Cambridge Pre-U

Cambridge International Examinations
Cambridge Pre-U Certificate

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0218112257

BIOLOGY **9790/03**

Paper 3 Practical Examination **May/June 2014**

2 hours 30 minutes

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Section B
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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	
Section A	
Section B	
Total	

This document consists of **14** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

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Section A

Answer **all** the questions.

You are recommended to spend no longer than **90 minutes** on question 1.

1 You should read through the whole of this question carefully and then plan your use of the time to make sure that you finish all the work that you would like to do.

Yeast cells are able to respire both aerobically and anaerobically using glucose as a substrate.

You are required to investigate the effect of temperature on the rate of respiration of yeast using a respirometer.

A simple respirometer can be made by attaching a length of glass tubing to a 10 cm^3 syringe, using a short section of PVC tubing. The respirometer may be supported with a retort stand and clamp or by standing the glass tubing in a boiling tube.

Fig. 1.1 shows a simple respirometer containing a yeast suspension.

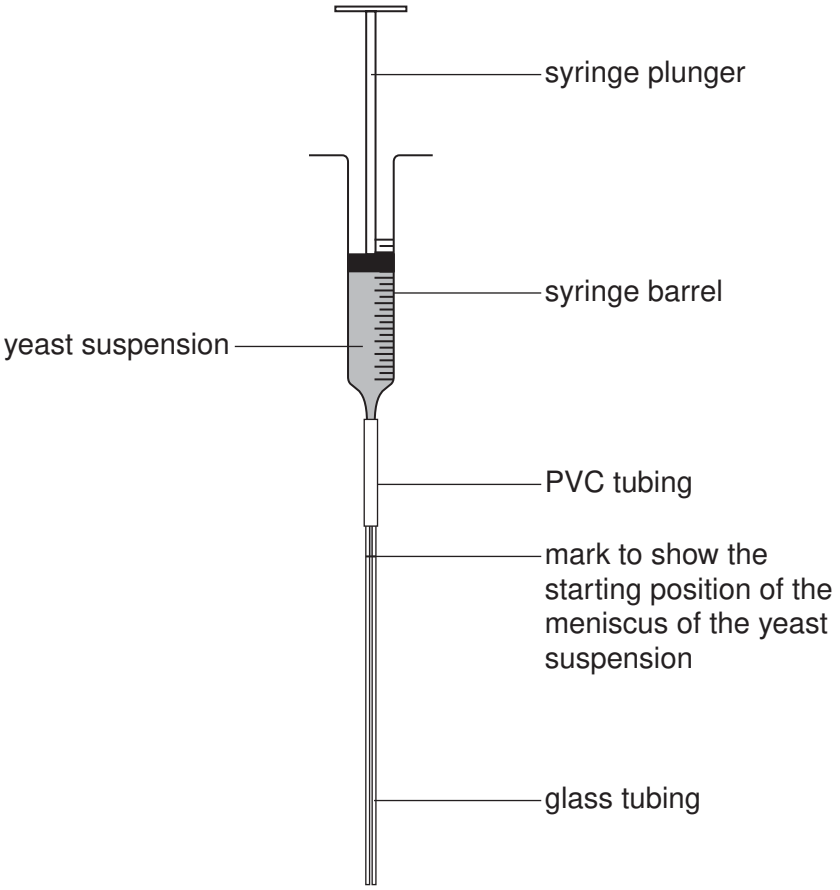

Fig. 1.1

You are provided with:

- some simple respirometers
- a suspension of yeast cells in a 20% glucose solution that has been maintained at 35 °C for at least 15 minutes before the start of the examination
- a suspension of yeast cells in water that has been maintained at 35 °C for at least 15 minutes before the start of the examination
- 20% glucose solution
- water at 30 °C
- water at 40 °C
- crushed ice
- hot water from a kettle
- a thermometer
- a stop clock, stopwatch or bench timer.

Consider a strategy to allow you to compare the effect of temperature on the rate of respiration of yeast, making use of the apparatus provided in the time available.

You will need to decide on a suitable range of temperatures for this investigation. Use the apparatus and the water and ice to set up and maintain water-baths at these temperatures, as necessary.

In order to introduce yeast suspension into the simple respirometers, use the following procedure:

- Remove a sample of the yeast suspension in 20% glucose solution and place it into a boiling tube.

- Make sure that the plunger is pushed fully into the barrel of the syringe.

- Insert the glass tubing into the yeast suspension in a boiling tube.

- Withdraw the plunger until the yeast suspension reaches the 5 cm^3 mark on the syringe.

- Lift the respirometer so that the glass tubing comes out of the yeast suspension.

- Keep the apparatus vertical. Slowly withdraw the plunger so that the yeast suspension rises up the glass tubing until the suspension is near the top of the glass tubing. (See Fig. 1.1).

- Mark the starting position of the meniscus of the yeast suspension.

Determine the rate of respiration of yeast by measuring the movement of the meniscus down the glass tubing.

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(a) Describe how you used the apparatus and materials provided to determine the effect of temperature on the rate of respiration.

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(b) Use the space below to present all of your results and any calculations that you have carried out.

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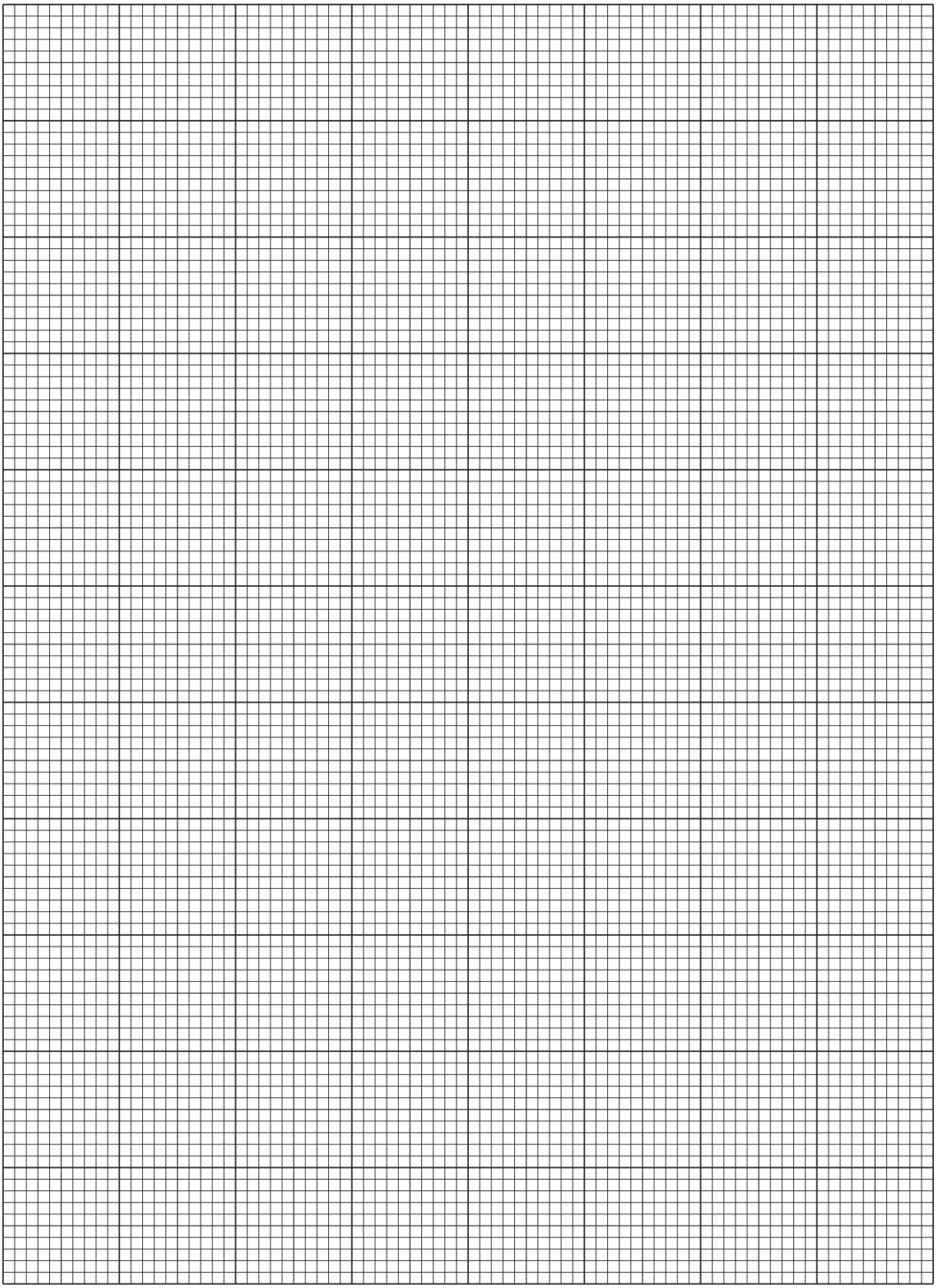
(c) Draw a graph of your results on the grid below to show the effect of temperature on the rate of respiration of yeast.



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(d) (i) Explain why the meniscus of the yeast suspension moved down the glass tubing.

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(ii) Describe **and** explain the results shown in your graph.

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(e) Identify the limitations and sources of error in the investigation that may have affected the quality of the results.

Explain how you would improve the method to overcome the limitations that you have identified.

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(f) The concentration of glucose in solution can be tested by using dip sticks that produce different colours at different concentrations of glucose.

The colours produced by different concentrations of glucose for a particular dip stick are shown in Table 1.1.

Table 1.1

glucose concentration / g 100 cm^{-3}	0	0.10	0.25	0.50	1.00	≥ 2.00

A student suggested a strategy for investigating the rate of respiration of yeast using these dip sticks.

This strategy involved testing the concentration of glucose at intervals of time.

Discuss the advantages **and** disadvantages of using such dip sticks to measure glucose concentrations in investigations of the factors that affect the rate of respiration of yeast.

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Section B

Answer **all** the questions.

You are recommended to spend no longer than **60 minutes** on question 2.

2 You are advised to read through the whole of this question carefully and then plan your use of the time to make sure that you finish all the work that you would like to do.

Tubular structures, such as blood vessels, are common in the mammalian body.

Slides **K1**, **K2** and **K3** are cross sections of blood vessels from a small mammal:

- **K1**, a renal artery
- **K2**, an aorta
- **K3**, a vena cava.

Examine slide **K1** with a hand lens and the low power of your microscope.

(a) (i) Use the space below to make a low-power plan drawing to show the arrangement of the tissues in the wall of the renal artery from slide **K1**.

Label your drawing.

[7]

(ii) Examine under high power all the layers that you have drawn in part **(i)**.

Use the space below to make a high-power drawing to show the details of these layers.

Label your drawing.

[7]

(iii) Indicate the magnification of your high-power drawing in part **(ii)**.

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(iv) Explain how you determined the magnification.

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(b) Examine slides **K2** and **K3** using a hand lens and your microscope.

Make a table in the space below to compare the three blood vessels shown in slides **K1**, **K2** and **K3**.

[8]

(c) Fig. 2.1 is a cross section of a capillary from a glomerulus of the kidney.

Label and annotate Fig. 2.1 to show how the structures visible are related to the function of the glomerulus.

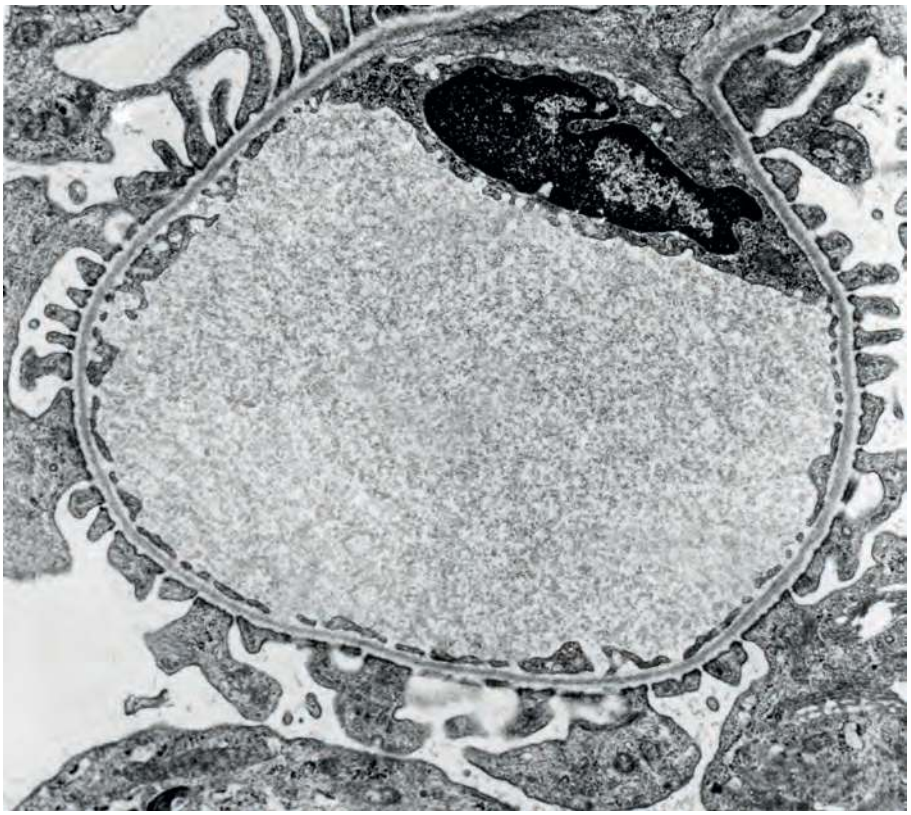

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Fig. 2.1

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(d) State two advantages of studying longitudinal sections of blood vessels in addition to cross sections such as **K1**, **K2** and **K3**.

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