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 12 June 2024

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.*

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 *Saccharomyces cerevisiae* is a type of yeast. It is a single-celled organism which is widely used in brewing and baking.

The photograph shows yeast cells seen through a microscope.

(Source: © Kateryna Kon/Shutterstock)

(a) Most of the ATP produced when yeast respires aerobically comes from oxidative phosphorylation in the mitochondria.

Oxidative phosphorylation requires a source of hydrogen ions and the movement of electrons.

(i) State the location in the mitochondria where oxidative phosphorylation takes place.

(1)

.....

(ii) Name **one** molecule that carries hydrogen for use in oxidative phosphorylation.

(1)

.....

(b) Describe an experiment to investigate the effect of temperature on the rate of respiration in yeast, using an artificial hydrogen carrier (redox indicator).

(5)

(c) Explain why temperature affects the rate of respiration in yeast.

(3)

(Total for Question 1 = 10 marks)

2 Habituation is an example of learning that can be observed in many different animals.

(a) Woodlice are small animals that live in damp places, for example under stones and in areas with decomposing leaves.

The photograph shows one species of woodlouse before and after being gently touched.

(Source: © StellaNature/Alamy Stock Photo)

Describe how you could investigate habituation in woodlice.

(4)

(b) Zebrafish are freshwater fish native to South Asia.

The photograph shows two zebrafish.

(Source: © Mirko Rosenau / Alamy Stock Photo)

If zebrafish are exposed to sudden sounds or flashes of light they show a 'startle reflex', where their body bends quickly and they swim away rapidly.

Scientists investigated habituation in zebrafish exposed to a sound.

Each fish was exposed to a sound and the distance travelled by the fish in 0.5 seconds was recorded.

Each fish was then exposed to the sound on four more occasions.

A control group of zebrafish was not exposed to any sound.

The table shows the results of this investigation.

Group	Mean distance travelled after stimulus / cm				
	1	2	3	4	5
Zebrafish exposed to sound	5.2	3.0	2.4	1.9	1.5
Zebrafish exposed to no sound (control group)	0.6	0.5	0.6	0.5	0.5

(i) The mean distance travelled by the fish decreased from 5.2 cm to 1.5 cm after five stimuli.

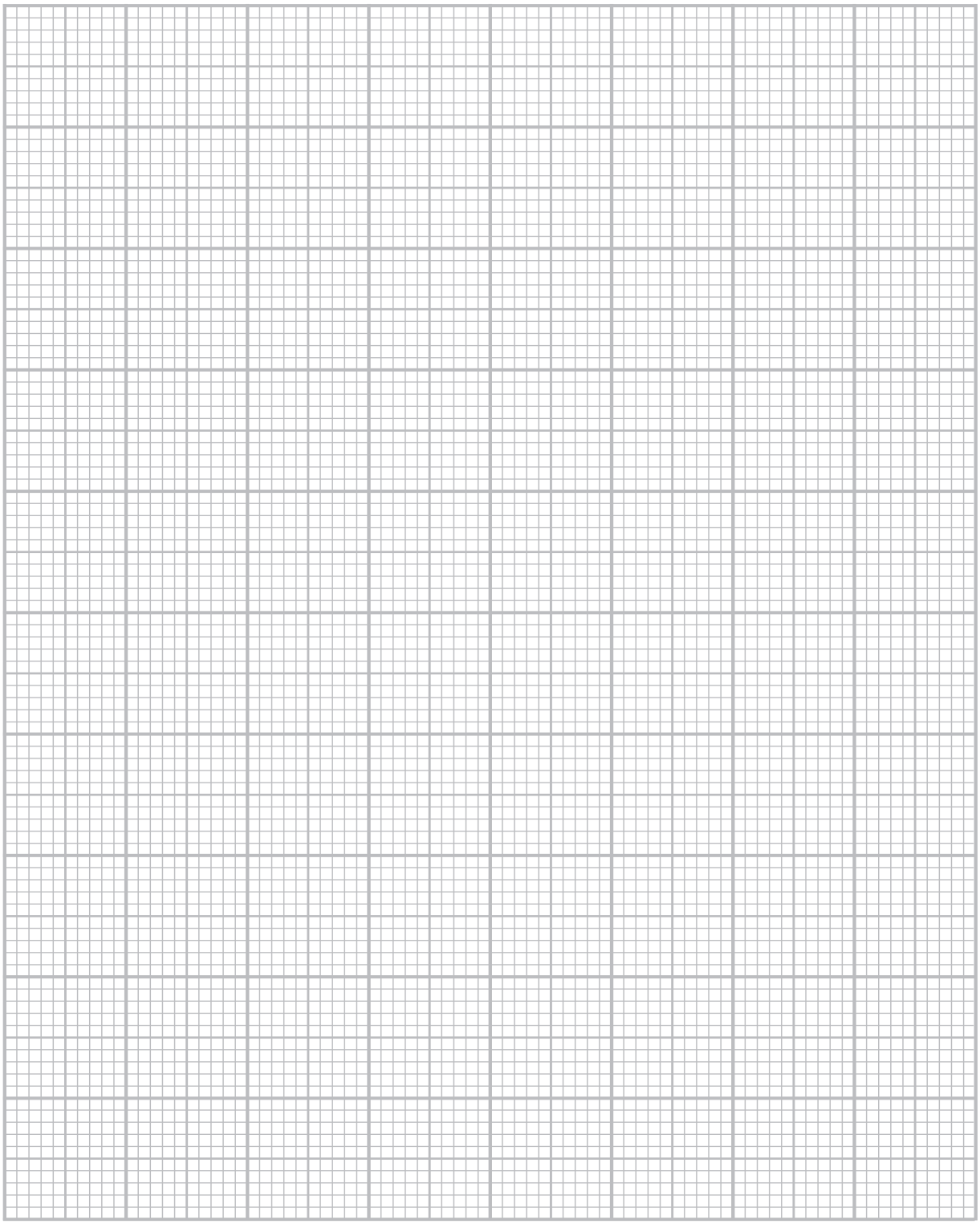
Calculate the percentage decrease in mean distance travelled.

(1)

Answer ..... %

(ii) Plot a line graph for the results of this investigation.

(3)



(iii) Give **one** way that this investigation should be conducted to avoid harming the fish.

(1)

(iv) State **one abiotic** and **one biotic** variable that could affect this investigation of habituation in zebrafish.

(2)

Abiotic variable

Biotic variable

(v) Choose **one** of the variables you have identified in (iv).

Describe how this variable could be controlled and the effect it would have on the results if it is not controlled.

(2)

Variable

How this variable could be controlled.

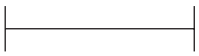
The effect it would have on the results if it was not controlled.

(Total for Question 2 = 13 marks)

3 The topshell is a marine mollusc widely found on European coasts.

It lives on rocky shores and is found in rock pools, on bare rocks and amongst seaweed.

The photograph shows a group of topshells.

Scale 

1 cm

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

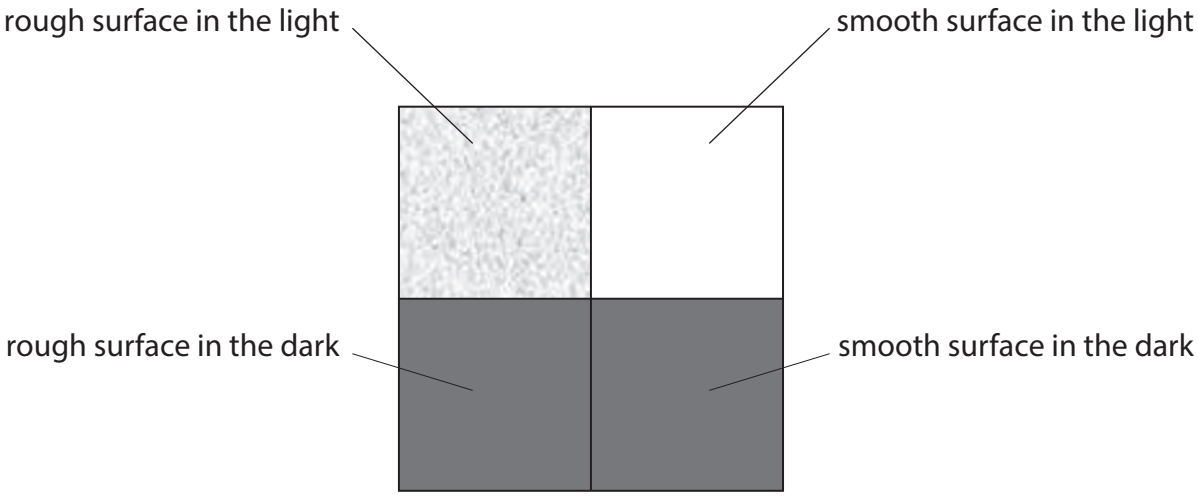
(a) Calculate the magnification of this photograph.

(1)

Answer .....

(b) A student investigated the types of habitat preferred by these topshells.

The diagram shows a tray with four different environmental conditions used by this student.



The student suggested the null hypothesis that topshells show no significant habitat preference.

Five topshells were placed in each of the four areas and the tray was left for five minutes for the animals to move around.

The number of topshells in each area was then recorded.

This was repeated three more times and the results totalled.

The table shows the results of this investigation.

Area	Number of topshells in each area of the tray after 5 minutes				Total number observed in each area of the tray	Total number expected in each area of the tray
	Trial 1	Trial 2	Trial 3	Trial 4	O	E
Smooth surface in the light	3	2	4	3		20
Rough surface in the light	4	4	4	3		20
Smooth surface in the dark	6	7	6	5		20
Rough surface in the dark	7	7	6	9		20

(i) Calculate the Chi-squared value using the formula:

(3)

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

Answer .....

(ii) The table shows some critical values for Chi-squared at different degrees of freedom.

Degrees of freedom	*p* value = 0.050
1	3.841
2	5.991
3	7.815
4	9.488

Comment on the results of this investigation.

Use the null hypothesis, your calculated Chi-squared value and the table of critical values to support your answer.

(3)

(iii) Justify **three** improvements that could be made to this investigation.

(3)

(Total for Question 3 = 10 marks)

4 When seeds germinate, starch is broken down and used as a respiratory substrate to provide energy for growth.

Respiration rate can be measured using a simple respirometer.

A student knew that mung beans germinate very quickly and wanted to compare the respiration rate in germinating mung beans with the rate in germinating peas.

They formed the following hypothesis:

Germinating mung bean seeds will have a faster respiration rate than germinating pea seeds.

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 how you would control and monitor important variables.

(8)

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

(3)

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

(3)

(Total for Question 4 = 17 marks)

TOTAL FOR PAPER = 50 MARKS