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8065773579

BIOLOGY **9700/51**

Paper 5 Planning, Analysis and Evaluation **October/November 2023**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 30.
- The number of marks for each question or part question is shown in brackets [ ].

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1 Fruits in the diet can be a source of vitamins, such as vitamin C and vitamin A, which are important in maintaining good health.

Vitamin A is a group of molecules that includes retinol and retinal.

Vitamin C is an organic acid known as ascorbic acid.

Ripening occurs in fruit when molecular changes cause an increase in sugar content, colour changes and softening of the fruit, over time.

Ascorbic acid is found in plant cells. The fruits of many plants have high concentrations of ascorbic acid.

A student planned to investigate how ascorbic acid concentration changes with ripeness in the fruit of the apple tree, *Malus domestica*.

The fruit of *M. domestica* (apples) are shown in Fig. 1.1.



Fig. 1.1

(a) The student removed an apple that was 5 cm in diameter from a tree. The student measured the sugar content of the apple, which was low. This indicated that the apple was at the early stages of ripening (unripe).

For the investigation, the student decided to select apples from trees when each apple was 5 cm in diameter.

The student assumed that the ripeness of each apple would increase each day after it had been picked from a tree.

(i) Suggest why the diameter of the apples selected may **not** give accurate estimates of ripeness.

.....

.....

..... [1]

(ii) Describe an improvement to the method for selecting the apples that would give more accurate estimates of ripeness.

.....

.....

..... [1]

(b) The student researched how ascorbic acid concentration changes with ripeness in the fruit of other species.

Based on this research, the student predicted that ascorbic acid concentration in apples will:

- be lowest in unripe apples when they are first picked from the tree
- increase over several days and peak in partially ripe apples
- decrease slightly in later days as the apples become fully ripe.

Sketch a line graph below, including labelled axes, to show the predicted results.



[2]

(c) The student used the redox indicator DCPIP to investigate how ascorbic acid concentration changes as the apples ripen.

The student tested the ascorbic acid concentration of the apples at intervals from the time they were taken from the tree until the apples were fully ripe.

For each test, the student prepared an apple extract solution and reacted this with a DCPIP solution of standardised concentration.

(i) The student was provided with a $0.01\,mol\,dm^{-3}$ stock solution of DCPIP.

After preliminary research, the student decided to dilute the stock solution to prepare a $0.0005\,mol\,dm^{-3}$ DCPIP solution to use in the experiment.

The student used two steps to dilute the stock solution to the $0.0005\,mol\,dm^{-3}$ DCPIP solution.

Complete the description of the two steps for the dilution by adding the correct values to the sentences.

step 1

The student mixed $10\,cm^3$ of $0.01\,mol\,dm^{-3}$ DCPIP stock solution with ..... cm^3 of distilled water to produce solution **A**. Solution **A** had a concentration of $0.001\,mol\,dm^{-3}$.

step 2

The student then mixed ..... cm^3 of solution **A** with $50\,cm^3$ of distilled water to produce the $0.0005\,mol\,dm^{-3}$ DCPIP solution.

[2]

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(ii) DCPIP changes colour from blue to colourless when it is reduced by ascorbic acid.

- The volume of DCPIP that can be reduced by ascorbic acid is a measure of the concentration of ascorbic acid present in a solution.
- When all the ascorbic acid present in a solution has reacted with DCPIP, any more DCPIP that is added will remain blue.

The student had access to standard laboratory equipment and a burette.

DCPIP solution can be added to a burette and released one drop at a time by turning a tap.

Fig. 1.2 shows a burette set up for this investigation.

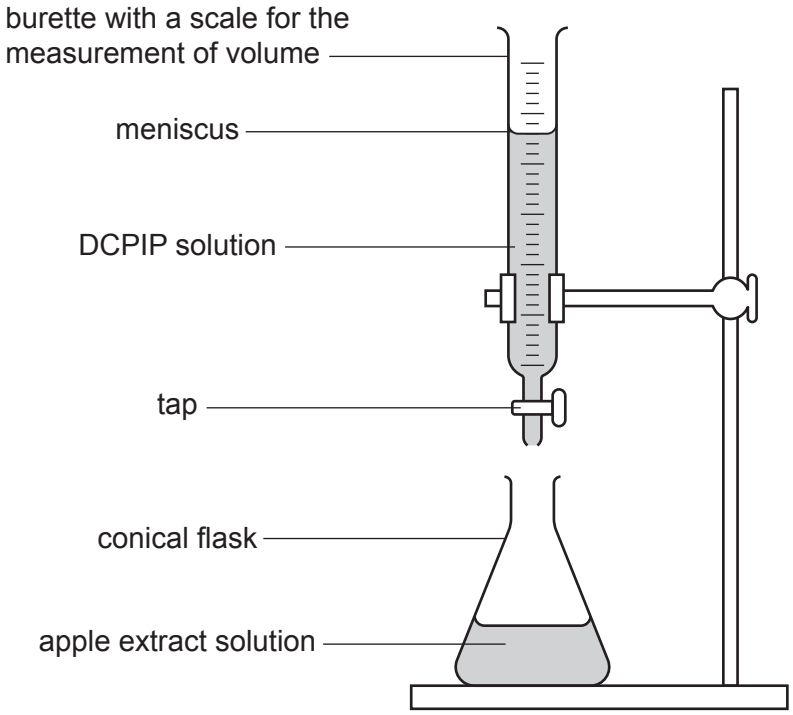


Fig. 1.2

Describe a method the student could use to:

- prepare apple extract solutions from the fruit
- collect the results needed to show the changes in ascorbic acid concentrations as the apples ripen, using DCPIP.

The description of your method should be set out in a logical way and be detailed enough for another person to follow.

You should **not** repeat the details from **(c)(i)** describing how to dilute the $0.01\,mol\,dm^{-3}$ stock solution of DCPIP.

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(d) After recording the results, the student decided that Pearson's linear correlation was a more appropriate test to use than Spearman's rank correlation to test whether ripeness and ascorbic acid concentration were correlated.

Suggest **two** reasons why Pearson's linear correlation was the more appropriate statistical test.

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..... [2]

(e) Many fruits are a good source of β-carotene, which can be converted in the human body to vitamin A.

The student investigated the β-carotene content of apples.

The student measured the β-carotene concentration in ripe apples and the ripe fruit of four other species.

Fig. 1.3 shows the results.

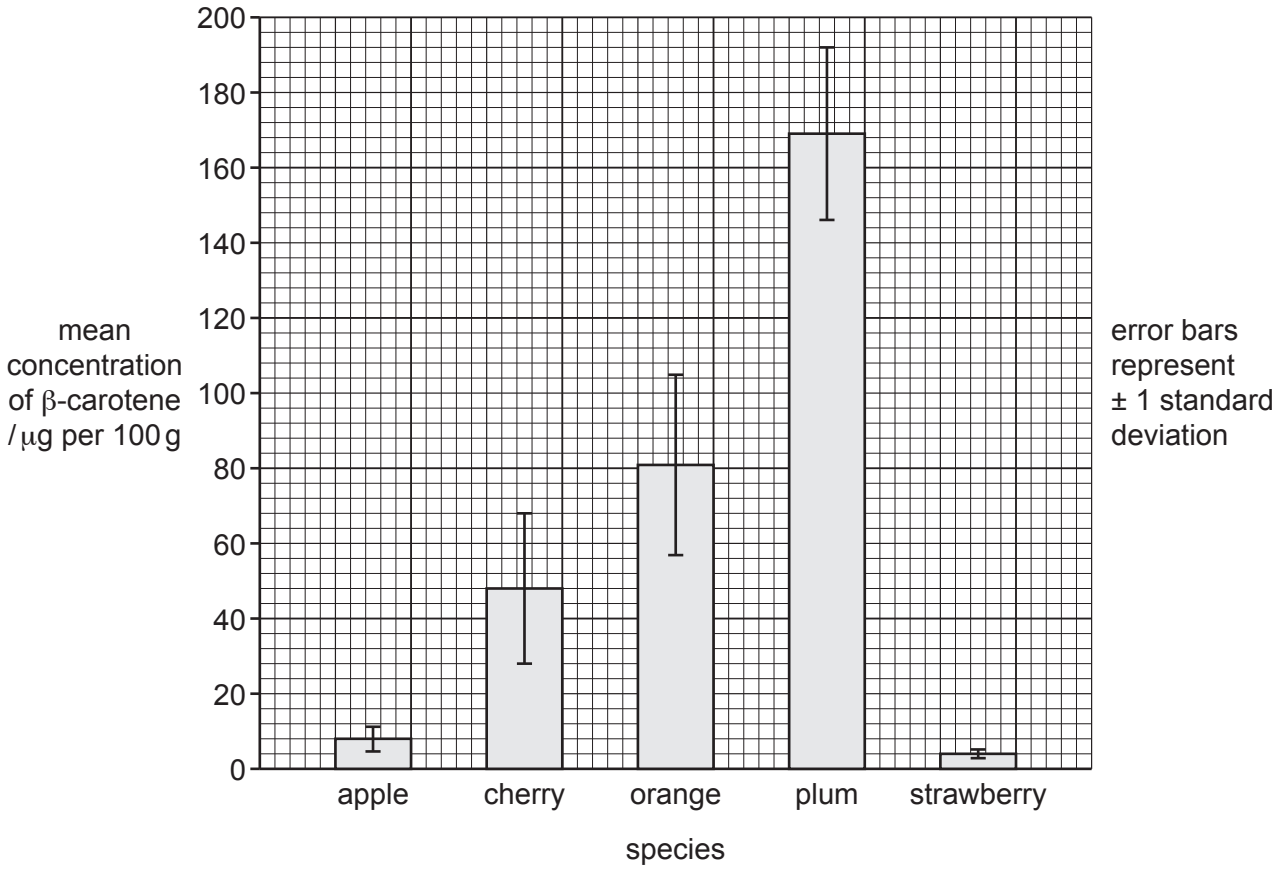


Fig. 1.3

The student concluded that apples are **not** a good dietary source of vitamin A.

Use the data in Fig. 1.3 to evaluate this conclusion.

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..... [3]

[Total: 20]

2 Trypsin is a protease enzyme. A student compared the activity of trypsin from two different species: the Atlantic salmon, *Salmo salar*, and the domestic pig, *Sus scrofa domesticus*.

Fig. 2.1 shows an Atlantic salmon and Fig. 2.2 shows domestic pigs.



Fig. 2.1



Fig. 2.2

Atlantic salmon are fish and are ectothermic, which means that the internal body temperature fluctuates with the surrounding environmental temperature.

The water temperature in the habitat of Atlantic salmon can decrease to –0.5 °C.

Domestic pigs are mammals and maintain an internal body temperature of approximately 38 °C.

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The student was provided with trypsin from Atlantic salmon, trypsin from domestic pigs and cubes of gelatine. Gelatine is made from the protein collagen.

The student measured the time taken for the trypsin from each animal species to break down the gelatine cubes at 20 °C.

The student:

- used 10 cm^3 of 5% trypsin solution from each animal species
- placed each trypsin solution in separate test-tubes, maintained at 20 °C in a water-bath
- placed a gelatine cube in each test-tube of trypsin solution
- recorded the time taken to break down the gelatine cube in each test-tube.

The student repeated this 12 times for each type of trypsin.

(a) (i) Identify the independent variable **and** the dependent variable in this experiment.

independent variable .....

dependent variable .....
[2]

(ii) The student standardised the temperature of the water-bath, the volume of the trypsin solution and the concentration of the trypsin solution.

State **one** other variable that the student should standardise in this experiment.

.....

..... [1]

(b) The results of the experiment are shown in Table 2.1.

Table 2.1

replicate	time taken to break down gelatine cube / seconds	
	Atlantic salmon	domestic pigs
1	125	130
2	121	127
3	128	134
4	119	128
5	132	135
6	125	130
7	131	132
8	127	128
9	126	128
10	131	137
11	131	133
12	129	131
mean	127.1	
standard deviation (s)	4.1	

(i) Use the data in Table 2.1 to calculate the mean time taken for trypsin from domestic pigs to break down the gelatine cube.

mean = ... seconds [1]

(ii) The formula for calculating standard deviation is:

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Key to symbols
x = observation
$\bar{x}$ = mean
n = sample size (number of observations)

The student calculated $\sum(x - \bar{x})^2$ as **110.92** for the domestic pigs.

Use the calculated value of $\sum(x - \bar{x})^2$ and the data in Table 2.1 to complete the calculation of the standard deviation for domestic pigs.

s = ... seconds [1]

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(iii) The student used a *t*-test to analyse the data.

The null hypothesis for this *t*-test was:

There is no difference between the time taken for trypsin from Atlantic salmon and trypsin from domestic pigs to break down a gelatine cube at 20°C.

The calculated value of *t* was **2.663**.

The student compared **2.663** to the values in Table 2.2.

Table 2.2

degrees of freedom	probability level (*p*)			
	0.10	**0.05**	**0.01**	**0.001**
20	1.725	2.086	2.845	3.850
21	1.721	2.080	2.831	3.819
22	1.717	2.074	2.819	3.792
23	1.714	2.069	2.807	3.767
24	1.711	2.064	2.797	3.745

Using Table 2.1, Table 2.2 and the calculated value of *t* of **2.663**, state **and** explain what the student can conclude about the results.

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(iv) Suggest explanations for the difference between the activity of the enzyme trypsin in Atlantic salmon and the activity of trypsin in domestic pigs.

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[Total: 10]

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Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2990725485

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **October/November 2023**

1 hour 15 minutes

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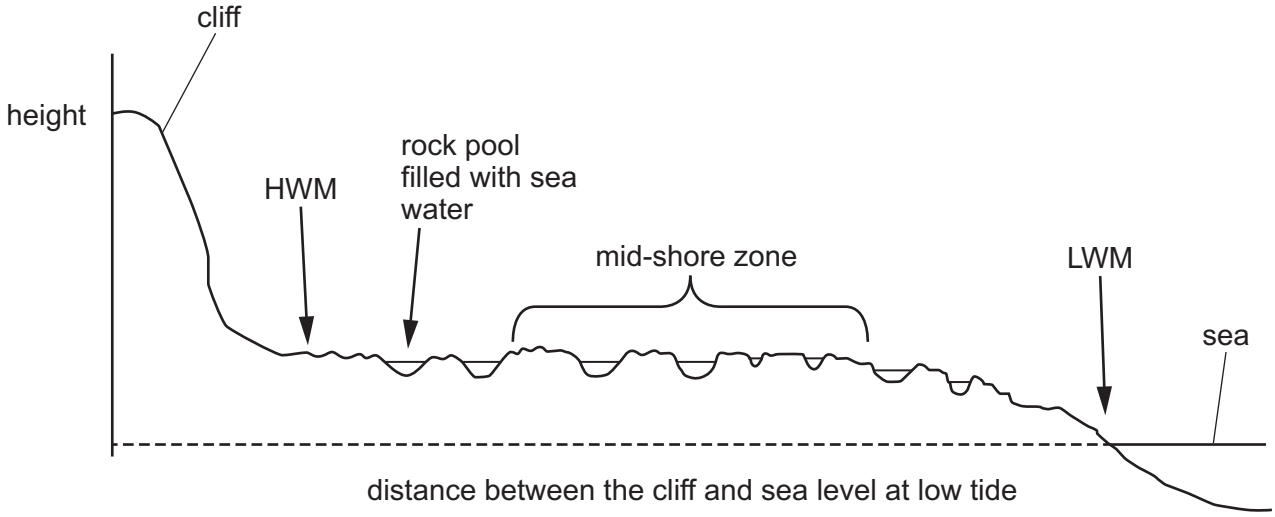
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1 Rocky shore ecosystems are found in some coastal regions. These ecosystems are inhabited by many different species of algae and animals. Twice each day the sea level rises to the high tide level and decreases to the low tide level in a regular pattern. The organisms in these ecosystems are exposed to very different conditions during the course of each day.

Algae are photosynthetic protoctists. Multicellular algae are found in many marine ecosystems.

Rock pools are formed in depressions in the shore as the water level lowers when the tide goes out.

Fig. 1.1 is a profile of a rocky shore ecosystem showing the positions of some rock pools. The mid-shore zone lies between the lower-shore zone and the upper-shore zone.



HWM = high-water mark – the highest point on the shore that is covered by sea water at high tide
LWM = low-water mark – the lowest point on the shore that is exposed to the air at low tide

Fig. 1.1

Fig. 1.2 shows a large rock pool on the mid-shore zone surrounded by smaller rock pools at low tide.



Fig. 1.2

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A student investigated the distribution and abundance of large, multicellular algae on a rocky shore in North Wales in the UK at low tide on one day in October 2011.

The student completed a preliminary survey of the shore at low tide and made some observations.

1. There were several different species of algae growing in the mid-shore zone.

2. Some algae were exposed to the air at low tide, but most grew in rock pools.

3. The distribution and abundance of the algae differed on the shore between the low-water mark (LWM) and the high-water mark (HWM).

4. Large rock pools appeared to have more species of algae than small rock pools.

5. Large rock pools were deeper than small rock pools.

The student decided to investigate the relationship between the depth of rock pools and the species diversity of the algae in the rock pools in the mid-shore zone.

The student selected 32 rock pools at random. Approximately half the rock pools were small and half were large. The depth of each rock pool at its deepest point was measured and the number of different species of algae in each rock pool was counted.

(a) State **two** variables that have been standardised in the investigation.

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2 .....

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[2]

(b) The results of the investigation are shown in Fig. 1.3.

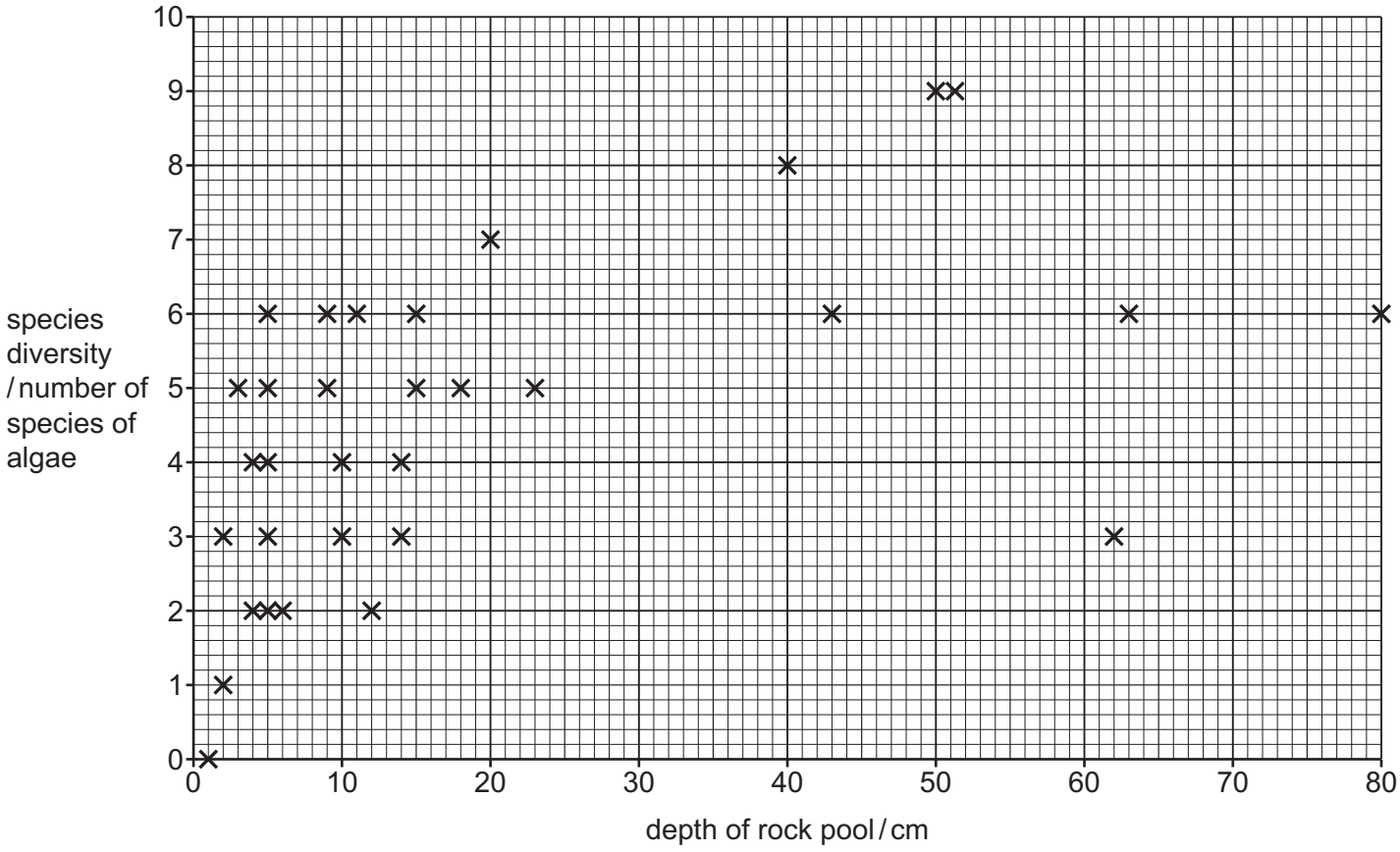


Fig. 1.3

The student used the Spearman's rank correlation to analyse the data in Fig. 1.3.

(i) State a null hypothesis for this investigation.

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..... [1]

(ii) The student calculated the Spearman's rank correlation coefficient (r_s) as 0.628.

Table 1.1 shows some of the critical values for the Spearman's rank correlation test.

Table 1.1

number of pairs of measurements	critical values	
	p = 0.05 (5%)	p = 0.01 (1%)
30	0.362	0.467
31	0.356	0.459
32	0.350	0.452
33	0.345	0.446
34	0.340	0.439

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Discuss, with reference to Table 1.1, the conclusions that can be made from the analysis of the data collected by the student.

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..... [3]

(iii) State **one** reason why Pearson's linear correlation coefficient is **not** appropriate for analysing the data shown in Fig. 1.3.

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..... [1]

(c) One important feature of scientific reports is that they provide enough information for other researchers to repeat each investigation.

Explain why it is difficult for researchers to repeat this investigation of species diversity in rock pools from the information provided.

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..... [2]

(d) The student noticed that part of the rocky shore had **no** rock pools. The student observed that the species of algae were not distributed equally on this part of the rocky shore from the LWM to the HWM.

Describe an investigation to find out how the distribution **and** abundance of the different species of algae varies on a rocky shore with **no** rock pools from the LWM to the HWM.

Your method should be set out in a logical order and be detailed enough for another person to follow.

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[7]

[Total: 16]

2 Abscisic acid (ABA) is a plant hormone that influences the growth and development of plants.

Salicylic acid (SA) is a plant hormone that interacts with other plant hormones, such as ABA, to influence growth and development in plants.

Scientists investigated the effects of ABA and SA on shoot growth in seedlings of rice, *Oryza sativa*.

The scientists germinated some rice grains and divided the young seedlings into four batches, **A** to **D**, each containing 9 seedlings of the same length. The seedlings were put into trays containing a seedling growth medium. The shoots in each batch of seedlings were sprayed once with a different solution:

batch **A** – water
batch **B** – 2 μmol dm^{-3} ABA
batch **C** – 2 μmol dm^{-3} ABA + 1.0 mmol dm^{-3} SA
batch **D** – 1.0 mmol dm^{-3} SA

The seedlings were then put into a growth chamber with constant conditions of light, temperature and humidity. The length of the shoot on each seedling was measured one day after spraying and five days after spraying.

Fig. 2.1 shows two seedlings taken at random from each batch five days after being sprayed.

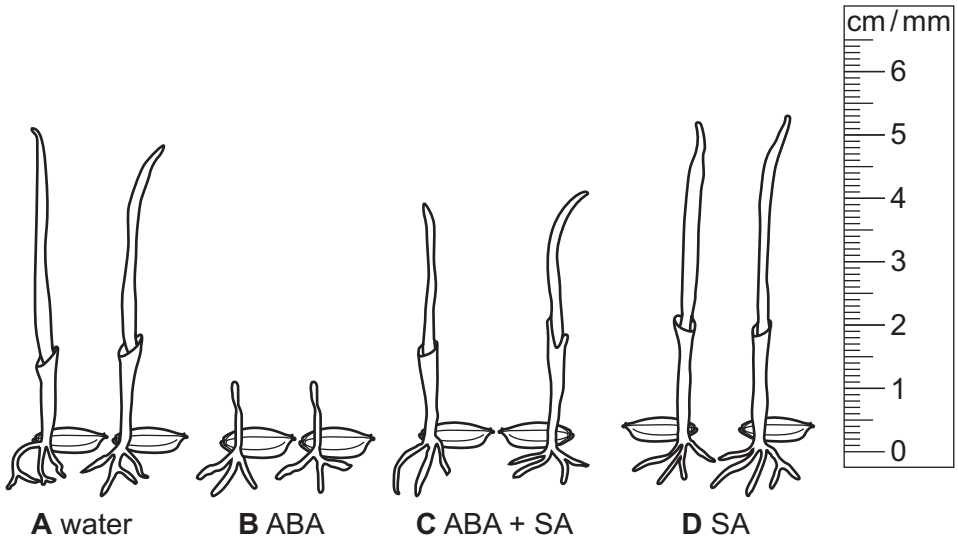


Fig. 2.1

The mean results of the investigation are shown in Fig. 2.2.

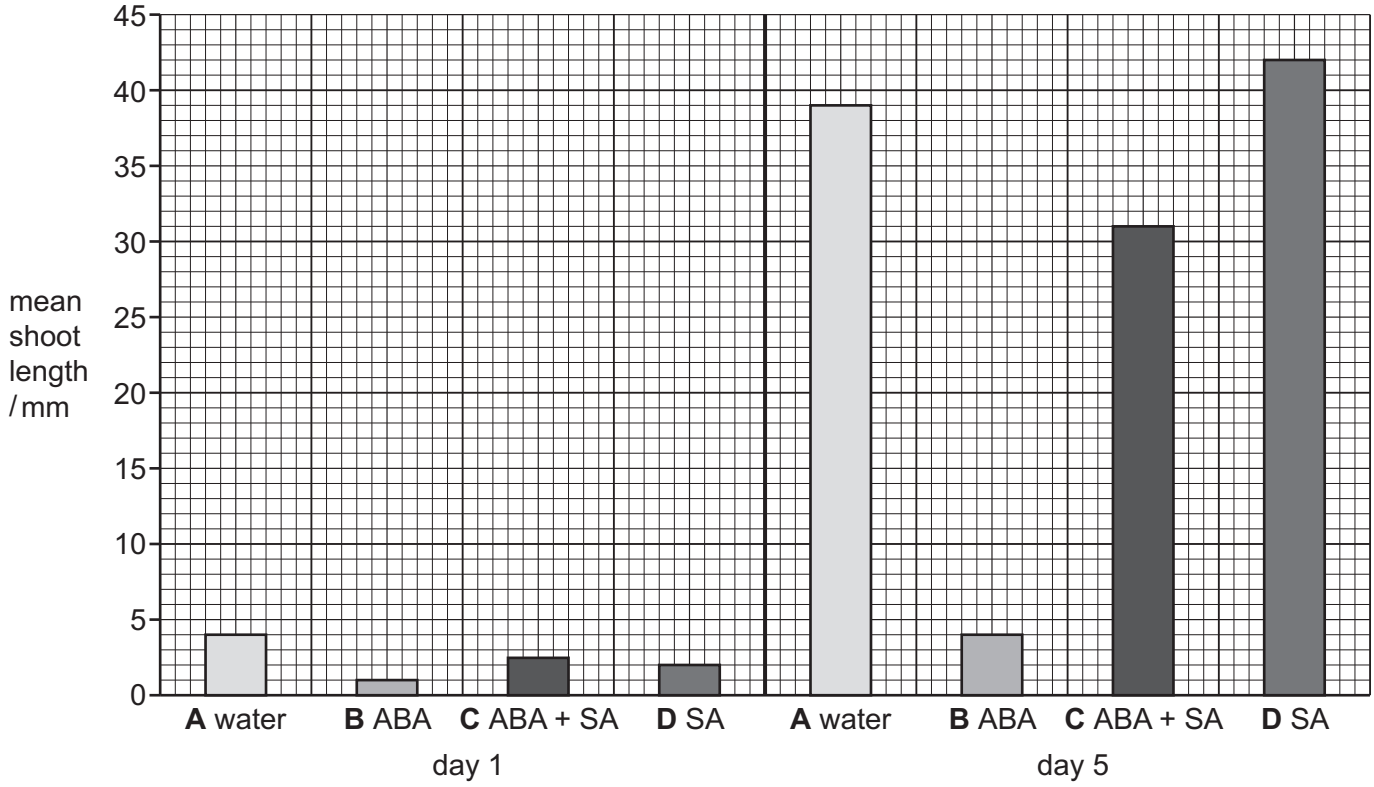


Fig. 2.2

(a) Seedlings do not always grow straight.

Suggest how the measurements of shoot length of the rice seedlings can be made as accurately as possible.

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..... [1]

(b) There were nine seedlings in each batch.

The standard deviation for the length of seedlings in batch **D** (sprayed with SA only) at day 5 is 5 mm.

The formula for calculating standard error (SE) is:

$$SE = \frac{s}{\sqrt{n}}$$

s = sample standard deviation
n = sample size (number of observations)

The formula for calculating the 95% confidence interval (95% CI) is:

$$95\%\ CI = \bar{x} \pm (2 \times SE)$$

$\bar{x}$ = mean

(i) Calculate the 95% CI for batch **D** (treated with SA only) at day 5.

95% CI = ... mm [1]

(ii) The values for 95% CI were used to add error bars for batches **C** and **D** at day 5. These error bars did not overlap. State what can be concluded from this.

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..... [1]

(c) Use the information in Fig. 2.2 to suggest **and** explain the effects of ABA and SA on the growth of the rice seedlings over five days.

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..... [3]

(d) The scientists delivered the plant hormones to the rice seedlings by spraying the shoots.

A student suggested that the rice seedlings could take up ABA and SA in the roots and transport the hormones to tissues in the shoot to give similar results to those in Fig. 2.2.

Outline a method to test this suggestion.

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..... [3]

Question 2 continues on page 12

(e) ABA and SA are reported in the scientific literature to be involved in the control of the mitotic cell cycle.

Cyclin-dependent kinases (CDKs) are enzymes involved in the control of the mitotic cycle. The gene *CDKB2* codes for one of these kinase enzymes.

Genes *KRP4* and *CycD6* code for proteins that regulate the activity of CDKs.

The scientists investigated the effect of ABA and SA on gene expression.

Microarrays were used to measure the relative quantities of mRNA produced by transcription of the three genes, *CDKB2*, *KRP4* and *CycD6*, in the cells of the seedlings that were sprayed by ABA and SA.

The relative quantity of mRNA produced is a measure of the level of gene expression.

Fig. 2.3 shows the effects of ABA alone, SA alone and ABA and SA combined on the expression of the three genes.

Error bars show **standard deviation** (*n* = 3).

(i) Complete Table 2.1 to show how the expression of the three genes is affected by the presence of ABA alone and SA alone, shown in Fig. 2.3.

Use **only** these descriptions to complete the table:

large increase **small increase** **large decrease** **small decrease** **no change**

Table 2.1

gene	**effect on gene expression**	
	ABA only	SA only
CDKB2		
KRP4		
CycD6		

[3]

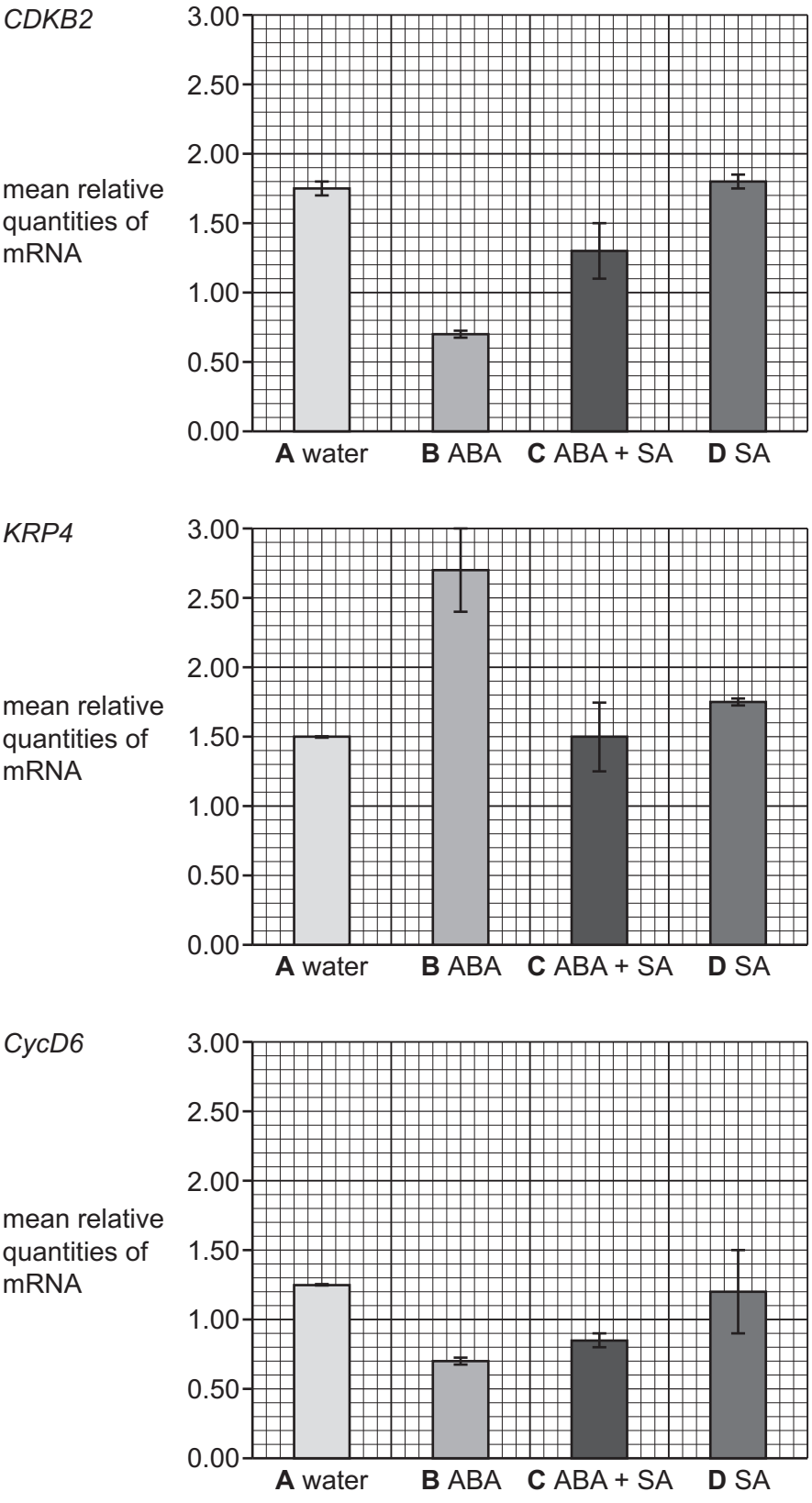

CDKB2
mean relative quantities of mRNA
3.00
2.50
2.00
1.50
1.00
0.50
0.00
A water
B ABA
C ABA + SA
D SA
KRP4
mean relative quantities of mRNA
3.00
2.50
2.00
1.50
1.00
0.50
0.00
A water
B ABA
C ABA + SA
D SA
CycD6
mean relative quantities of mRNA
3.00
2.50
2.00
1.50
1.00
0.50
0.00
A water
B ABA
C ABA + SA
D SA

Fig. 2.3

(ii) Fig. 2.3 also shows the results of spraying the seedlings with the mixture of ABA and SA (batch **C**) on the expression of the three genes.

The scientists made two conclusions about the effects of the mixture of ABA and SA (batch **C**) on the expression of the genes *KRP4* and *CycD6*.

Conclusion 1: SA counteracts the stimulation of gene expression of *KRP4* by ABA.

Conclusion 2: SA does not reverse the effect of ABA on gene expression of *CycD6*.

State **and** explain whether the evidence from Fig. 2.3 **fully supports**, **partially supports** or **does not support** each of these conclusions.

conclusion 1 .....

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conclusion 2 .....

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[2]

[Total: 14]

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Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

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0350862846

BIOLOGY **9700/53**

Paper 5 Planning, Analysis and Evaluation **October/November 2023**

1 hour 15 minutes

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[Turn over

1 Fruits in the diet can be a source of vitamins, such as vitamin C and vitamin A, which are important in maintaining good health.

Vitamin A is a group of molecules that includes retinol and retinal.

Vitamin C is an organic acid known as ascorbic acid.

Ripening occurs in fruit when molecular changes cause an increase in sugar content, colour changes and softening of the fruit, over time.

Ascorbic acid is found in plant cells. The fruits of many plants have high concentrations of ascorbic acid.

A student planned to investigate how ascorbic acid concentration changes with ripeness in the fruit of the apple tree, *Malus domestica*.

The fruit of *M. domestica* (apples) are shown in Fig. 1.1.



Fig. 1.1

(a) The student removed an apple that was 5 cm in diameter from a tree. The student measured the sugar content of the apple, which was low. This indicated that the apple was at the early stages of ripening (unripe).

For the investigation, the student decided to select apples from trees when each apple was 5 cm in diameter.

The student assumed that the ripeness of each apple would increase each day after it had been picked from a tree.

(i) Suggest why the diameter of the apples selected may **not** give accurate estimates of ripeness.

.....

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..... [1]

(ii) Describe an improvement to the method for selecting the apples that would give more accurate estimates of ripeness.

.....

.....

..... [1]

(b) The student researched how ascorbic acid concentration changes with ripeness in the fruit of other species.

Based on this research, the student predicted that ascorbic acid concentration in apples will:

- be lowest in unripe apples when they are first picked from the tree
- increase over several days and peak in partially ripe apples
- decrease slightly in later days as the apples become fully ripe.

Sketch a line graph below, including labelled axes, to show the predicted results.



[2]

(c) The student used the redox indicator DCPIP to investigate how ascorbic acid concentration changes as the apples ripen.

The student tested the ascorbic acid concentration of the apples at intervals from the time they were taken from the tree until the apples were fully ripe.

For each test, the student prepared an apple extract solution and reacted this with a DCPIP solution of standardised concentration.

(i) The student was provided with a $0.01\,mol\,dm^{-3}$ stock solution of DCPIP.

After preliminary research, the student decided to dilute the stock solution to prepare a $0.0005\,mol\,dm^{-3}$ DCPIP solution to use in the experiment.

The student used two steps to dilute the stock solution to the $0.0005\,mol\,dm^{-3}$ DCPIP solution.

Complete the description of the two steps for the dilution by adding the correct values to the sentences.

step 1

The student mixed $10\,cm^3$ of $0.01\,mol\,dm^{-3}$ DCPIP stock solution with ..... cm^3 of distilled water to produce solution **A**. Solution **A** had a concentration of $0.001\,mol\,dm^{-3}$.

step 2

The student then mixed ..... cm^3 of solution **A** with $50\,cm^3$ of distilled water to produce the $0.0005\,mol\,dm^{-3}$ DCPIP solution.

[2]

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(ii) DCPIP changes colour from blue to colourless when it is reduced by ascorbic acid.

- The volume of DCPIP that can be reduced by ascorbic acid is a measure of the concentration of ascorbic acid present in a solution.
- When all the ascorbic acid present in a solution has reacted with DCPIP, any more DCPIP that is added will remain blue.

The student had access to standard laboratory equipment and a burette.

DCPIP solution can be added to a burette and released one drop at a time by turning a tap.

Fig. 1.2 shows a burette set up for this investigation.

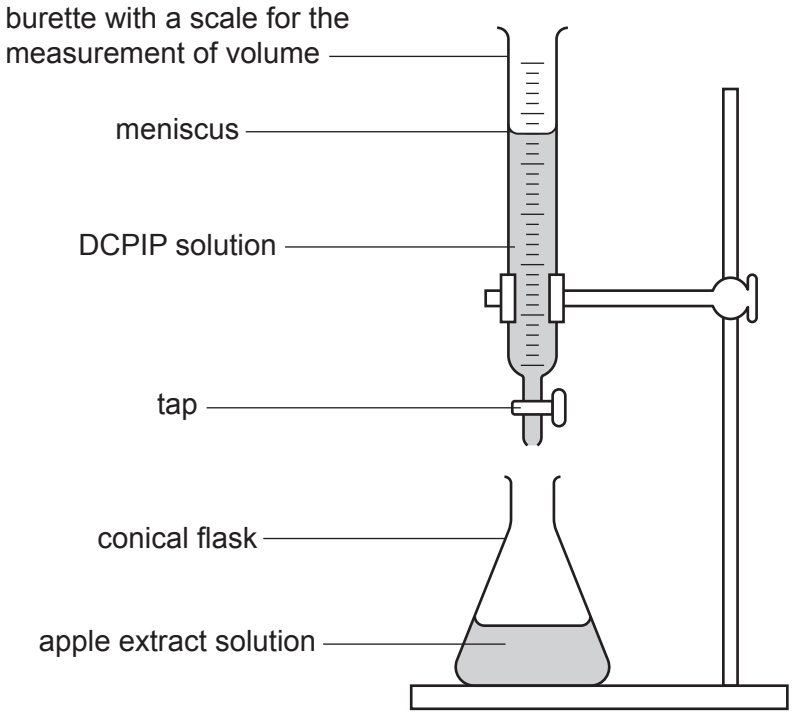


Fig. 1.2

Describe a method the student could use to:

- prepare apple extract solutions from the fruit
- collect the results needed to show the changes in ascorbic acid concentrations as the apples ripen, using DCPIP.

The description of your method should be set out in a logical way and be detailed enough for another person to follow.

You should **not** repeat the details from **(c)(i)** describing how to dilute the $0.01\,mol\,dm^{-3}$ stock solution of DCPIP.

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..... [9]

(d) After recording the results, the student decided that Pearson's linear correlation was a more appropriate test to use than Spearman's rank correlation to test whether ripeness and ascorbic acid concentration were correlated.

Suggest **two** reasons why Pearson's linear correlation was the more appropriate statistical test.

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..... [2]

(e) Many fruits are a good source of β-carotene, which can be converted in the human body to vitamin A.

The student investigated the β-carotene content of apples.

The student measured the β-carotene concentration in ripe apples and the ripe fruit of four other species.

Fig. 1.3 shows the results.

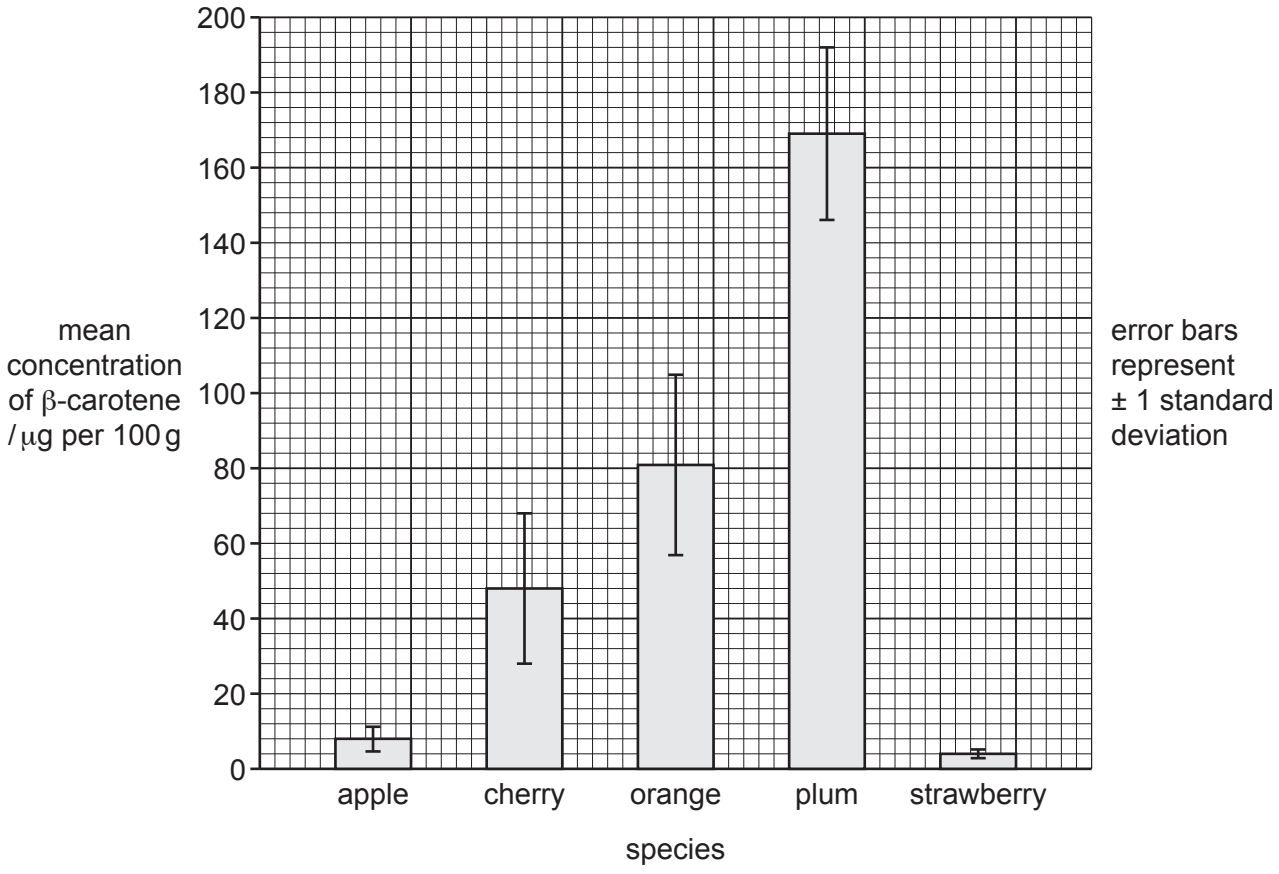


Fig. 1.3

The student concluded that apples are **not** a good dietary source of vitamin A.

Use the data in Fig. 1.3 to evaluate this conclusion.

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..... [3]

[Total: 20]

2 Trypsin is a protease enzyme. A student compared the activity of trypsin from two different species: the Atlantic salmon, *Salmo salar*, and the domestic pig, *Sus scrofa domesticus*.

Fig. 2.1 shows an Atlantic salmon and Fig. 2.2 shows domestic pigs.



Fig. 2.1



Fig. 2.2

Atlantic salmon are fish and are ectothermic, which means that the internal body temperature fluctuates with the surrounding environmental temperature.

The water temperature in the habitat of Atlantic salmon can decrease to –0.5 °C.

Domestic pigs are mammals and maintain an internal body temperature of approximately 38 °C.

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The student was provided with trypsin from Atlantic salmon, trypsin from domestic pigs and cubes of gelatine. Gelatine is made from the protein collagen.

The student measured the time taken for the trypsin from each animal species to break down the gelatine cubes at 20 °C.

The student:

- used 10 cm^3 of 5% trypsin solution from each animal species
- placed each trypsin solution in separate test-tubes, maintained at 20 °C in a water-bath
- placed a gelatine cube in each test-tube of trypsin solution
- recorded the time taken to break down the gelatine cube in each test-tube.

The student repeated this 12 times for each type of trypsin.

(a) (i) Identify the independent variable **and** the dependent variable in this experiment.

independent variable .....

dependent variable .....
[2]

(ii) The student standardised the temperature of the water-bath, the volume of the trypsin solution and the concentration of the trypsin solution.

State **one** other variable that the student should standardise in this experiment.

.....

..... [1]

(b) The results of the experiment are shown in Table 2.1.

Table 2.1

replicate	time taken to break down gelatine cube / seconds	
	Atlantic salmon	domestic pigs
1	125	130
2	121	127
3	128	134
4	119	128
5	132	135
6	125	130
7	131	132
8	127	128
9	126	128
10	131	137
11	131	133
12	129	131
mean	127.1	
standard deviation (s)	4.1	

(i) Use the data in Table 2.1 to calculate the mean time taken for trypsin from domestic pigs to break down the gelatine cube.

mean = ... seconds [1]

(ii) The formula for calculating standard deviation is:

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Key to symbols
x = observation
$\bar{x}$ = mean
n = sample size (number of observations)

The student calculated $\sum(x - \bar{x})^2$ as **110.92** for the domestic pigs.

Use the calculated value of $\sum(x - \bar{x})^2$ and the data in Table 2.1 to complete the calculation of the standard deviation for domestic pigs.

s = ... seconds [1]

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(iii) The student used a *t*-test to analyse the data.

The null hypothesis for this *t*-test was:

There is no difference between the time taken for trypsin from Atlantic salmon and trypsin from domestic pigs to break down a gelatine cube at 20°C.

The calculated value of *t* was **2.663**.

The student compared **2.663** to the values in Table 2.2.

Table 2.2

degrees of freedom	probability level (*p*)			
	0.10	**0.05**	**0.01**	**0.001**
20	1.725	2.086	2.845	3.850
21	1.721	2.080	2.831	3.819
22	1.717	2.074	2.819	3.792
23	1.714	2.069	2.807	3.767
24	1.711	2.064	2.797	3.745

Using Table 2.1, Table 2.2 and the calculated value of *t* of **2.663**, state **and** explain what the student can conclude about the results.

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..... [3]

(iv) Suggest explanations for the difference between the activity of the enzyme trypsin in Atlantic salmon and the activity of trypsin in domestic pigs.

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..... [2]

[Total: 10]

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