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 25 October 2023

Morning (Time: 1 hour 20 minutes)

Paper reference **WBI16/01**

Biology

International Advanced Level

UNIT 6: Practical Skills in Biology II

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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 7 5 6 2 0 A 0 1 2 4

Pearson

Answer ALL questions.

1 The photograph shows fruits on a camu camu tree.

(Source: © 'guentermanaus / Shutterstock)

Camu camu trees grow in the Amazon basin of South America.

The fruits have a very high vitamin C content.

(a) A student found the vitamin C content of camu camu fruits changed with the length of time in storage.

Freshly picked fruits had a mean vitamin C content of 2 400 mg per 100 g.

After being stored for 28 days, the mean vitamin C content was 1 848 mg per 100 g.

Calculate the percentage decrease in vitamin C found in the camu camu fruits after 28 days.

(1)

Answer ..... %

(b) The student read that 'the vitamin C content of these fruits decreases the most during the first 14 days of storage.'

Describe an experiment to investigate the change in vitamin C content when the fruits are stored for 14 days compared with 28 days.

(6)

(c) Vitamin C promotes the production of collagen to help the repair of human connective tissues.

Describe the structure of a collagen molecule.

(3)

(Total for Question 1 = 10 marks)

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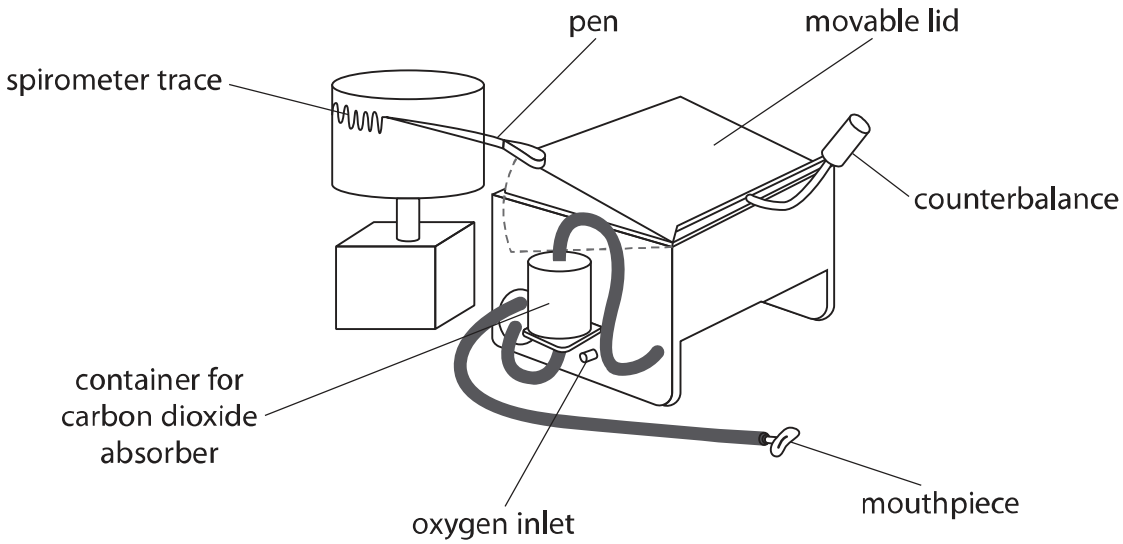
2 The diagram shows a spirometer that can be used to investigate human lung function.



A student used a spirometer to investigate the consumption of oxygen of a group of volunteers.

(a) Suggest **one** risk the volunteer subjects might encounter when using this spirometer and how the student could reduce the risk.

(2)

Risk

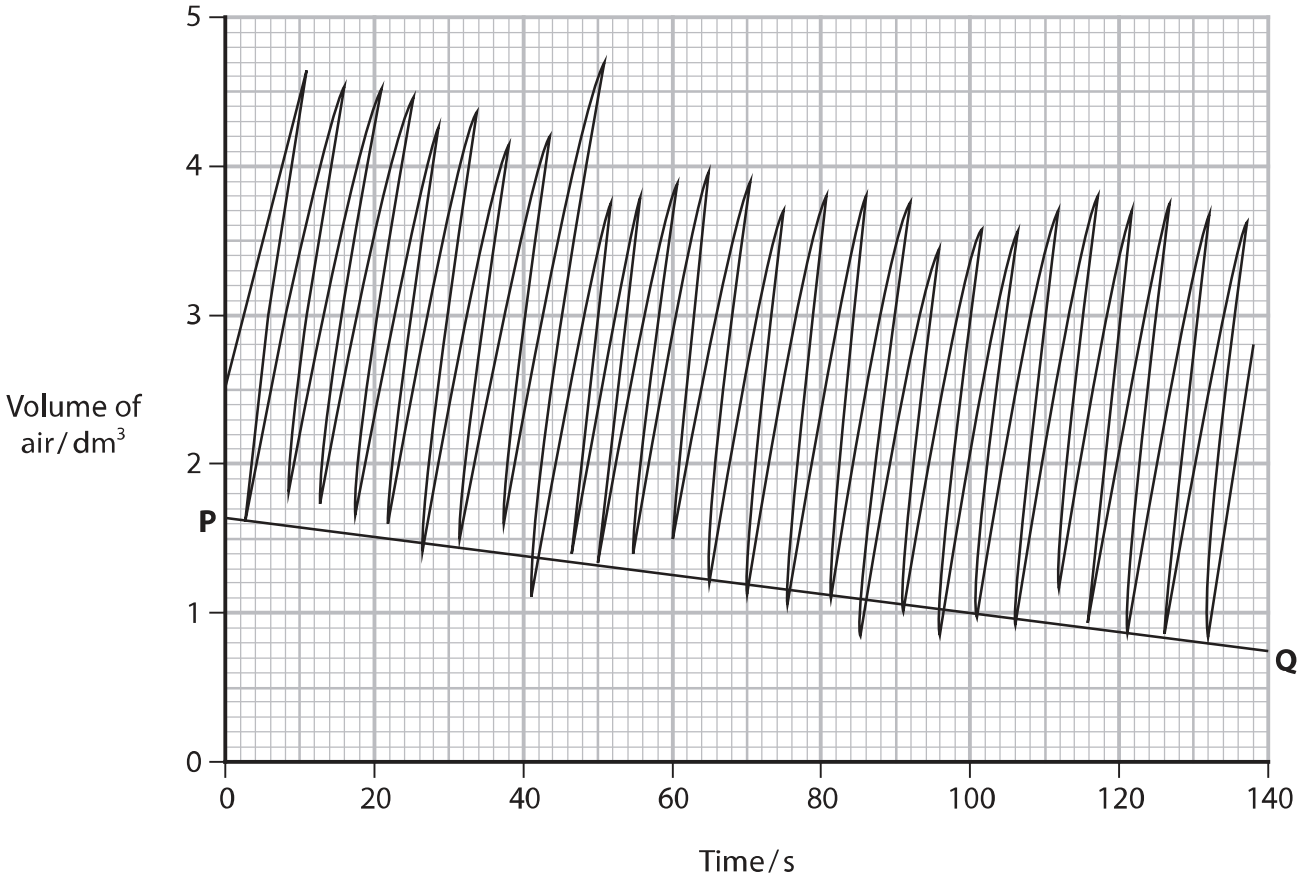
.....

How the student could reduce the risk.

.....

.....

(b) The graph shows a spirometer trace from one volunteer breathing at rest.



The line PQ indicates the oxygen consumption.

Calculate the rate of oxygen consumption between P and Q.

Give your answer with appropriate units.

(2)

Answer .....

(c) The student controlled several variables in this investigation.

(i) State **two biotic** variables that could affect this investigation.

(2)

First variable

Second variable

(ii) Choose **one** of the variables you have identified in (i).
Describe how this variable can be controlled.

(1)

Variable

Method of control

(d) Describe how the ventilation centre in the medulla oblongata controls the ventilation rate.

(3)

(Total for Question 2 = 10 marks)

3 The photograph shows a young locust eating the leaves of a plant.

(Source: © Nigel Cattlin / Alamy Stock Photo)

Locusts can breed in large numbers and destroy crops, such as sorghum, in East Africa.

A scientist observed that some varieties of sorghum were more likely to be eaten by young locusts.

The scientist collected the seeds of two varieties of sorghum (A and B) and grew them in trays.

Locust eggs were collected and hatched into young locusts.

Twenty young locusts were placed in a cage containing 100 g of fresh sorghum leaves of variety A. The cage was kept at 30 °C.

After 24 hours, the leaves were removed and the mass of leaves eaten was calculated.

This method was repeated with fresh sorghum leaves of variety B.

The method was repeated six times for these two varieties of sorghum leaves.

The results:

Mass of leaves eaten of variety A

17.3 17.2 17.5 17.0 16.7 16.9

Mass of leaves eaten of variety B

17.8 17.9 17.7 17.6 17.8 17.4

(a) State a suitable null hypothesis for this investigation.

(1)

.....

.....

.....

.....

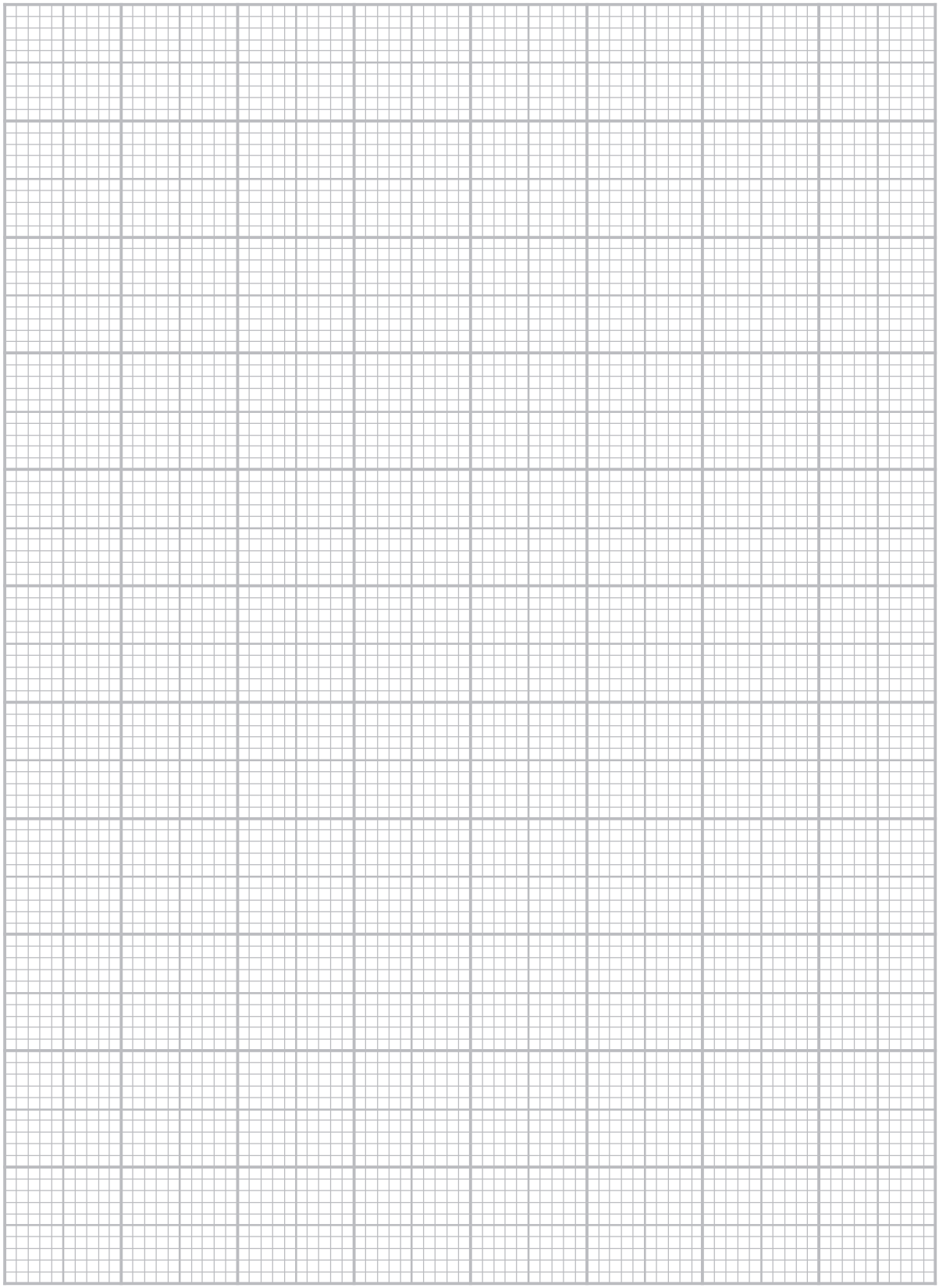
(b) Draw a suitable table to display the **data** and your calculated **means** for the mass of leaves eaten for these varieties of sorghum.

(3)

(c) Draw a suitable graph to show the mean mass of leaves eaten of variety A and variety B.

Include an indication of the variability of the data.

(3)



(d) The student analysed the data using the *t* test formula:

$$t = \frac{(\bar{x}_A - \bar{x}_B)}{\sqrt{\frac{(S_A)^2}{n_A} + \frac{(S_B)^2}{n_B}}}$$

Where:

$\bar{x}$ is the mean value for each treatment

n is the number of samples for each treatment

$(S_A)^2 = 0.084$ and $(S_B)^2 = 0.032$

(i) Calculate the value of *t*.

(2)

Answer .....

(ii) The table shows the critical values of *t* for different degrees of freedom.

The number of degrees of freedom = $(n_1 - 1) + (n_2 - 1)$.

Degrees of freedom	p = 0.05	p = 0.01
6	2.45	3.70
7	2.37	3.50
8	2.31	3.36
9	2.26	3.25
10	2.23	3.17
11	2.20	3.11
12	2.18	3.06

Describe the conclusions that can be drawn from this investigation.
Use the information in the table to support your answer.

(2)

(e) Describe how the student could extend this investigation to collect more data to either support or reject the hypothesis.

(2)

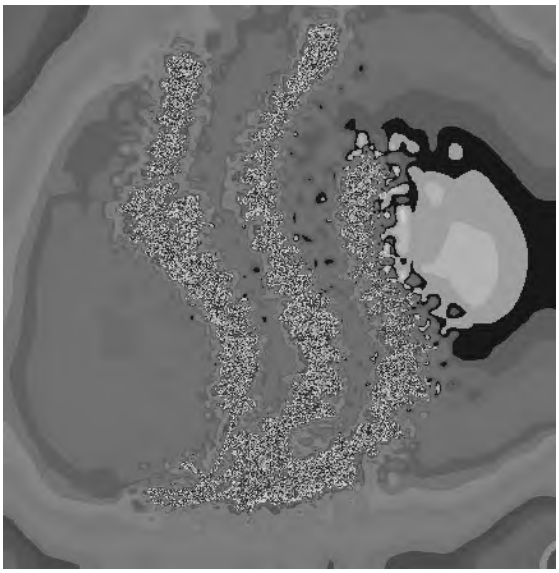
(f) Some scientists predict that climate change will increase the destruction of crops in East Africa.

Suggest **one** reason why some scientists think this.

(1)

(Total for Question 3 = 14 marks)

4 The photograph shows an aquatic plant, *Cabomba aquatica*.



(Source: © Dorling Kindersley Ltd / Alamy Stock Photo)

This plant grows in water in Asia.

A student observed that the shortest plants were always seen in water shaded by overhanging trees.

The student thought that reduced photosynthesis may be limiting the growth of these plants.

The student formed the following hypothesis:

Low light intensity reduces the rate of photosynthesis in Cabomba aquatica.

Plan an investigation to find evidence to support or reject this hypothesis.

Your answer should give details under the following headings.

(a) Describe preliminary practical work that you might undertake to ensure your proposed method would provide quantitative results.

(2)

(b) Devise a detailed method, including how you would control and monitor important variables.

(9)

(c) Describe how your results should be recorded, presented and analysed in order to draw conclusions from your investigation.

(3)

(d) Suggest **two** limitations of your proposed method.

(2)

(Total for Question 4 = 16 marks)

TOTAL FOR PAPER = 50 MARKS

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