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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.

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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.

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

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(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]

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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.

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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.

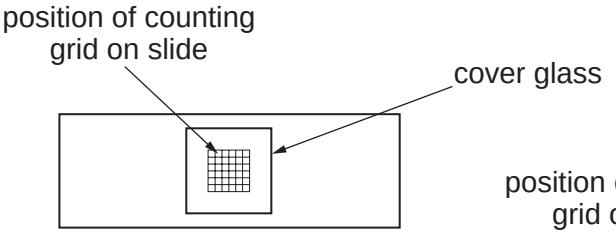

Fig. 2.1

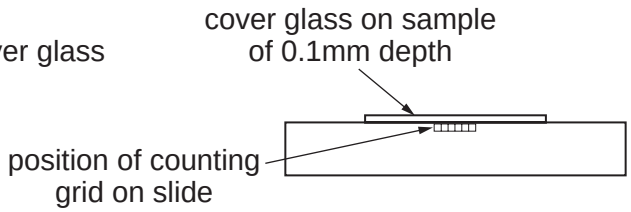

Fig. 2.2

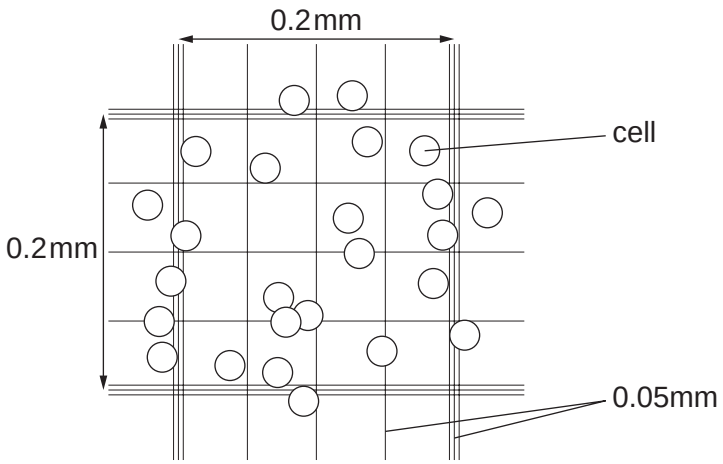

Fig. 2.3

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

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(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]

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

Substance Y promotes growth in animal cell cultures.

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(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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[Total: 12]

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QUESTION 3 STARTS ON PAGE 8

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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]

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(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.

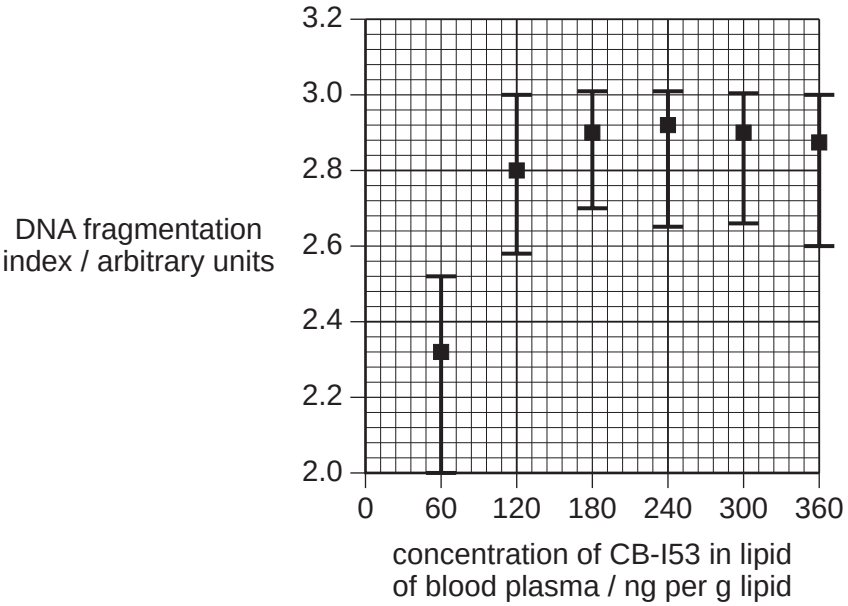

Fig. 3.1

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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