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 **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 out** 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.*
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.

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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Q:1/1/1/1/1/

P 7 0 8 1 5 A 0 1 2 0

Pearson

Answer ALL questions.

1 The photograph shows a zebrafish, *Danio rerio*.

Zebrafish live in freshwater throughout South Asia.

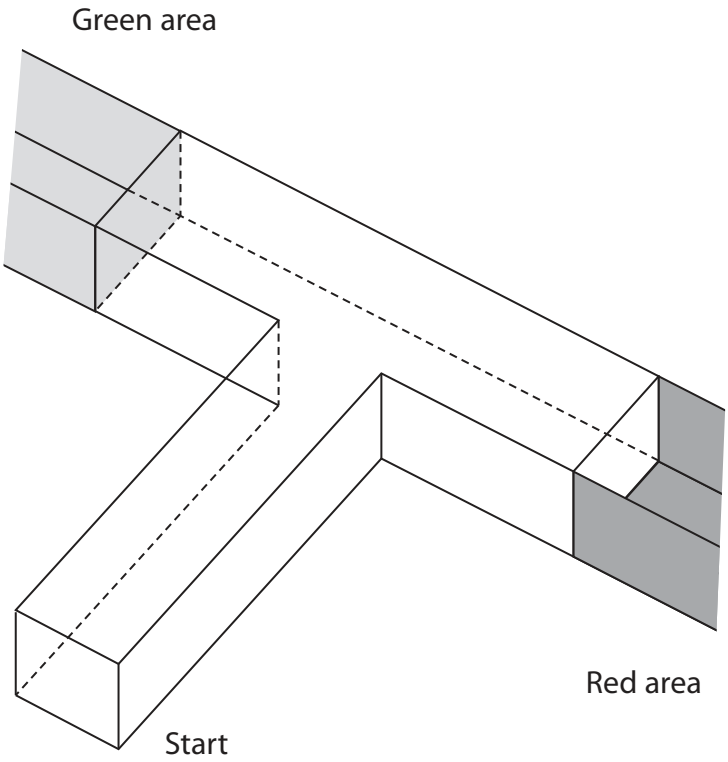
Magnification ×1

(Source: © Pablo Bou Mira/Alamy Stock Photo)

Zebrafish are social animals. They can be kept in large numbers in tanks in the laboratory.

A scientist investigated the preference of zebrafish for different coloured areas of a T-maze, filled with water.

The diagram shows the T-maze used in this investigation.



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A group of 72 zebrafish was used in this investigation.

These fish were raised from eggs of zebrafish living in a river.

Each fish was placed at the start of the T-maze and the colour area the fish swam to was recorded.

The results are shown in the table.

Number of fish preferring	
Green area	**Red area**
44	28

(a) Each fish was returned to the source that the eggs came from.

Suggest **one** reason why the scientist thought it was acceptable to carry out this investigation.

(1)

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(b) (i) The scientist made a prediction:

There is no difference between the observed (O) and expected (E) colour preference of the zebrafish.

Using the formula calculate the value of Chi squared.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

(3)

Answer .....

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(ii) The critical value of Chi squared was 3.84.

Give a conclusion that could be made from this investigation.

(1)

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(c) (i) State **one** abiotic variable that could affect the results of this investigation.

(1)

Abiotic variable

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(ii) Describe how this abiotic variable could be controlled and the effect it could have on the results if it is not controlled.

(2)

Variable

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Describe how this variable is controlled

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Describe the effect it could have on the results if it is not controlled.

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(d) Suggest why the scientist used each zebrafish only once.

(1)

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(Total for Question 1 = 9 marks)

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2 The photograph shows kiwifruits and guava fruits from two different parts of the world.

kiwifruit

(Source: © Aflo Co., Ltd./Alamy Stock Photo)

guava fruit

(Source: © Y H Lim/Alamy Stock Photo)

These fruits contain vitamin C.

A student investigated the vitamin C content present in each type of fruit.

(a) Describe an experiment to measure the vitamin C content of each type of fruit.

(6)

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(b) The student found the vitamin C content of the fruits to be:

kiwifruit 92.7 mg 100 g^{-1}

guava fruit 223.3 mg 100 g^{-1}

Calculate the percentage difference in vitamin C content of the guava fruit compared with the kiwifruit.

Give your answer to three significant figures.

(2)

Answer ..... %

(c) Vitamin C is needed in the production of factors involved in the formation of a blood clot.

Describe how a blood clot is formed.

(4)

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(Total for Question 2 = 12 marks)

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3 The photograph shows a sunflower plant, *Helianthus annuus*.

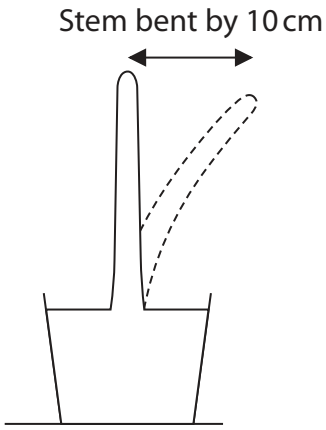
(Source: © Richard Griffin/Alamy Stock Photo)

A student investigated the effect that wind had on the bending of plants.

Thirty sunflower plants were grown in individual pots until they were 60 cm tall.

The leaves and flowers were removed from the sunflower plants.

For one group of 15 plants, the top of each stem was bent by 10 cm and then released as shown in the diagram.



The bending of the stems was repeated once a day for eight weeks.

A control group of 15 plants were kept in the same conditions but without the stems being bent.

The diameter of the stem at the base of each plant was measured after eight weeks.

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The results of this investigation are:

Experimental group stem diameters (mm)

17.34 18.16 17.61 18.14 17.64 18.14 17.95 17.78
17.69 17.84 17.99 17.95 17.89 18.16 18.22

Control group stem diameters (mm)

17.15 17.52 17.57 17.03 17.26 17.31 17.09 17.38
17.41 17.21 17.34 17.16 17.15 17.32 17.60

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

(1)

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(b) Draw a suitable table to display the **data** and your calculated **means** for these two groups of plants.

(3)

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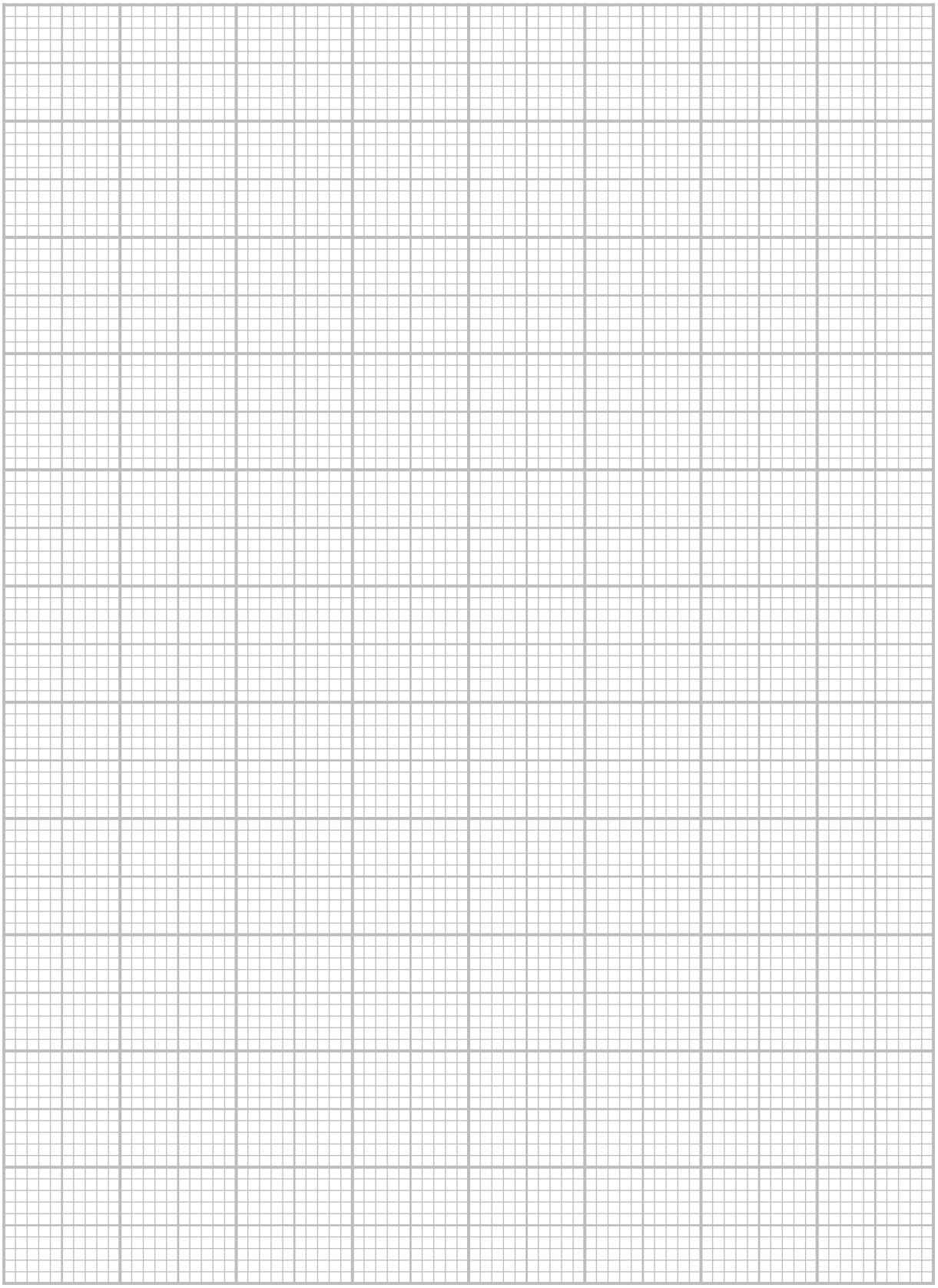
(c) Plot a suitable graph to show the mean diameter of the stems for each group of plants. Include an indication of the variability of these data.

(3)



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(d) The student analysed this data with a *t* test using the 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 group of plants

n is the number of samples for each group of plants

$(S_A)^2 = 0.03$ and $(S_B)^2 = 0.06$

(i) Calculate the value of *t*.

(2)

Answer .....

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

The number of degrees of freedom = $(n_A - 1) + (n_B - 1)$

Degrees of freedom	Level of significance (p)	
	0.05	0.01
15	2.13	2.95
16	2.12	2.92
17	2.11	2.90
18	2.10	2.88
19	2.09	2.86
20	2.09	2.84
21	2.08	2.83
22	2.07	2.82
23	2.07	2.81
24	2.06	2.80
25	2.06	2.79
26	2.06	2.78
27	2.05	2.77
28	2.05	2.76
29	2.04	2.76
30	2.04	2.75

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

(2)

(e) Explain why it may **not** be reasonable to draw valid conclusions from the results of this investigation.

(2)

(Total for Question 3 = 13 marks)

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4 The photograph shows germinating mung beans, *Vigna radiata*.

(Source: © Martin Lee/Alamy Stock Photo)

Mung beans contain starch and proteins. These molecules can be respired.

Mung beans develop into seedlings using energy from respiration.

The respiratory quotient (RQ) indicates the type of molecule being respired.

A student formed the following hypothesis:

As mung bean seedlings age, their respiratory quotient (RQ) decreases.

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

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

(3)

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

(8)

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

(3)

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

(2)

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(Total for Question 4 = 16 marks)

TOTAL FOR PAPER = 50 MARKS

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