UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4975597231

BIOLOGY **9700/33**

Paper 31 Advanced Practical Skills **May/June 2010**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

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.
You are advised to spend one hour on each question.

For Examiner's Use	
1	
2	
Total	

This document consists of **11** printed pages and **1** blank page.

You are reminded that you have only one hour for each question in the practical examination. You should read carefully through the whole of each question and then plan your use of the time to make sure that you finish all the work that you would like to do.

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You will gain marks for recording your results according to the instructions.

1 You are required to investigate how much glucose diffuses through selectively permeable Visking (dialysis) tubing in 15 minutes.

You are provided with

- 25 cm^3 of 10% glucose solution, labelled **G**
- about 20 cm of Visking (dialysis) tubing in a container of distilled water, labelled **V**
- 100 cm^3 of distilled water, labelled **W**
- 20 cm^3 of 0.1% glucose solution, labelled **S1**
- 20 cm^3 of 0.2% glucose solution, labelled **S2**
- 20 cm^3 of 0.3% glucose solution, labelled **S3**
- 100 cm^3 of Benedict's solution, labelled **Benedict's solution**.

Proceed as follows:

1. Tie a knot in the Visking tubing as close as possible to one end so that it seals the end.

2. To open the other end, wet the Visking tubing and rub the tubing gently between your fingers.

3. Use a syringe to put 10 cm^3 of **G** into the open end of the Visking tubing.

4. Rinse the outside of the Visking tubing by dipping it into the water in the container labelled **V**.

5. Put the Visking tubing into a large test-tube in a test-tube rack.

6. Fold the open end of the Visking tubing over the top of the large test-tube as shown in Fig. 1.1.

7. Use an elastic band to hold the Visking tubing in place.

8. Use a syringe to put some of **W** into the large test-tube so that it surrounds the Visking tubing.

9. Immediately start a stop clock, stop watch or record the time on a clock to time for 15 minutes.

(a) Draw on Fig. 1.1 a line to show the level of water in the large test-tube. [1]

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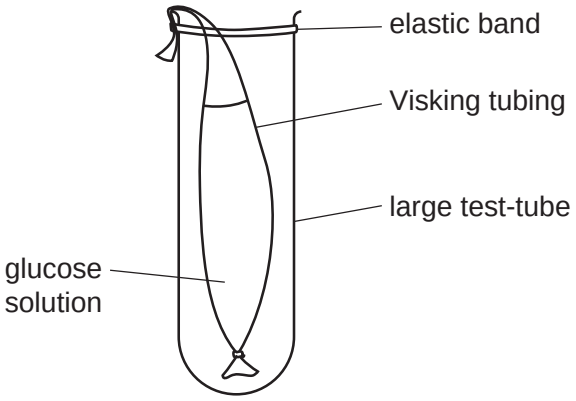

Fig. 1.1

To find out how much glucose has diffused out of the Visking tubing after 15 minutes, you are provided with solutions **S1**, **S2** and **S3**.

In order to find how much glucose has diffused from inside the Visking tubing into the water you will need to test a sample of the water with Benedict's solution.

You should record the time taken for the first appearance of any green colour.

The result will be compared with the time taken for the first appearance of any green colour obtained from testing solutions **S1**, **S2** and **S3** with Benedict's solution.

To do this you need to use the same procedure.

(b) State the volume of Benedict's solution and the volume of the solutions (**S1**, **S2** and **S3**) and the **sample** you are testing.

volume of Benedict's solution ..... cm^3

volume of each solution (**S1**, **S2** or **S3**) ..... cm^3

volume of **sample** ..... cm^3 [1]

(c) State **one** variable, other than volume, which needs to be kept constant when you do the tests and describe how you will keep this variable constant.

.....

.....

.....[2]

10. After 15 minutes, pour the water from around the Visking tubing into a beaker or container and label it **sample**.

11. Now test all four solutions, **sample**, **S1**, **S2** and **S3**.

(d) (i) Prepare the space below and record your results.

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[4]

(ii) Estimate the concentration of glucose in the sample.

.....[1]

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(iii) Suggest how you might modify this investigation to find the effect of temperature on the rate of diffusion of glucose through Visking tubing.

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.....[2]

(e) A student investigated the rate of diffusion of a coloured solution through agar. A Petri dish containing a layer of agar had a small well of 1 cm diameter, cut so that 10 drops of the coloured solution could be placed in the well. The distance the coloured solution diffused from the edge of the well was measured at 15 minute intervals.

Fig. 1.2 shows the surface view of the Petri dish after 75 minutes.

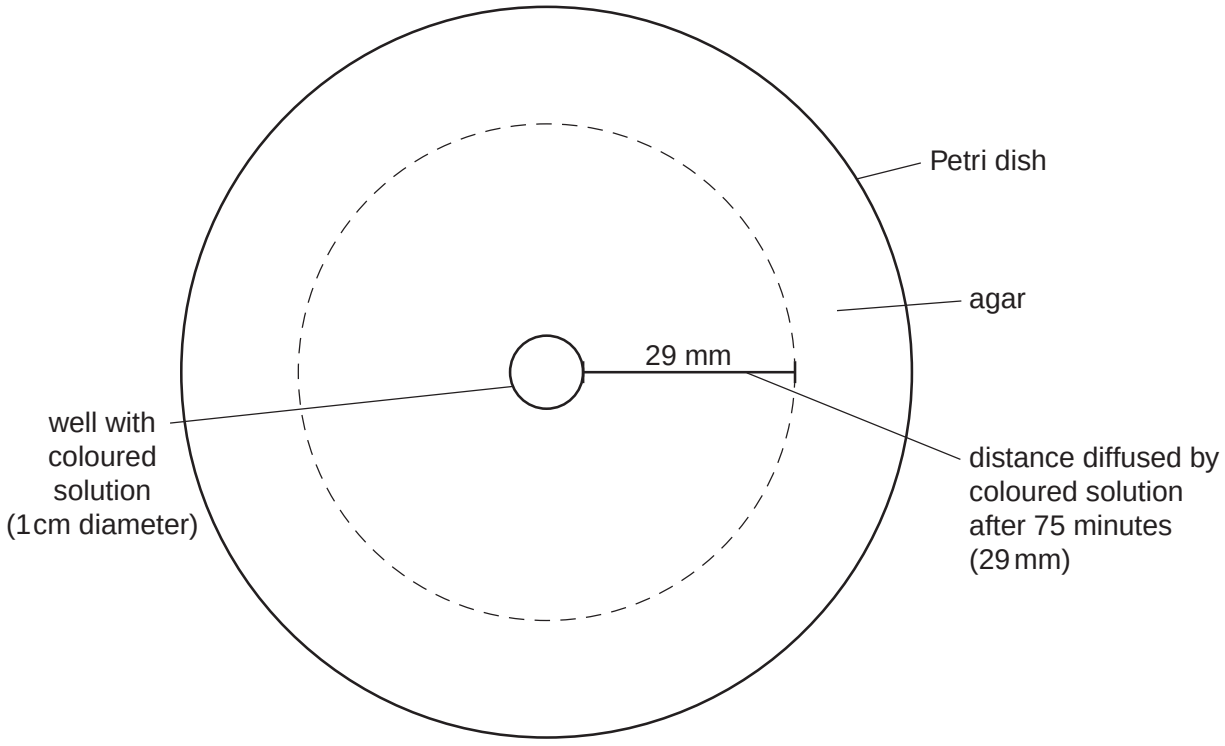

Fig. 1.2

The results of the student's investigation are shown in Table 1.1.

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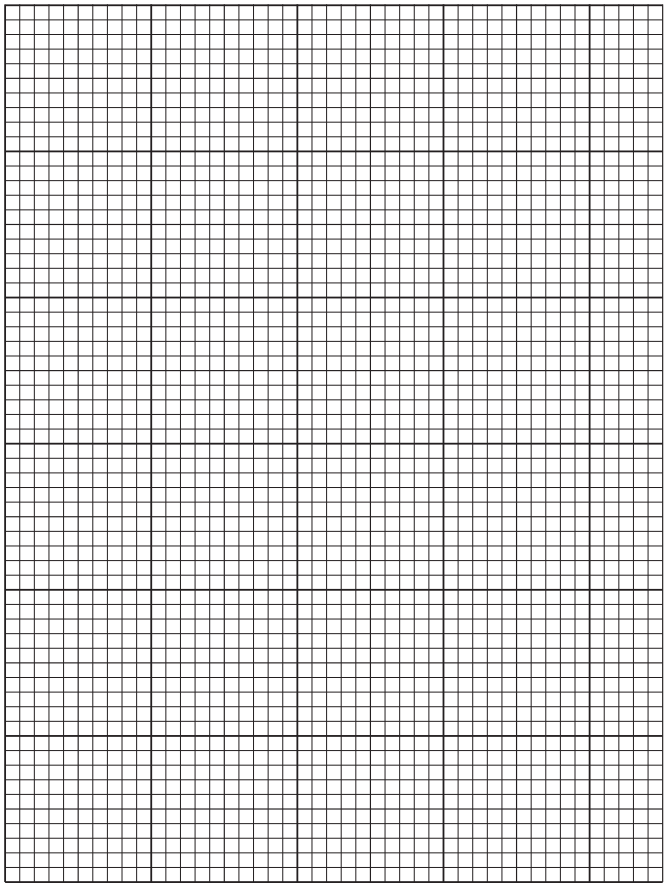
Table 1.1

time / min	distance diffused from well by coloured solution / mm
0	0
15	14
30	22
45	26
60	28
75	29

(i) Plot a graph to show the results in Table 1.1.



[4]

(ii) Use the graph to calculate the rate of diffusion of the solution between 10 minutes and 20 minutes.

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Show on your graph where you took the readings. [1]

Show all the steps in your calculation. [1]

[2]

(iii) Describe and explain the trend in the rate of diffusion shown in the graph you have drawn in **(e)(i)**.

.....

.....

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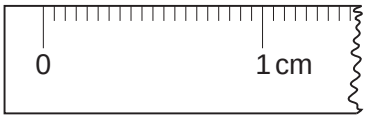
.....

.....[2]

(f) The ruler used to measure the distances in Table 1.1 is shown in Fig. 1.3.



magnification x 3

Fig. 1.3

State the uncertainty of the measurements using this ruler.

.....[1]

[Total: 22]

2 Fig. 2.1 and Fig. 2.2 are photomicrographs of blood taken from two different types of organisms.

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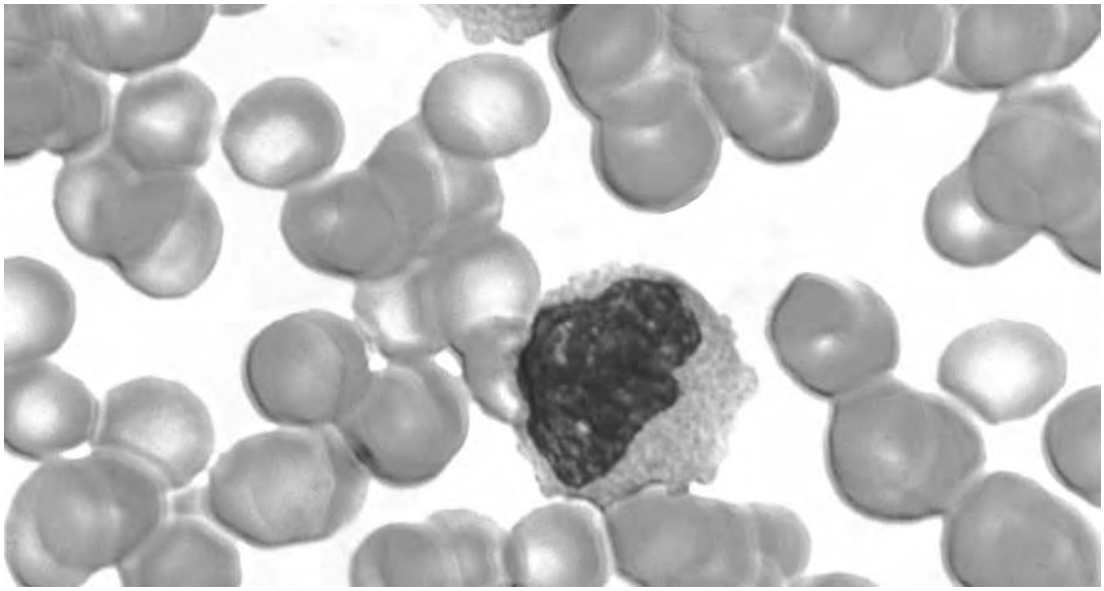
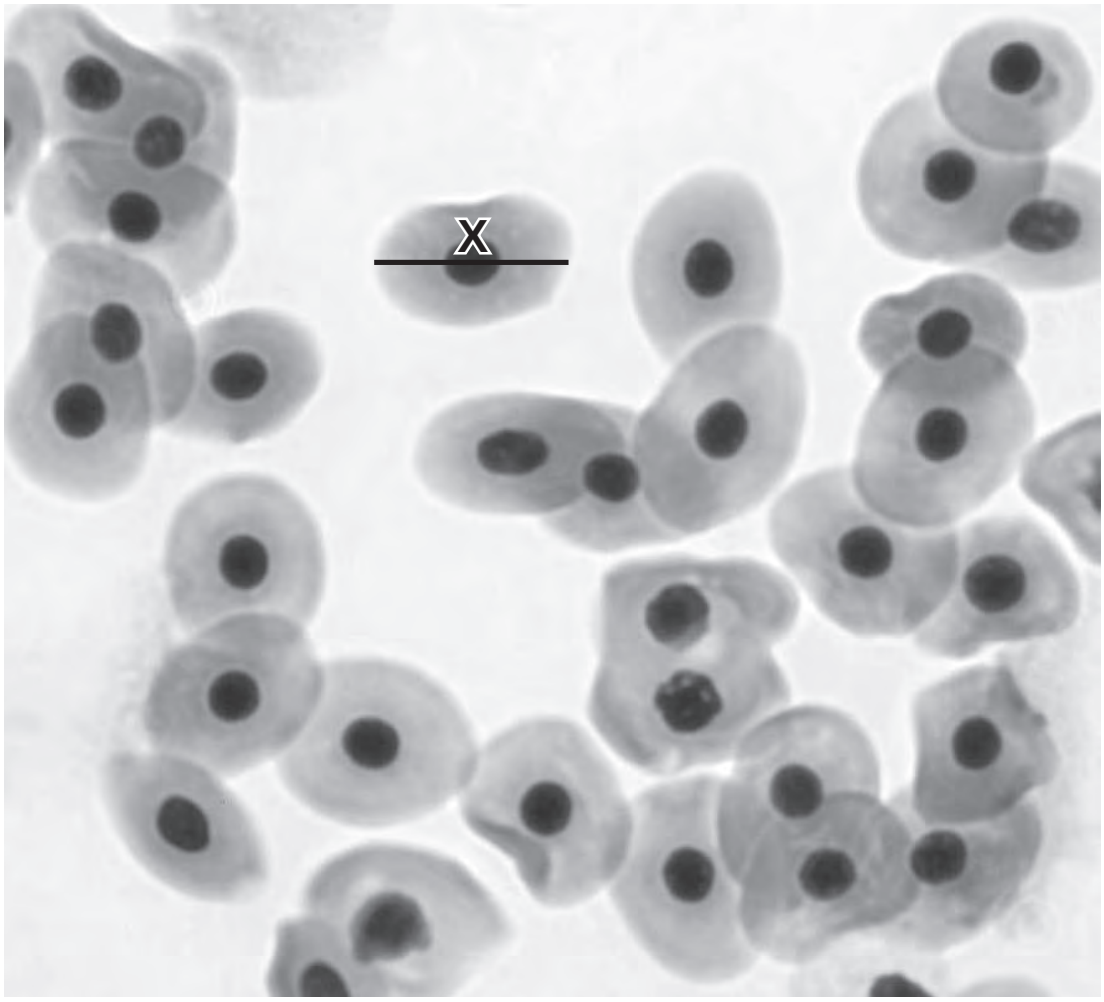


magnification × 2500

Fig. 2.1



magnification × 700

Fig. 2.2

(a) (i) Make large, labelled drawings of two different types of cell from Fig. 2.1 and one cell from Fig. 2.2.

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Indicate on the photomicrographs the cells that you have drawn.

[4]

(ii) Prepare the space below so that it is suitable for you to compare and contrast the cells in Fig. 2.1 and Fig. 2.2.

Record your observations in the space which you have prepared.

[5]

[Turn over

(iii) Calculate the actual diameter of the cell shown by the line **X** in Fig. 2.2.

Show all the steps in your calculation.

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.....μm [2]

(iv) Suggest how you would obtain a mean diameter for cells of this type.

.....

.....

.....[1]

K1 is a slide showing transverse sections through blood vessels.

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(b) (i) Draw a large plan diagram of two different blood vessels shown in **K1**.

[5]

(ii) Suggest **one** way in which these blood vessels are adapted for transport.

.....[1]

[Total: 18]