
15	0.44	0.47	0.47
30	0.37	0.39	0.43
45	0.31	0.36	0.39
60	0.27	0.32	0.34

(i) The percentage decrease in the vitamin C content of the fruit with no coating, over the 60-day period, was 43.75%.

Calculate the difference in the percentage decreases for the fruit coated with chitosan and the fruit with no coating.

Give your answer to two significant figures.

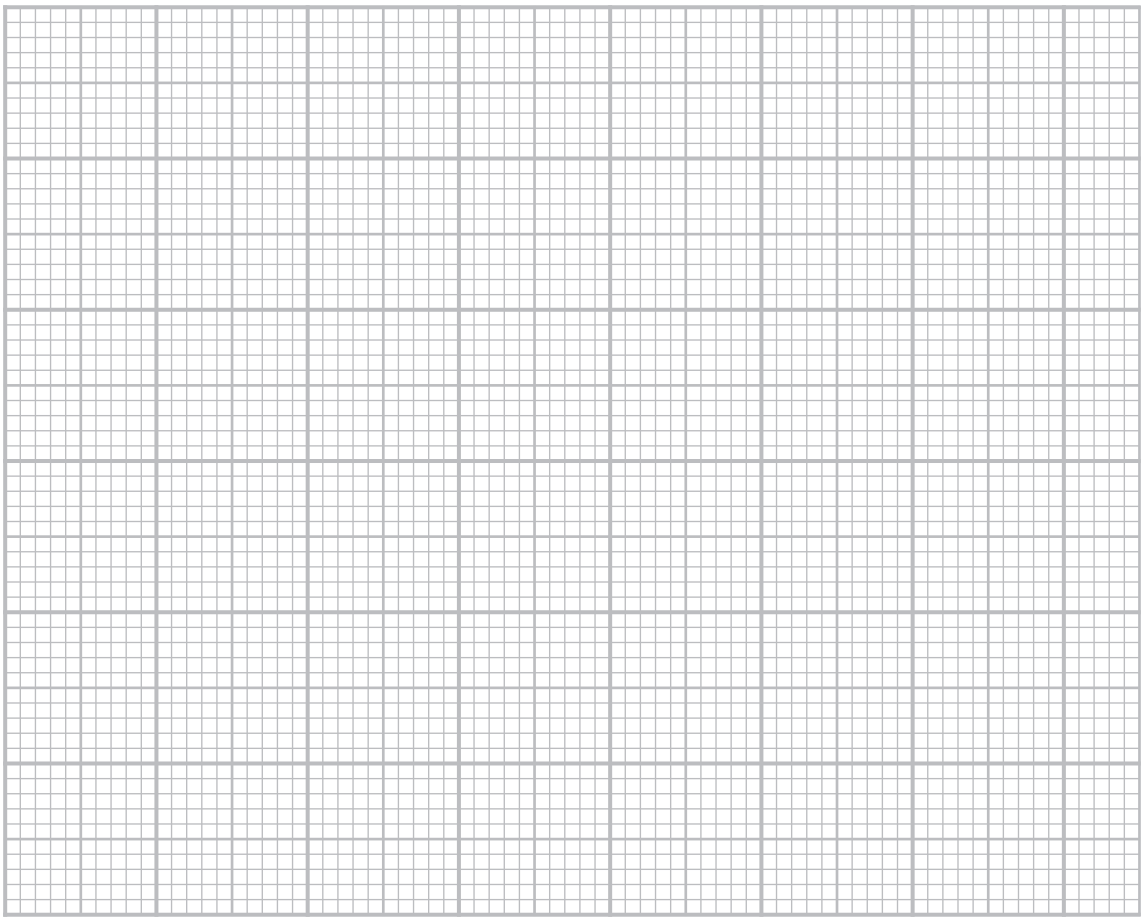
(2)

Answer .....

(ii) Plot a suitable graph to show the relationship between storage time and the vitamin C content in the fruits coated with cinnamon oil.

Draw a line of best fit through the data.

(4)



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(iii) This data has no indication of repeatability.

Describe how data could have been collected in this investigation and presented to show its repeatability.

(3)

(iv) A coating made from a combination of chitosan and cinnamon oil was also tested.

Describe an investigation to determine if this coating is more effective than the two coatings used separately in preserving the vitamin C content.

(3)

(b) The antimicrobial activity of the coatings was investigated using the agar diffusion method.

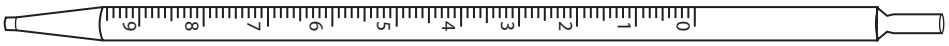
Agar plates were spread with a suspension of bacteria containing 5×10^5 bacteria per cm^3.

Two suspensions of bacteria were made, one with *E. coli* and one with *S. aureus*.

Discs of filter paper were soaked in either the chitosan or the cinnamon oil and placed on top of the agar. The agar plates were then incubated.

Agar plates were also prepared that had two types of fungi grown on them: *A. flavus* and *P. citrinum*.

(i) The diagram shows a graduated pipette.



The pipette was used to prepare the suspension of bacteria.

Describe how to use a graduated pipette to measure an accurate volume.

(2)

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(ii) The suspension of bacteria containing 5×10^5 bacteria per cm^3 was used.

Each agar plate was spread with 0.2 cm^3 of this suspension.

Calculate the number of bacteria that were added to each agar plate.

Give your answer in standard form.

(1)

Answer .....

(iii) Explain **two** safety precautions that must be taken when preparing these plates.

(2)

1 .....

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2 .....

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(iv) The table shows some differences between the method using bacteria and the method using fungi.

Type of microorganism	Type of agar	Incubation temperature / °C	Length of incubation / hours
bacteria	nutrient agar	35	24
fungi	potato dextrose agar	28	72

Suggest why different conditions were used when growing these two types of microorganism.

(3)

Type of agar .....

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Incubation temperature .....

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Length of incubation .....

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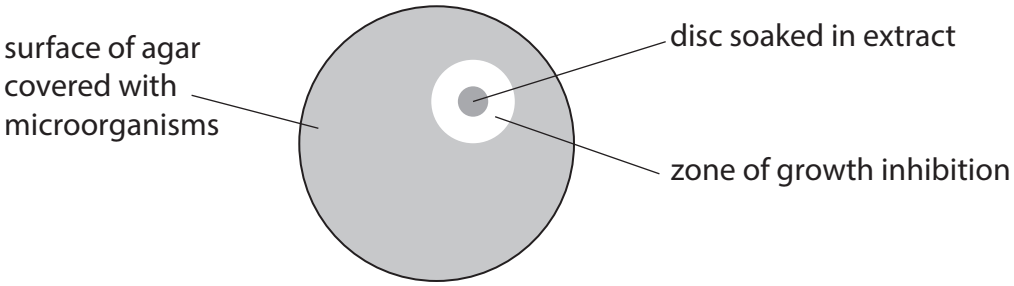
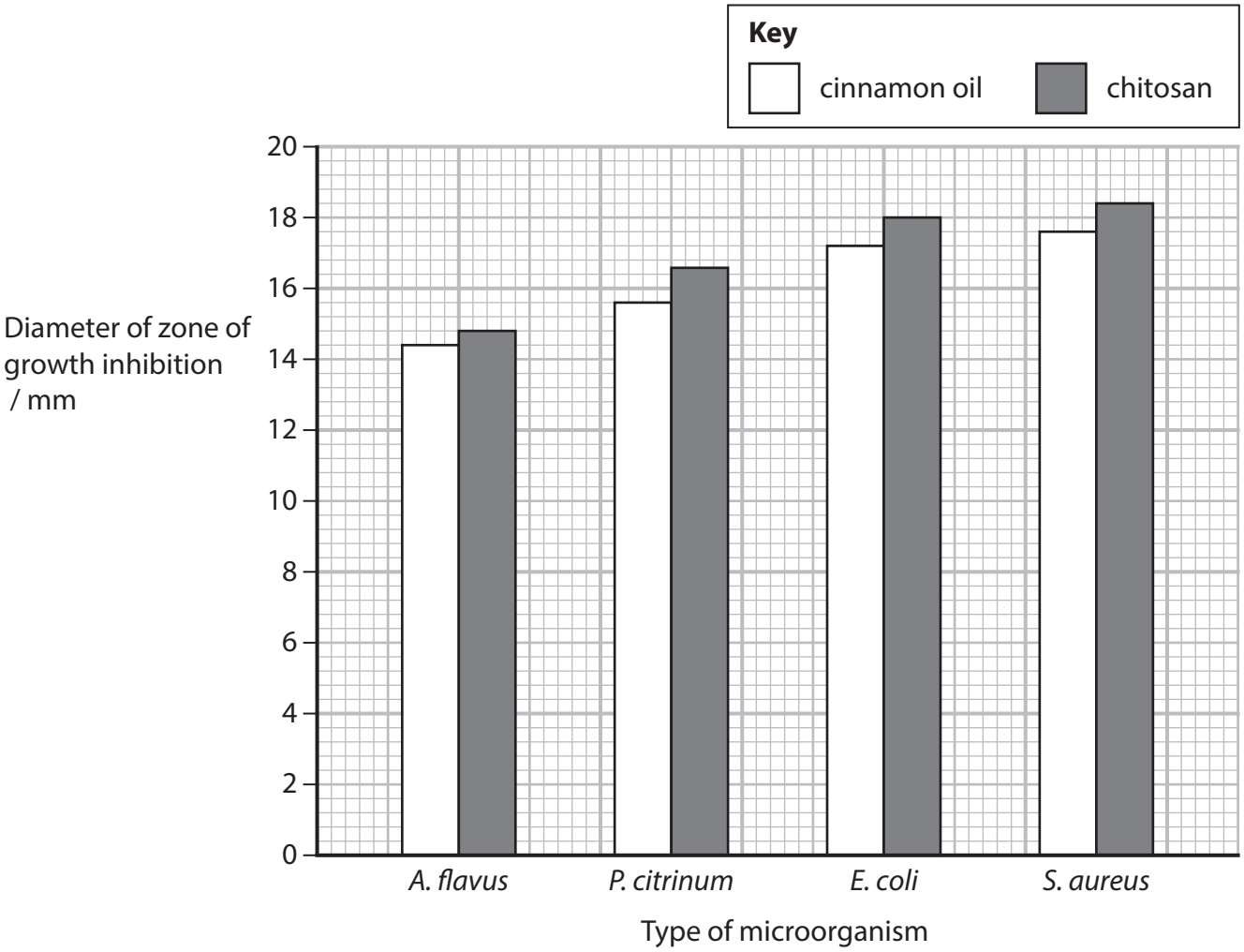
(v) The antimicrobial activity was compared by measuring the diameter of the zone of growth inhibition. The greater the diameter, the greater the antimicrobial activity.

The diagram shows the zone of growth inhibition.



The graph shows the results of this investigation.



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Evaluate the usefulness of this data when making conclusions about the antimicrobial activity of cinnamon oil and chitosan in this investigation.

(4)

(Total for Question 3 = 24 marks)

TOTAL FOR PAPER = 50 MARKS

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