UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7680352975

BIOLOGY **9700/53**

Paper 5 Planning, Analysis and Evaluation **October/November 2010**

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.

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1	
2	
Total	

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

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1 Fig. 1.1 shows a simple apparatus used by a student to measure the rate of respiration in the yeast *Saccharomyces cerevisiae*.

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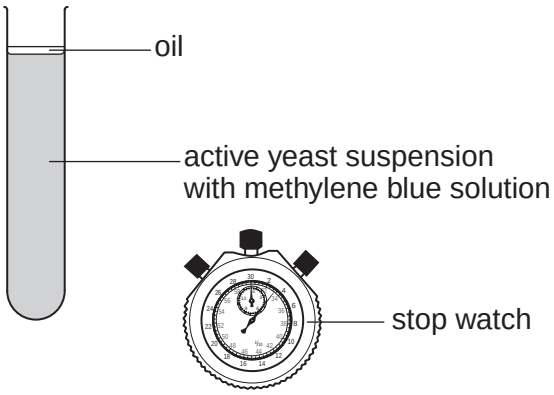


Fig. 1.1

Active yeast suspension is a pale cream colour. It is prepared by mixing dry yeast, glucose and water and leaving for 1 hour at 30 °C. The methylene blue solution acts as an electron acceptor and becomes colourless when reduced.

(a) (i) State how the dependent variable is measured in this experiment.

.....

..... [1]

(ii) Explain why the layer of oil is needed.

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..... [1]

(iii) Outline how the student could use this apparatus to find the optimum temperature for the respiration of yeast.

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.....[7]

In a further investigation, the student tested the ability of yeast to use different sugars. Active yeast suspensions were mixed with 2% solutions of six different sugars. The yeast was allowed to metabolise the sugars at its optimum temperature and the carbon dioxide released was collected for a 10 minute period.

Table 1.1 shows the student's results.

Table 1.1

volume of carbon dioxide in 10 mins / cm^3											
monosaccharides						disaccharides					
glucose (glu)		fructose (fru)		galactose (gal)		sucrose (glu + fru)		maltose (glu + glu)		lactose (glu + gal)	
1	2.0	1	5.0	1	0.1	1	3.0	1	1.4	1	0.3
2	2.2	2	3.8	2	0.3	2	2.6	2	1.7	2	0.4
3	2.4	3	4.6	3	0.2	3	3.6	3	1.3	3	0.6
mean	2.2	mean	4.5	mean	0.2	mean	3.1	mean	1.5	mean	0.4

(b) Suggest an explanation for these results.

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.....[3]

Based on these observations, the student made a hypothesis:

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The yeast will form more cells when provided with fructose than with glucose.

Table 1.2 shows the results of counting cell samples from the active yeast suspension that had been supplied with fructose or glucose and left at the optimum temperature for 30 minutes. Three samples were taken from each suspension and the cells counted using a microscope slide with a grid. Four counts were made from each sample and the number of cells per mm^3 calculated.

Table 1.2

	fructose number of cells per mm^3					glucose number of cells per mm^3				
	count 1	count 2	count 3	count 4	mean	count 1	count 2	count 3	count 4	mean
sample 1	52	75	62	56	62	53	55	48	54	51
sample 2	58	66	71	46		45	52	51	52	
sample 3	65	61	68	64		53	53	42	54	

The student then calculated the standard error for these results.

The standard deviation for fructose = 8.11 = 8 cells

The standard error for fructose = 2.30 = 2 cells

The formula for standard error is: $S_M = \frac{s}{\sqrt{n}}$ s = standard deviation, n = number of samples

(c) (i) Complete the calculation to find the value of S_M for glucose.

Show your working. State your answer to the nearest whole cell.

$$S_M = \frac{4}{\sqrt{\quad}}$$

S_M = ...[3]

(ii) State what standard deviation shows.

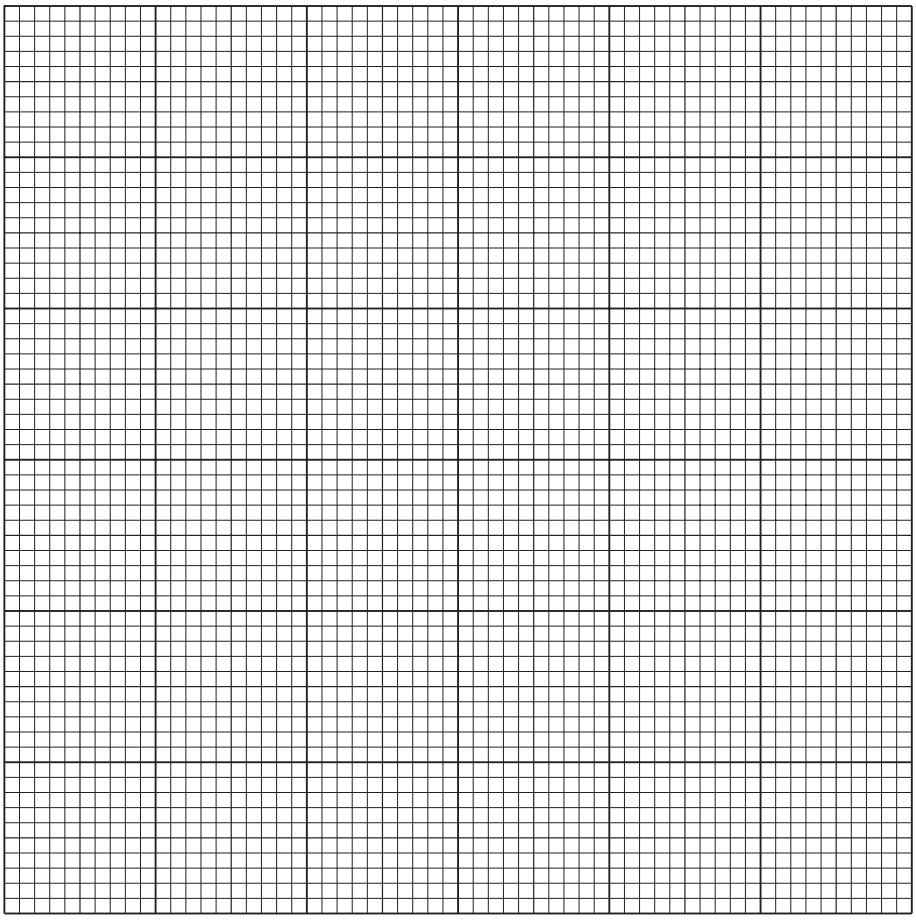
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.....[2]

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(iii) Use the grid to plot the data in Table 1.2 to show the difference in the mean population size of yeast supplied with fructose and yeast supplied with glucose. Include error bars.

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[3]

(iv) State whether the data support the hypothesis. Give a reason for your answer.

.....

.....[1]

[Total: 21]

2 In an investigation on the effects of nicotine, 20 regular smokers completed a memory test. Their reaction time after smoking various amounts of nicotine was measured.
The following procedure was used:

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- the participants did not smoke for 12 hours before the test
- the participants took a memory test
- the participants smoked a cigarette containing 0.05 mg of nicotine
- the participants took a memory test
- the participants smoked a cigarette containing 1.1 mg of nicotine
- the participants took a memory test.

The memory test consisted of:

- a random set of two, three or four letters was shown on a computer screen for 250 ms
- after 1000 ms a single letter was shown for 250 ms
- the participant pressed a 'yes button' if the letter was present in the original set or a 'no button' if it was not present
- the time taken to respond was recorded as the reaction time.

Fig. 2.1 shows the results of these investigations.

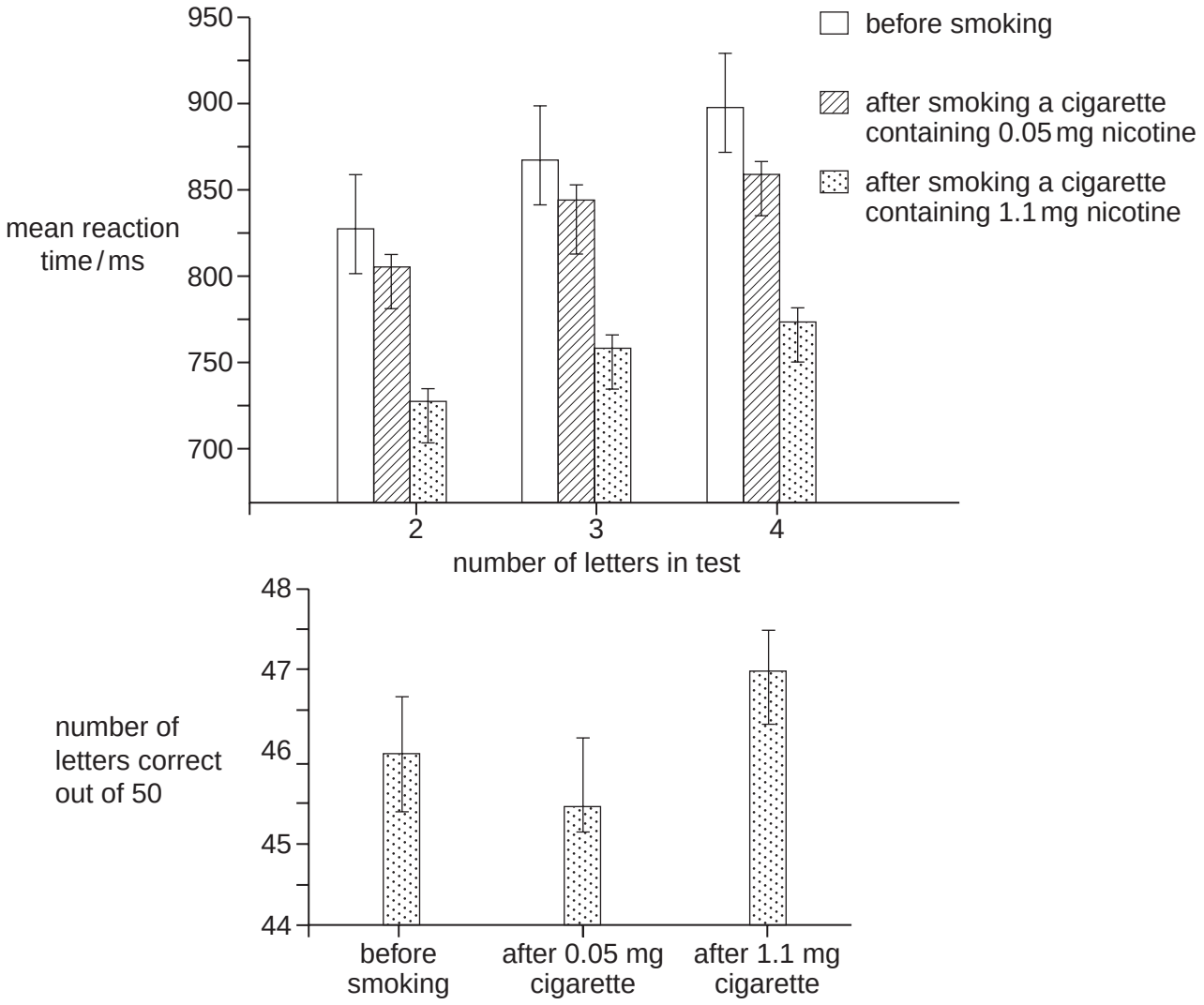


Fig. 2.1

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(a) **(i)** Identify the independent and the dependent variable in this investigation.

independent variable .....

.....

dependent variable .....

.....[2]

(ii) State two variables that are controlled in this investigation. For each, state how it is controlled.

variable 1 .....

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.....

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variable 2 .....

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.....[4]

(b) The investigators concluded

An increase in nicotine decreases reaction time and improves accuracy of the memory test.

State how the results

(i) support this conclusion

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(ii) do not support this conclusion.

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.....[3]

[Total: 9]

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