www.XtremePapers.com

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

7338206883

BIOLOGY **9700/51**

Paper 5 Planning, Analysis and Evaluation **October/November 2009**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
Total	

This document consists of **7** printed pages and **5** blank pages.

© UCLES 2009

BLANK PAGE

1 An investigation into the effect of temperature on the rate of the light-dependent stage of photosynthesis was carried out using isolated chloroplasts.
Samples of chloroplasts suspended in buffer were mixed with a coloured electron acceptor and exposed to light. The colour changes from blue to colourless as electrons are taken up by the electron acceptor.

For Examiner's Use

(a) (i) Sketch a graph to predict the results of the investigation.



[2]

(ii) Identify two key variables that must be controlled in this investigation.
For each explain how it might be controlled.

1.....

.....

.....

2. .....

.....

.....[4]

(iii) Outline a procedure to find the rate of reaction for this investigation.

.....

.....

.....[2]

(b) In a further investigation, small quantities of ADP and inorganic phosphate were added to the isolated chloroplasts before testing.

Suggest an hypothesis being tested by this further investigation.

.....

.....[1]

[Total: 9]

© UCLES 2009

[Turn over

For Examiner's Use

2 A solution of substance **Y**, thought to be a growth hormone, was made by dissolving a known mass of **Y** in 10 cm^3 of distilled water. This solution was added to samples from a culture of animal cells containing 3000 cells per mm^3.

- 25 mm^3 of solution **Y** was added to a cell sample.
- 25 mm^3 of distilled water was added to another cell sample.

After four days the number of cells per mm^3 of each culture was estimated using a microscope slide with a counting grid.

(a) Identify and explain the purpose of the control experiment used in this investigation.

.....

.....

..... [2]

(b) Fig. 2.1 shows a top view of a microscope slide with a counting grid. Fig. 2.2 shows a vertical section through the microscope slide and grid. Fig. 2.3 shows the detail of part of the grid viewed through a microscope.

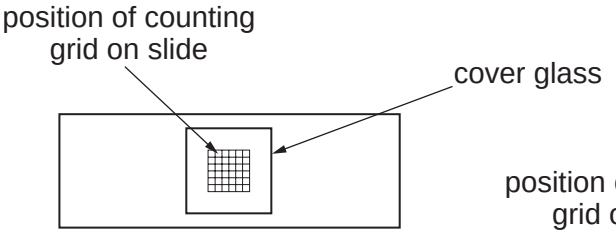


Fig. 2.1

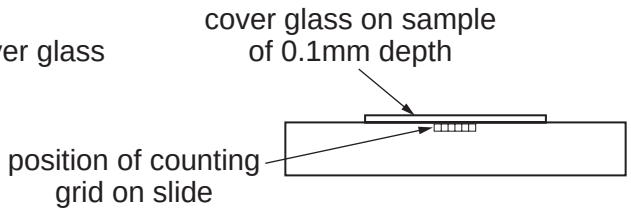


Fig. 2.2

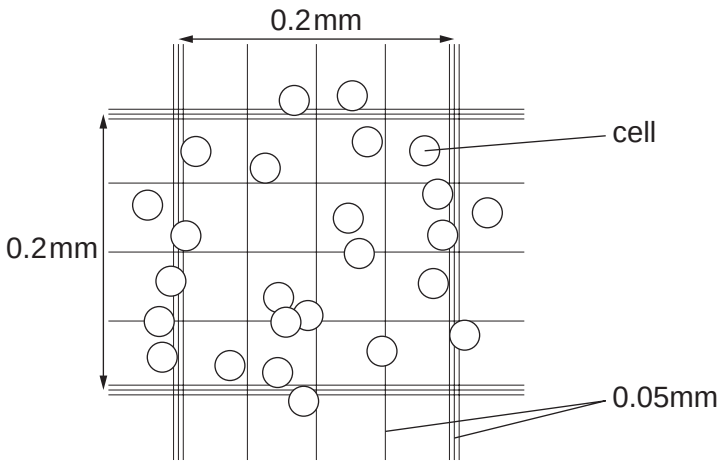


Fig. 2.3

Suggest how this apparatus could be used to estimate the number of cells per mm^3 of culture.

For Examiner's Use

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) Table 2.1 shows estimated number of cells in the experimental and control cultures after three days growth.

Table 2.1

	thousands of cells per mm^3 of culture										
sample number	1	2	3	4	5	6	7	8	9	10	**mean**
experimental culture	7.5	8.1	7.6	6.2	7.5	7.8	8.9	6.5	7.9	7.3	**7.5**
control culture	5.6	7.5	8.2	6.7	3.5	6.5	5.9	3.7	5.8	8.4	

(i) Complete Table 2.1 by calculating the mean number of cells per mm^3 in the control culture.

Write your answer in Table 2.1. [1]

(ii) A student correctly calculated the percentage increase in the number of cells per mm^3 in the experimental culture as 151% using the formula:

$$\frac{\text{(final number – original number)}}{\text{original number}} \times 100$$

Calculate the percentage increase in the control culture.
Show your working.

..... [1]

(d) The student's hypothesis for the investigation was:

For Examiner's Use

Substance Y promotes growth in animal cell cultures.

(i) Identify evidence from the results that supports this hypothesis.

.....

.....

.....

.....

.....

(ii) Identify evidence from the results that does **not** support this hypothesis.

.....

.....

.....

.....

.....[4]

[Total: 12]

BLANK PAGE

QUESTION 3 STARTS ON PAGE 8

For Examiner's Use

3 **(a)** Polychlorinated biphenyls (PCBs) are persistent organic pollutants. Their use has been banned in many countries. The effects of these pollutants on male fertility has been investigated by many scientists.

(i) One group of studies on fish indicates that some of these pollutants decrease the size of the testes in relation to body mass.

Suggest a procedure by which the relative size of the testes of fish might be estimated.

.....

.....

.....

.....

.....[3]

(ii) Name a statistical test that is suitable for determining if the decrease in the relative size of the testes is significant.

Explain your choice.

test .....

explanation .....[2]

(iii) Suggest one way in which the decrease in relative size of the testes may lower fertility of fish.

.....

.....

.....[1]

© UCLES 2009

For Examiner's Use

(b) Another group of studies tested the effect of one type of PCB, CB-153, on the DNA of human sperm.

In this study, the concentration of CB-153 present in the lipid in the blood plasma of fishermen was measured.

The DNA of a sperm sample was labelled using a fluorescent marker. Undamaged DNA fluoresces green and damaged DNA fluoresces red. The proportion of damaged DNA can be calculated as a DNA fragmentation index.

The data was grouped into six equal sized groups and plotted in relation to the concentration of CB-153 in the lipid in the blood plasma.

Fig. 3.1 shows the results of this study.

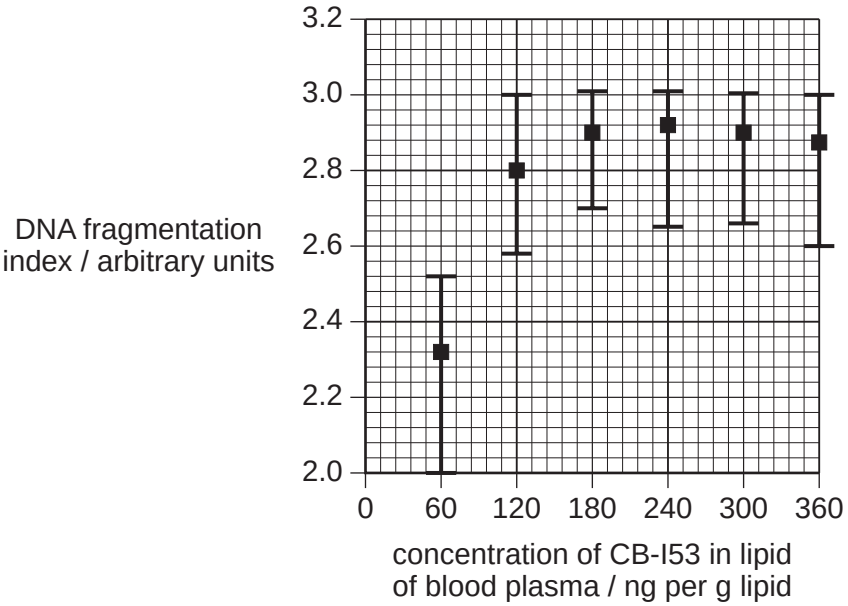


Fig. 3.1

State the conclusions that can be drawn from this investigation about the effect of CB-153 on the DNA of human sperm.

.....

.....

.....

.....

.....

.....[3]

[Total: 9]

© UCLES 2009

BLANK PAGE

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

www.XtremePapers.com

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4988245957

BIOLOGY **9700/52**

Paper 5 Planning, Analysis and Evaluation **October/November 2009**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
Total	

This document consists of **7** printed pages and **1** blank page.

© UCLES 2009

1 A definition of probiotics is: *'Live microorganisms which when administered in adequate amounts confer a health benefit to a person'*.
Lactic acid bacteria (LAB), which can be found in yoghurt, are commonly used as probiotics. The longer these bacteria survive in gastric juice (in the stomach) and intestinal juice (in the small intestine) the greater the benefit to the person.

For Examiner's Use

The effect of immobilisation and continuous culture on the probiotic characteristics of the LAB bacterium *Bifidobacterium longum* was studied.

Two continuous culture system were used:

C1: a control culture containing free bacteria,

C2: a test culture containing bacteria immobilised in beads.

The temperature of the fermenters was varied during the culture period.

Day 1–6	37 °C
Day 7–13	35 °C
Day 14 onwards	32 °C

Samples were collected from each culture system at different times. These cells were tested for their tolerance to a variety of environmental stresses.

(a) Suggest two variables in the fermenter that should be controlled. For each variable, suggest a method by which it might be controlled.

1. variable .....

   method of control .....

   .....

2. variable .....

   method of control .....

   ..... [4]

© UCLES 2009

The ability of cells to survive in the stomach and intestines was tested by mixing the cultures with artificial gastric and intestinal juices and incubating for 1 hour at 37 °C. Cell survival was estimated by counting the number of live colonies growing on culture plates after 48 hours.

For Examiner's Use

Fig. 1.1 shows the effect of immobilisation and continuous culture on cell survival of *B. longum*.

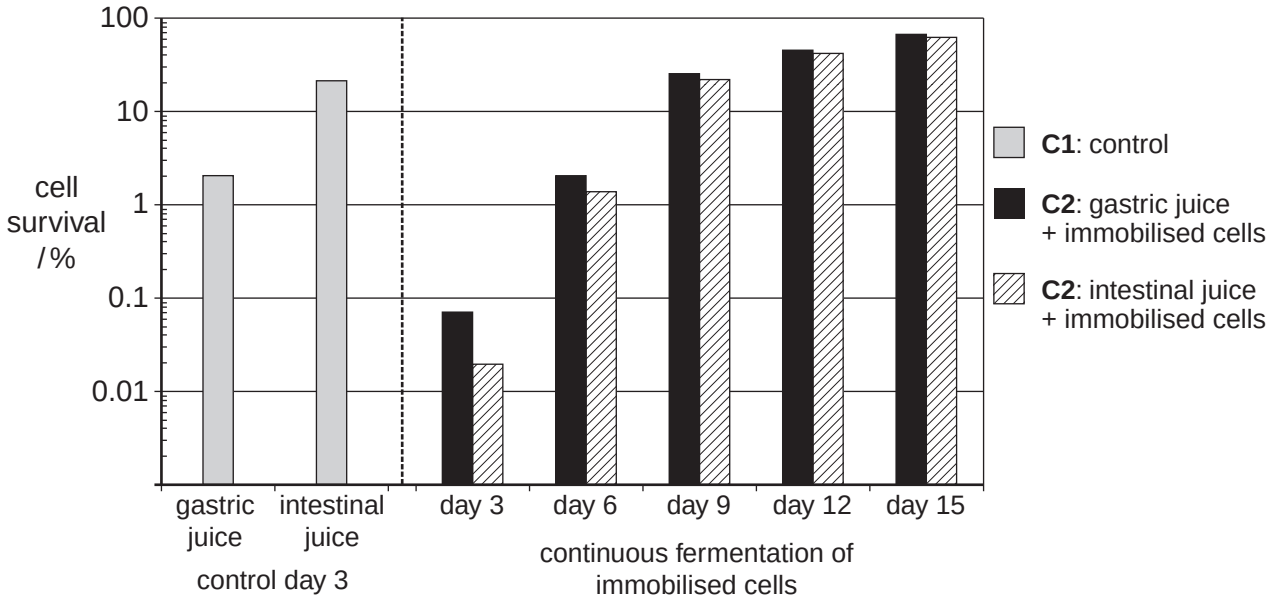


Fig. 1.1

(b) Describe what these results show about the percentage survival of *B. longum* in continuous culture.

.....

.....

.....

.....

.....

.....[3]

(c) The standard deviation of the survival rates for control cells after 3 days was estimated at 2±1% in gastric juice and 21±9% in intestinal juice.
State the data needed to calculate the standard deviation.

.....

.....[2]

[Total: 9]

2 Fig. 2.1 shows a diagram of a pollen trap.

For Examiner's Use

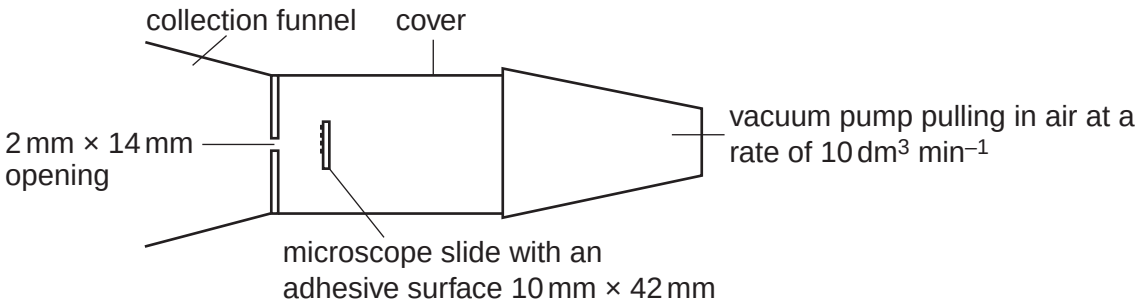


Fig. 2.1

This apparatus can be used to estimate the number of pollen grains present in the atmosphere. The apparatus is left for a period of time, the slide removed and a pollen stain added. The number of pollen grains are counted using a microscope.

A student thought that there would be more pollen in the atmosphere during the day than during the night. The hypothesis was:

As the light increases the number of pollen grains present in the atmosphere will increase and then decrease as the light decreases.

(a) Outline a procedure, using this pollen trap, that the student could use to test this hypothesis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

For Examiner's Use

.....

.....

.....[8]

(b) In a further investigation, the student collected pollen between 06.00h and 12.00h on a dry, hot day and estimated the number of pollen grains in 1 m^3 of air.

The mean number of pollen grains visible in the field of view = 6

The area of the field of view = 0.25 mm^2

The number of pollen grains in 1 m^3 of air = 2800

Use the data collected by the student and the information in Fig. 2.1 to show how the student obtained this number. Show all the steps in your calculation.

[3]

(c) The student then collected pollen for the same time period on a wet, hot day.

The mean number of pollen grains visible in the field of view = 2

The chi-squared test at 1 degree of freedom showed that the results were significant at 0.05 probability.

(i) State a null hypothesis for the chi-squared test.

.....

.....[1]

(ii) Explain why the student chose the chi-squared test.

.....

.....[1]

(iii) Explain why the student used 1 degree of freedom.

.....[1]

[Total: 14]

3 Discs of a plant tissue with cells containing a red pigment were cut and washed in running water for 24 hours. These discs were used by a group of students in an investigation to test the hypothesis:

For Examiner's Use

Ethanol increases membrane permeability more than an increase in temperature.

Fig. 3.1 shows the experimental set up used.

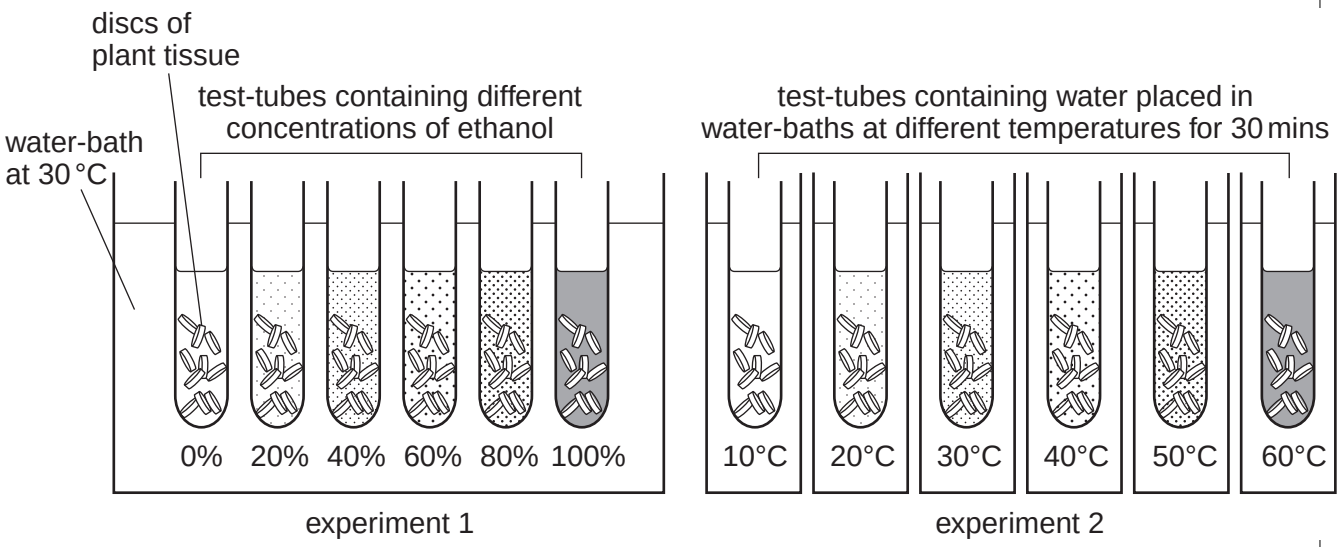


Fig. 3.1

After 30 minutes the liquid around the discs of plant tissue was poured into a colorimeter tube. A colorimeter with a blue filter was used to measure the absorbance of light. Water was used to standardise the absorbance of the colorimeter to 0.

The more red pigment in the liquid the higher the absorbance of light.

(a) (i) Identify the two independent variables in the investigation.

1. .....

2. ..... [2]

(ii) Identify the dependent variable.

..... [1]

Table 3.1 shows the results of experiment 1.

Table 3.1

	absorbance at each ethanol concentration					
	0%	20%	40%	60%	80%	100%
student 1	0.00	0.12	0.21	0.35	0.65	0.70
student 2	0.10	0.10	0.22	0.32	0.60	0.75
student 3	0.00	0.18	0.20	0.38	0.59	0.72
student 4	0.00	0.18	0.35	0.35	0.65	0.76
student 5	0.15	0.10	0.18	0.34	0.62	0.75

Table 3.2 shows the results of experiment 2.

Table 3.2

	absorbance at each temperature					
	10 °C	20 °C	30 °C	40 °C	50 °C	60 °C
student 1	0.00	0.00	0.00	0.09	0.65	0.79
student 2	0.15	0.20	0.05	0.15	0.70	0.85
student 3	0.10	0.05	0.00	0.18	0.62	0.81
student 4	0.00	0.00	0.04	0.30	0.75	0.88
student 5	0.10	0.00	0.02	0.25	0.60	0.85

(b) (i) **On Table 3.1**, indicate by placing a circle around the value, **two** results that may be anomalous. [2]

(ii) Suggest why the design of this investigation does not provide reliable results to allow a conclusion to be made about the hypothesis.

.....

.....

.....

.....

.....

.....[2]

[Total: 7]

© UCLES 2009

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.