Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

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.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ▶

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Pearson

Answer ALL questions.

Write your answers in the spaces provided.

1 The photograph shows a brine shrimp, *Artemia salina*.

Magnification $\times 2.0$

Brine shrimps are invertebrate animals that live in salt lakes. They feed on algae and reproduce by producing eggs.

When the conditions are favourable, the eggs hatch into brine shrimps.

A student observed that eggs hatched faster when calcium ions were added to the saltwater.

(a) Describe an experiment to investigate the effect of calcium ion concentration on the time taken for brine shrimps to hatch.

(5)

(b) (i) State **two abiotic** variables, other than the independent variable, that could affect this experiment.

(2)

First variable .....

Second variable .....

(b) (ii) Choose **one** of the variables you have identified in (b)(i).

Explain how this variable could be controlled.

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

(2)

Variable .....

How this variable is controlled.

.....

.....

Effect it could have on the results if it is not controlled.

.....

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(c) Calcium ions can bind to some enzymes.

Explain how the presence of calcium ions can affect the time taken for brine shrimp eggs to hatch.

(3)

(Total for Question 1 = 12 marks)

2 The photograph shows switchgrass, *Panicum virgatum*.

© Florapix / Alamy Stock Photo

This plant is grown on many farms in North America. It produces a large biomass that can be used to generate electricity or food for farm animals.

A scientist investigated the biomass produced by two different varieties of switchgrass, Almo and Kanlow.

One field was divided into twenty plots of the same area.

Ten of these plots were planted with seeds of the variety Almo and the other ten plots were planted with seeds of the variety Kanlow.

All the plots were planted with the same density of seeds.

All the plots were harvested by machine on the same day.

This was repeated each year for seven years.

The notebook shows the results of this investigation.

Almo biomass $\times 10^3$ kg per hectare	Kanlow biomass $\times 10^3$ kg per hectare
year one 20.1	year one 15.5
year two 19.2	year two 22.2
year three 14.2	year three 14.4
year four 11.4	year four 11.4
year five 11.8	year five 12.6
year six 13.6	year six 15.2
year seven 14.0	year seven 16.5

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

(1)

(b) (i) State the meaning of the term **biomass**.

(1)

(ii) When burnt, switchgrass biomass releases 14.25 MJ kg^{-1} of energy.

Calculate the energy released from burning all the Kanlow biomass produced in year four.

Give your answer to **two** significant figures, using standard form.

(2)

..... MJ

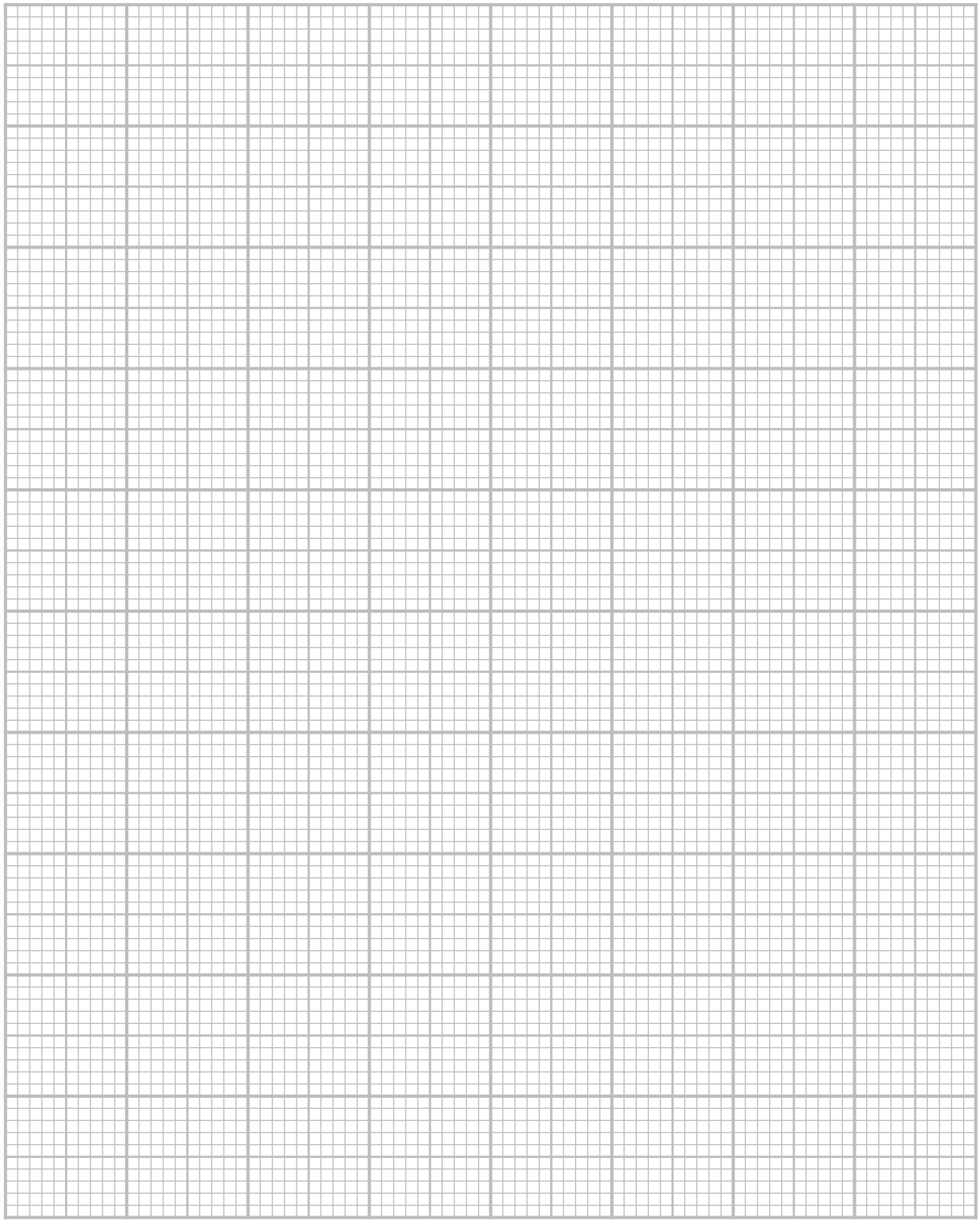
(iii) Draw a suitable table to display the results of this investigation. Label the median for both varieties of switchgrass.

(2)

(c) Draw a graph to show the **median** biomass for each variety of switch grass.

Include an indication of the variability of the data.

(3)



(d) The scientist used a Mann-Whitney *U* test to analyse the data.

The following formulae were used.

$$U_1 = R_1 - \frac{n_1(n_1 + 1)}{2}$$

$$U_2 = R_2 - \frac{n_2(n_2 + 1)}{2}$$

Where n_1 and n_2 are the number of samples of each switchgrass.

The scientist calculated the value of $R_1 = 57.5$ and $R_2 = 47.5$

The value of $U_1 = 29.5$

(i) Calculate the value of U_2.

(2)

Answer .....

(ii) The table shows the critical value of U for probability value of $p = 0.05$.

For the difference to be significant, the smallest calculated U value has to be equal to, or less than, the critical value shown in the table.

Probability value $p = 0.05$

		n_2							
		5	6	7	8	9	10	14	15
n_1	5	2	3	5	6	7	8	13	14
	6	3	5	6	8	10	11	17	19
	7	5	6	8	10	12	14	22	24
	8	6	8	10	13	15	17	26	29
	9	7	10	12	15	17	21	31	34
	10	8	11	14	17	20	23	36	39
	14	13	17	22	26	31	36	55	59
	15	14	19	24	29	34	39	59	64

Deduce the conclusion that can be drawn from this investigation.

Use your graph and the information in the table to support your answer.

(3)

(e) Explain why it may **not** be reasonable to draw a valid conclusion from the method used in this investigation and the results obtained.

(3)

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(Total for Question 2 = 17 marks)

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3 The photograph shows a sea slug of the genus *Aplysia*, a marine animal.

Magnification $\times 1.0$

Aplysia can be kept in tanks in a laboratory.

Aplysia absorb oxygen using external gills.

When the gills are touched, the gills are completely withdrawn into the body by a reflex action.

The gills re-emerge after some time.

The student formed the following hypothesis:

The more frequently the gills are touched the less time it takes them to re-emerge.

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)

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

(10)

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

(4)

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

(4)

(Total for Question 3 = 21 marks)

TOTAL FOR PAPER = 50 MARKS

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