Cambridge Pre-U

Cambridge International Examinations
Cambridge Pre-U Certificate

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3355030827

BIOLOGY (PRINCIPAL) **9790/04**

Paper 4 Practical **May/June 2017**

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	

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 3 Pre-U Certificate.

This document consists of **15** printed pages, **5** blank pages and **1** Insert.

CAMBRIDGE International Examinations

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Section A

Answer **all** questions.

You are advised to spend no more than **90 minutes** on Question 1.

1 You are advised to read the whole of this question before starting the practical work, as you will need to make decisions about how to obtain suitable results.

In this investigation you are going to assess the sugar content of coconut water.

In **Part 1** you will practise two methods to assess the sugar content.

- Diastix® test strips (dip sticks) are used to determine the concentration of glucose in solutions. The coloured pad at the end of each test strip is impregnated with reagents.

- Benedict's solution is used to detect the presence of reducing sugars and can provide an indication of their concentration in solutions. It is an alkaline solution of copper sulfate.

In **Part 2** you will make some standard solutions of glucose of known concentrations and test them with the two methods.

In **Part 3** you will use the two methods to assess the reducing sugar content of coconut water.

In **Part 4** you will carry out the non-reducing sugar test on coconut water.

You are provided with:

- 10% solution of coconut water
- 100 g dm^{-3} glucose solution
- 10 g dm^{-3} glucose solution
- Benedict's solution
- dilute hydrochloric acid
- dilute sodium hydroxide
- Universal Indicator paper
- Diastix® test strips, which turn different colours according to the concentration of glucose in the test solution
- A colour chart, provided as an Insert in the Question Paper, to use for determining the concentration of glucose using Diastix® test strips.

To use a Diastix® test strip to determine the concentration of glucose, follow these instructions.

- Dip a test strip into the solution to be tested and remove immediately.

- Shake off any excess solution.

- Place the test strip on a white tile and start a stopwatch or bench timer.

- After exactly 30 seconds, match the colour of the test strip with the colour chart and note the glucose concentration in g dm^{-3}.

- Ignore any colour changes that occur after 30 seconds.

Proceed as follows.

Part 1 – Practising the two methods

Method 1

1 Use a 5 cm^3 syringe to put 5 cm^3 of 100 g dm^{-3} glucose solution into the flat-bottomed tube.

2 Test the glucose solution with a Diastix® test strip.

(a) Record the colour of the test strip **and** the concentration of glucose indicated by comparison with the colour chart.

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(b) Diastix® test strips are used to indicate the concentration of glucose in a solution.

Explain how test strips such as these work to indicate the concentration of glucose.

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Method 2

1 Set up a boiling water-bath using a large beaker that is three-quarters full of water.

2 Use a 5 cm^3 syringe to put 5.0 cm^3 of 100 g dm^{-3} glucose solution into a test-tube.

3 Use a 5 cm^3 syringe to add 5.0 cm^3 of Benedict's solution to the glucose solution in the test-tube.

4 Start a stopwatch or bench timer and immediately place the test-tube into the boiling water-bath. Observe carefully.

5 The solution will begin to change colour and go cloudy. Record the time when the solution at the top of the test-tube becomes noticeably cloudy. This is the end-point. The higher the concentration of reducing sugars, the shorter the time taken to reach the end-point.

(c) State the time taken to reach the end-point.

.....[1]

6 Remove the test-tube from the boiling water-bath and place it in a test-tube rack to cool.

Part 2 – Making and testing standard solutions of glucose

1 Decide the concentrations of glucose that you will use as standard solutions in **Part 3** to assess the reducing sugar content of coconut water.

(d) Use the space below to draw a dilution table showing how you will prepare these glucose concentrations in the small beakers provided.

[4]

2 Prepare the standard solutions of glucose according to your dilution table.

3 Use **both** methods of assessing sugar content to test the solutions that you have prepared and record your results in part **(e)** on page 6.

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[Turn over

(e) Record your results in a suitable table in the space below.

[5]

(f) Draw a graph, on the grid opposite, to show the results you obtained with **Benedict's solution**. [5]

(g) Describe the pattern of results for **Benedict's solution**, as shown in your graph.

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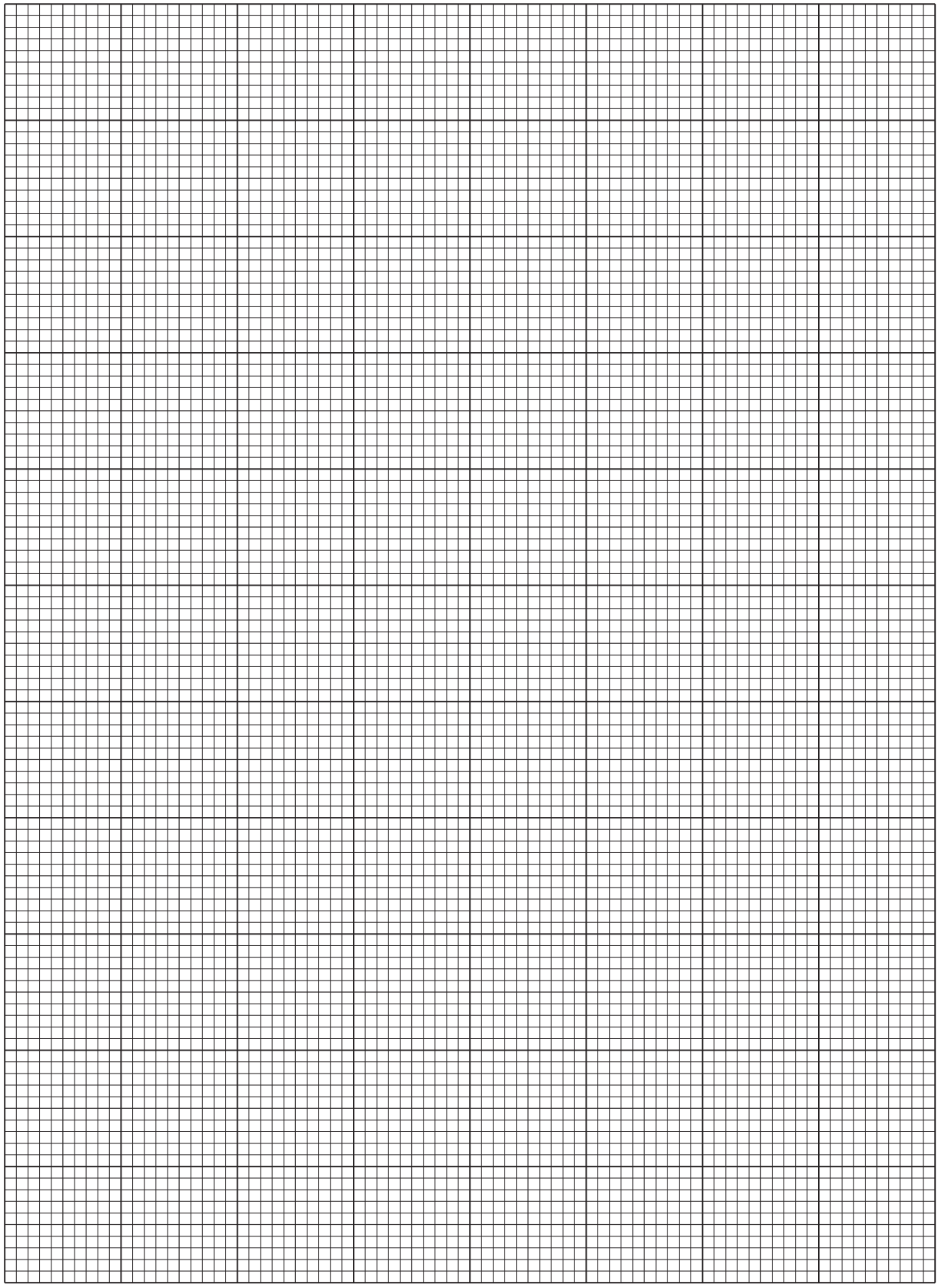

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Part 3 – Assessing the reducing sugar content of coconut water

1 Carry out the two tests on the 10% solution of coconut water.

(h) Use the spaces below to record your results and make your assessment of the reducing sugar content of the 10% solution of coconut water for each of the two methods.

Diastix® test strips

Benedict's solution

[3]

(i) Explain how you made your assessment of the reducing sugar content using the results from the test with **Benedict's solution**.

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Part 4 – Carrying out the non-reducing sugar test on coconut water

1 Use the apparatus and materials provided to assess the non-reducing sugar content of the 10% solution of coconut water.

(j) Use the spaces below to record your results and make your assessment of the non-reducing sugar content of the 10% solution of coconut water for each of the two methods.

Diastix® test strips

Benedict's solution

[3]

The questions in parts **(k)**, **(l)** and **(m)** apply to all four parts of the investigation.

(k) Describe **and** explain any precautions that you took to ensure valid, high quality results.

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(l) A 10% solution of coconut water is reported to have a sugar concentration of $5\,g\,dm^{-3}$.

Comment on the reasons for any differences between this figure and the results you report above.

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(m) Discuss the advantages **and** disadvantages of the two methods that you used for determining the sugar concentration in fruit drinks, such as coconut water.

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[Total: 45]

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Section B

Answer **all** questions.

You are advised to spend no more than **60 minutes** on Section B.

You should read through the whole of Question 2 and Question 3 carefully and then plan your use of the time to make sure that you finish all the work that you would like to do.

2 Slide **T1** is a cross-section through the thorax of the embryo of a small mammal.

(a) Use a hand lens and the low power of your microscope to look carefully at slide **T1**.

(i) Locate the following organs:
- spinal cord
- lungs
- heart.

Draw an outline of the cross-section of the thorax visible in slide **T1**. Use at least half of the space provided on page 13.

On your drawing, show the positions and outlines of the spinal cord, lungs and heart. Label these organs. [7]

(ii) In mammalian embryos, the skeletal system is made of cartilage rather than bone.

The vertebral column, the sternum (breast bone) and the ribs are visible in slide **T1**.

Add to your drawing the positions and outlines of these skeletal structures. Label these structures. [6]

(iii) Locate the oesophagus in slide **T1**.

Add to your drawing the position and outline of the oesophagus and the shape of its lumen. Label the oesophagus. [2]

(iv) Indicate the scale of your drawing on page 13. [2]

*Space for labelled drawing of slide **T1***

(b) Slide **L1** shows a cross section of lung tissue from an adult small mammal.

Use the low power and the high power of your microscope to compare the structure of the lung tissue in the embryo on slide **T1** with the structure of the lung tissue in the adult on slide **L1**.

State the differences in structure that you have observed **and** suggest reasons for these.

Use the space below for any drawings that you wish to make.

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[Total: 22]

3 Fig. 3.1 is a false-colour transmission electron micrograph of cardiac muscle tissue.

(a) Label Fig. 3.1 to identify four structures that are visible.

Annotate Fig. 3.1 to state the functions of the structures that you have labelled.

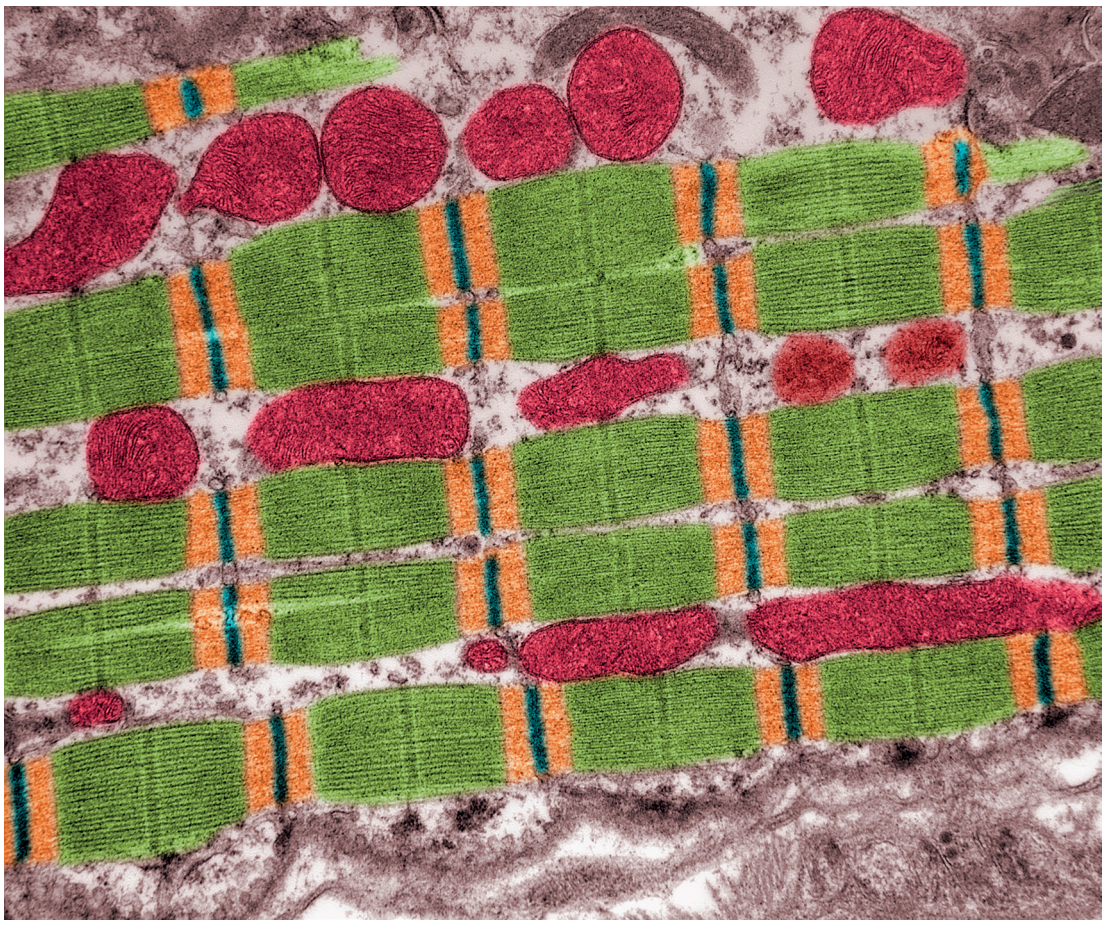

Fig. 3.1

[8]

(b) Adrenaline and noradrenaline bind to β receptors on cell surface membranes of cardiac muscle cells.

Immunohistology is the use of antibodies joined to fluorescent dyes to show the position of particular cellular structures.

Fig. 3.2 shows cardiac muscle fibres that have been treated in this way using such antibodies. The red colour indicates the position of β receptors.

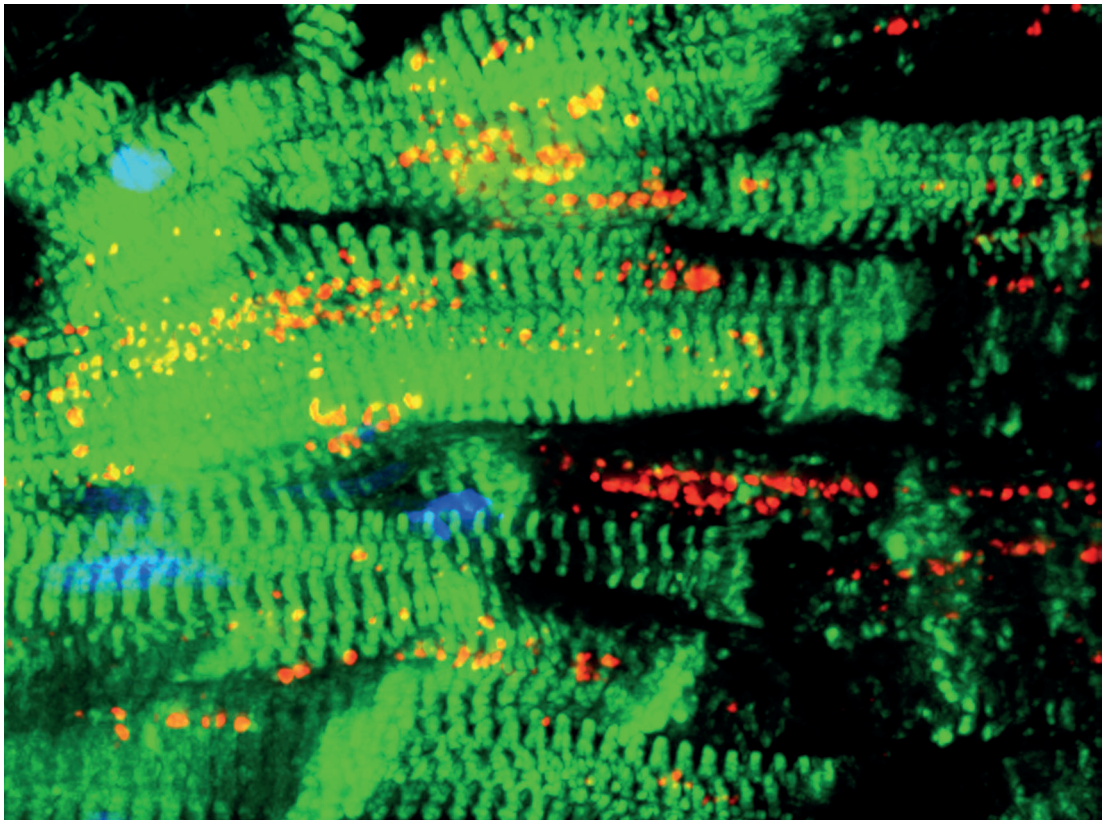

Fig. 3.2

(i) Suggest why β receptors are located on the cell surface membrane of cardiac muscle cells and not in the cytoplasm.

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(ii) Explain the advantages of using antibodies in studying histology compared with using chemical stains.

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