UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6748637284

BIOLOGY **9700/53**

Paper 5 Planning, Analysis and Evaluation **May/June 2011**

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 ink.
You may use a soft 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 **both** 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 A student used the procedure outlined below to find the water potential of a plant storage tissue that has coloured cell sap.

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- pieces of plant tissue are placed into different sucrose solutions of known concentrations to allow osmosis to occur
- damaged cells release pigment that colours the sucrose solutions that bathe the tissue
- the water potential of the sucrose solutions may change as a result of osmosis
- sucrose solutions become less dense if they **gain** water from the tissue
- a pipette is filled with the coloured sucrose solution that has bathed the plant tissue
- a drop of the coloured bathing sucrose solution is released half way down a tube of sucrose solution of the same concentration as the original bathing solution as shown in Fig. 1.1
- the direction and rate of movement of the drop of coloured solution is determined by its density

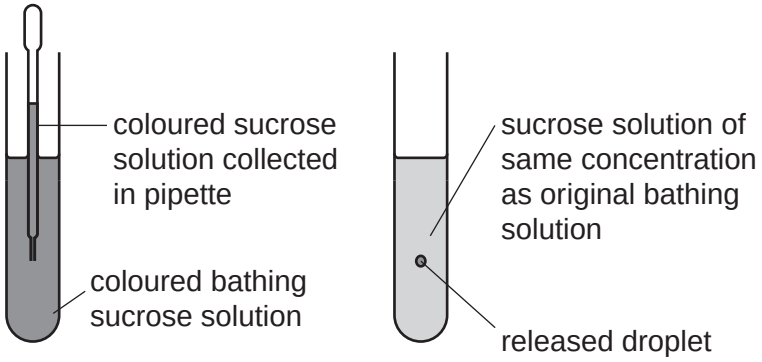


Fig. 1.1

Fig. 1.2 shows the results that the student plotted from the investigation.

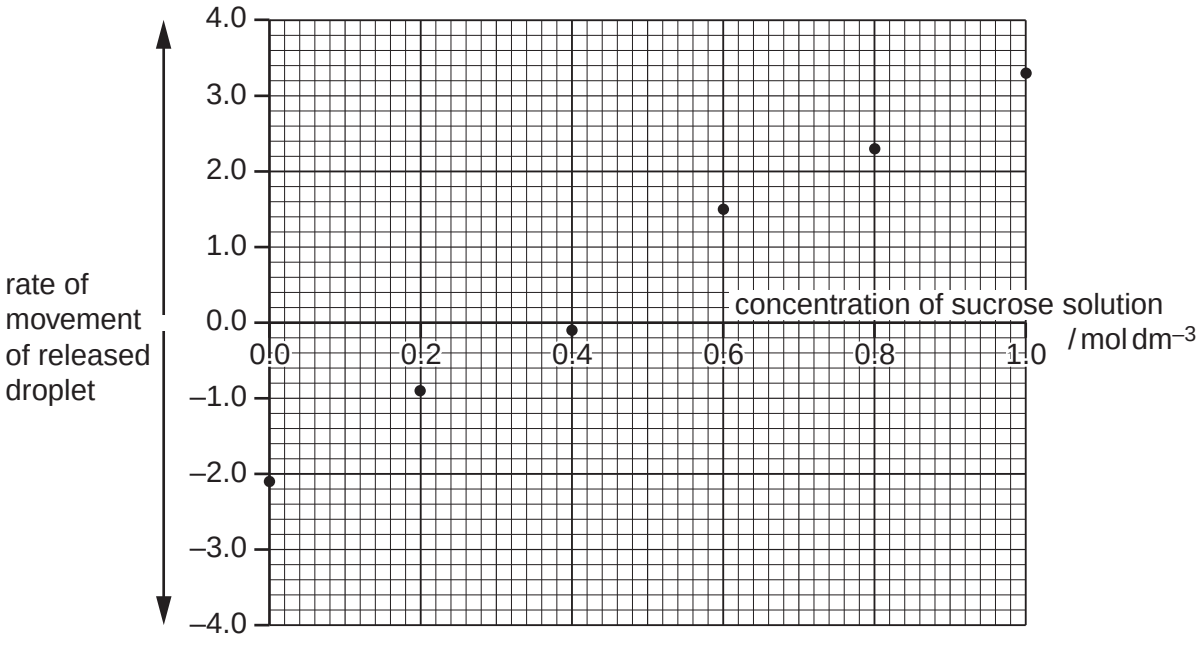


Fig. 1.2

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(a) Describe how the student could use this procedure to find the water potential of the plant storage tissue that has coloured cell sap.

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.... [8]

(b) (i) Suggest suitable units for the rate of movement of the drop.

.....[1]

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(ii) State how the student would estimate the water potential of the plant tissue.

.....

.....

.....[2]

(c) (i) Identify the independent and dependent variables in this investigation.

independent .....

.....

dependent .....

.....[2]

(ii) Identify **two** variables which the student may not have adequately controlled during the investigation.

1. .....

2. .....[2]

(iii) State how **one** of the variables you have identified in **(c)(ii)** may have influenced the results.

.....

.....

.....[1]

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(d) The student made direct observations of the cells of the tissues that had been immersed in 0.2 mol dm^{-3} and 0.8 mol dm^{-3} sucrose solutions.

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(i) Predict the appearance of the cells under the microscope when immersed in

0.2 mol dm^{-3} sucrose solution .....

.....

0.8 mol dm^{-3} sucrose solution .....

.....[1]

Use the space below for any diagrams you include in your answer to **(i)**.

(ii) Explain your answers to **(d)(i)**.

.....

.....

.....[2]

[Total: 19]

2 One possible cause of infertility in women is the failure of immature oocytes to complete meiosis. Scientists studying the causes of infertility tested a naturally occurring compound, FF-MAS, to find out how it stimulates meiosis to restart in oocytes.

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One hypothesis is that FF-MAS activates a specific membrane receptor, LXR alpha. This hypothesis was tested on mice using FF-MAS and three compounds known to activate this receptor in other cells.

The main stages of the experimental procedure were

- immature female mice were injected with follicle stimulating hormone (FSH) and their ovaries removed 48 hours later
- the oocytes were isolated and cultured in a medium that maintains them at the primary oocyte stage of development
- different concentrations of the test compounds were added to separate cultures of oocytes
- the whole procedure was repeated for each compound
- the effect of each test compound on meiosis was recorded after 24 hours
- the mean percentage of cells showing stimulation of meiosis was calculated together with the standard error (S_M)

Table 2.1 shows the results of this investigation.

Table 2.1

compound	mean percentage stimulation of meiosis ± S_M			
	concentration of the activator compound added to the oocytes / μmol dm^{-3}			
	0.00	0.07	0.70	7.00
FF-MAS	11.9 ± 2.6	11.5 ± 3.2	39.0 ± 5.6	86.1 ± 1.7
cholesterol	9.6 ± 1.6	13.8 ± 2.9	12.5 ± 2.7	15.5 ± 2.7
22R-HC	10.5 ± 1.3	14.7 ± 6.2	15.8 ± 1.6	6.0 ± 1.2
25-HC	15.1 ± 2.6	15.0 ± 2.2	9.8 ± 0.3	14.1 ± 1.7

(a) (i) Suggest why the mice were treated with FSH before the ovaries were removed.

.....

..... [1]

(ii) Suggest the purpose of keeping the oocytes in a medium that maintains them at the primary oocyte stage.

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..... [1]

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(b) Explain what S_M shows about the mean percentage values.

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.....

.....[1]

Statistical tests were carried out to compare the stimulatory effects on meiosis of FF-MAS with the effects of the other compounds at each of the three concentrations used.

(c) (i) State the null hypothesis for these tests.

.....

.....[1]

(ii) State a statistical test that could be used and give the reason for your choice.

test .....

reason for your choice .....

.....[2]

(iii) The result of the statistical test comparing FF-MAS with 22R-HC at 0.70 μmol dm^{-3} was significant at 0.05 probability level. Explain what this means.

.....

.....[1]

(d) (i) State whether or not the evidence in Table 2.1 supports the original hypothesis that FF-MAS activates the specific membrane receptor, LXR alpha.

Explain your answer.

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.....[1]

(ii) State the conclusions that can be drawn from the results in Table 2.1.

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.....[3]

[Total: 11]

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