



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Advanced Level

CANDIDATE  
NAME

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**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	
<b>Total</b>	

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



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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.

(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.

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2.....  
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..... [4]

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

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..... [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.

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..... [1]

[Total: 9]

[Turn over

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

- $25\text{ mm}^3$  of solution **Y** was added to a cell sample.
- $25\text{ mm}^3$  of distilled water was added to another cell sample.

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

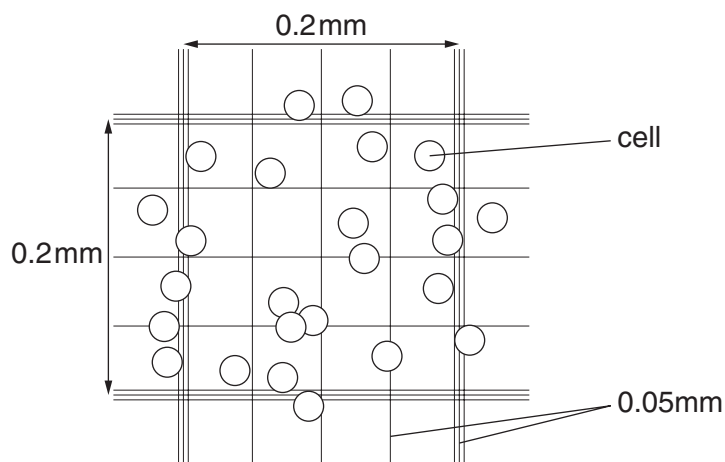
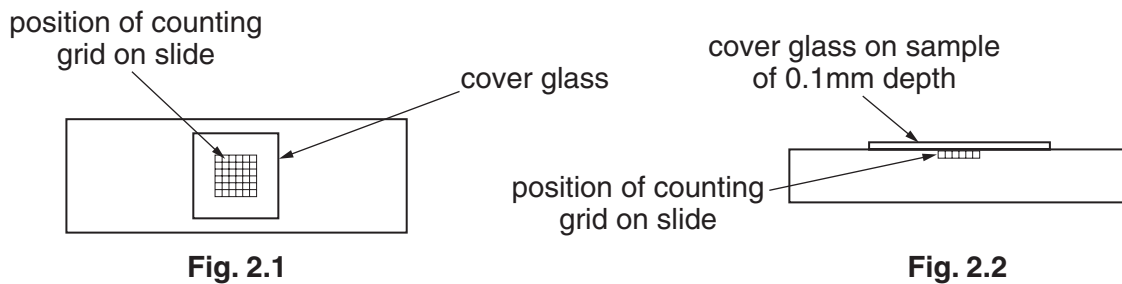
- (a) Identify and explain the purpose of the control experiment used in this investigation.

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..... [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. 2.3**

Suggest how this apparatus could be used to estimate the number of cells per mm<sup>3</sup> of culture.

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..... [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 <sup>3</sup> 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	<b>7.5</b>
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<sup>3</sup> 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<sup>3</sup> in the experimental culture as 151% using the formula:

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

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

..... [1]

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

Substance Y promotes growth in animal cell cultures.

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

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

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..... [4]

[Total: 12]

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**QUESTION 3 STARTS ON PAGE 8**

**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.

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.....[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.

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..... [1]



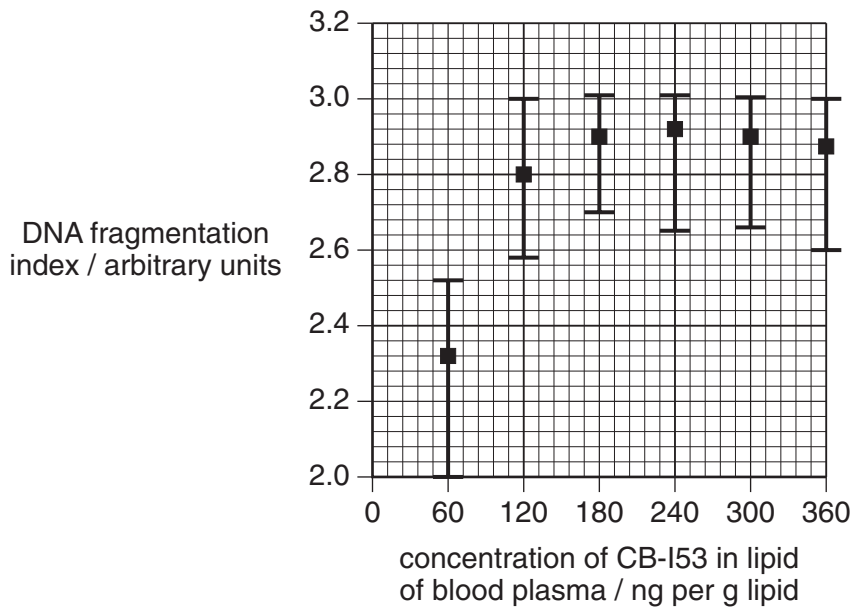
(b) Another group of studies tested the effect of one type of PCB, CB-153, on the DNA of human sperm.

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.

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..... [3]

[Total: 9]





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