Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Thursday 23 January 2025

Afternoon (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.*

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.

1 The photograph shows a brine shrimp that is found in salt lakes in North America.

(Source: © Nature Picture Library / Alamy Stock Photo)

These brine shrimps hatch from eggs and feed on algae.

Some salt lakes contain copper ions from industrial activity. The concentration of copper ions is increasing, as the lakes are drying out.

A student hypothesised that an increasing concentration of copper ions may affect the time taken for the brine shrimps to hatch from the eggs.

(a) Describe an experiment to investigate the effect of the concentration of copper ions on the time taken for the brine shrimps to hatch from eggs.

(6)

(b) Suggest why using brine shrimps in this investigation does not create any ethical concerns.

(1)

(c) Copper ions (Cu^{2+}) can inhibit the enzymes involved in the hatching of brine shrimps.

Describe how copper **ions** could inhibit enzyme activity.

(3)

(Total for Question 1 = 10 marks)

2 Termites are insects that live in colonies and build termite mounds.

The photographs show a termite and a termite mound near an acacia tree, in East Africa.

(Source: © Jassada Wattanaungoon / Alamy Stock Photo)

(Source: © Independent Picture Service / Alamy Stock Photo)

Acacia trees can grow up to six metres in height in harsh environmental conditions.

These trees produce fruit containing seeds.

A student observed that the trees only produced fruit when they grew next to a termite mound.

(a) Describe a sampling method that could be used to collect valid data to investigate this observation.

(4)

(b) The table shows the observed results from another investigation.

Number of acacia trees producing fruit			
Trees growing next to termite mounds		**Trees not growing next to termite mounds**	
observed (O)	expected (E)	observed (O)	expected (E)
79	.....	51	.....

The student predicted that there is no difference between the observed (O) and expected (E) number of fruiting trees.

The student used the Chi squared test to analyse these results.

(i) Complete the table to show the expected (E) results.

(1)

(ii) Calculate the value of Chi squared (χ^2) using the formula:

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

(2)

Answer .....

(iii) Give **one** reason why the student used a Chi squared test to analyse these data.

(1)

.....

.....

.....

(iv) State **two abiotic** variables, other than mineral ions, that could affect the results of this investigation.

(2)

first variable

.....

second variable

.....

(c) The analysis showed that there is a positive relationship between the closeness of the mounds and the fruiting of the trees.

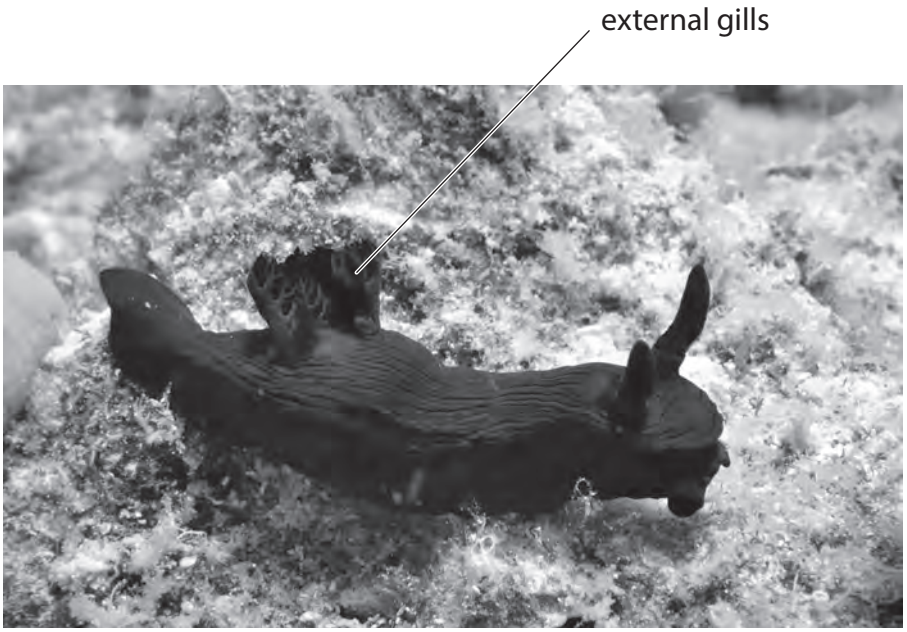
The soil near termite mounds has an increased concentration of nitrate ions.

Explain how nitrate ions help acacia trees to produce fruit.

(2)

(Total for Question 2 = 12 marks)

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



(Source: © Walkdragon / Shutterstock)

Aplysia can be kept in tanks in a laboratory.

Aplysia absorbs oxygen using external gills.

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

A student applied a touch stimulus to the gills and recorded the percentage of the gills that remained visible.

The touch stimulus was repeated five times at 30 second intervals and each response recorded.

The investigation was repeated with two more sea slugs and the means calculated.

The table shows the results obtained from these three sea slugs.

Stimulus	1st	2nd	3rd	4th	5th
Mean percentage of gill that remained visible (%)	10	52	47	49	45

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

(1)

.....

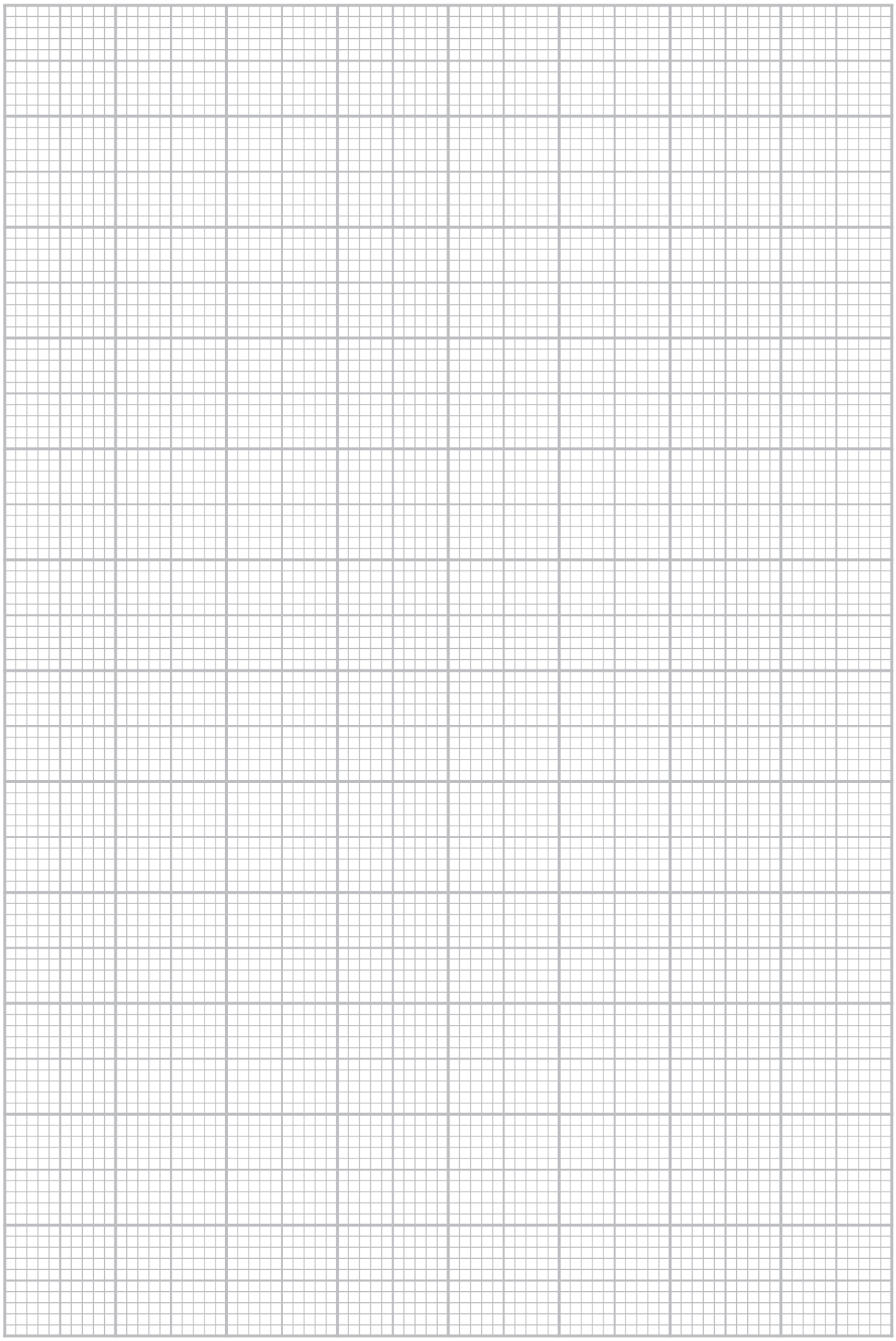
.....

.....

.....

(b) Draw a suitable graph to show the results in this table.

(3)



(c) The student used a correlation coefficient (r_s) to analyse the results.

The student produced a table to calculate the correlation coefficient (r_s).

Stimulus number (a)	Mean percentage of visible gills (b)	Rank (a)	Rank (b)	*d*	d^2
1	10	1	1	0	
2	52	2	5	–3	
3	47	3	3	0	
4	49	4	4	0	
5	45	5	2	–3	

(i) Complete the table.

(1)

(ii) Calculate the correlation coefficient, r_s, using the formula:

(2)

$$r_s = 1 - \frac{6\left(\sum d^2\right)}{n\left(n^2 - 1\right)}$$

Where:

$\sum$ = the sum of

d = the difference between each pair of ranks

n = the size of the sample (number of pairs of values)

Answer .....

(iii) The table shows some critical values for this statistical test.

Number of pairs of values	Level of significance (p)		
	0.10	0.05	0.01
4	1.000	–	–
5	0.900	1.000	–
6	0.829	0.886	1.000
7	0.714	0.786	0.929
8	0.643	0.738	0.881
9	0.600	0.700	0.833
10	0.564	0.648	0.794

Describe the conclusion that can be drawn from this investigation.

Use your calculated r_s value and the table of critical values to support your answer.

(2)

(d) Describe how the student could extend this investigation to collect more data to either support or reject the null hypothesis, in part (a).

(2)

(e) The change in response of an animal to repeated stimulation is an example of habituation.

Give **one** reason why habituation is beneficial to an animal.

(1)

(Total for Question 3 = 12 marks)

4 There are nearly 2 000 species of blow fly. They have a worldwide distribution.

Blow flies lay their eggs on dead mammals.

The eggs hatch into larvae that feed on organic matter.

The photograph shows some blow fly larvae feeding on muscle.

(Source: © Minden Pictures / Alamy Stock Photo)

Magnification × 1

Larvae are grown in large numbers in laboratories to test the toxicity of new chemical products.

In a laboratory they are fed on muscle.

A student formed the following hypothesis:

Blow fly larvae will have a higher rate of respiration when feeding on cubes of liver compared with cubes of muscle.

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)

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(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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