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**BIOLOGY (PRINCIPAL)**

**9790/04**

Paper 4 Practical

**For Examination from 2016**

SPECIMEN PAPER

**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 and 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.

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 **14** printed pages and **2** blank pages.

## 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.

The enzyme lipase catalyses the hydrolysis of ester bonds in triglycerides. Its activity is affected by the presence of bile salts.

Full fat milk will be used as the source of triglycerides.

**You are to investigate the effect of different concentrations of bile salts on the rate of hydrolysis of triglycerides in milk.**

You are provided with a 1% solution of lipase and a 5% solution of bile salts.

*Proceed as follows.*

- 1 Use the syringes and the small beakers to prepare a number of different concentrations of bile salts using the 5% bile salts solution and water provided. You will need a maximum of 10 cm<sup>3</sup> of each bile salts solution.

- (a) Complete the table below to show how you have prepared the different solutions.

final concentration of bile salts / %	volume of 5% bile salts solution / cm <sup>3</sup>	volume of water / cm <sup>3</sup>

[3]

- (b) Suggest suitable controls for this experiment.

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[2]

- 2 Label test-tubes with the concentrations of bile salts that you have prepared.
- 3 Prepare the labelled test-tubes with milk, sodium carbonate solution, bile salts solutions and thymolphthalein solution, using the following quantities:
  - 5.0 cm<sup>3</sup> of milk
  - 5.0 cm<sup>3</sup> of sodium carbonate solution
  - 1.0 cm<sup>3</sup> of the appropriate bile salts solution
  - three drops of thymolphthalein.
- 4 Label a test-tube or test-tubes with the control or controls that you have decided to use, and prepare these appropriately
- 5 Put a bung into each test-tube in turn and invert twice so that the contents are a uniform blue colour.
- 6 Put some warm water in a beaker to act as a water-bath. The beaker should be about half-full. Adjust the temperature of the water to 50 °C (± 2 °C).
- 7 Place the test-tubes prepared in steps 3 and 4 into the water-bath.
- 8 Stir the lipase solution with the glass rod provided. Put 2.0 cm<sup>3</sup> of the lipase solution into as many labeled, clean test-tubes as you need for the concentrations of bile salts that you are testing and your controls. Place them in the water-bath.
- 9 Prepare the space on page 4 to record your results.

(c) (i) As pH falls, the blue colour of the thymolphthalein will fade until it is colourless.

Describe how this is used to gain information about the rate of hydrolysis of the lipid in the milk by lipase.

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..... [3]

(ii) Measure and record the temperature in the water-bath at appropriate points during the experiment. Record your measurements in the space below.

[1]

- 10 After all the test-tubes have been in the water-bath for at least **five minutes**, add the lipase solution, from each test-tube, to the test-tubes containing the milk and bile salts solutions, and, where appropriate, to the control test-tubes as well.

**Immediately** after adding the lipase solution insert a bung into each test-tube and invert twice to mix the contents.

- (d) You should record your results in a logical way, to show the effect of bile salts on the rate of triglyceride hydrolysis by lipase in the space below.

Record and justify any further decisions that you make about your investigation in the space below the table.

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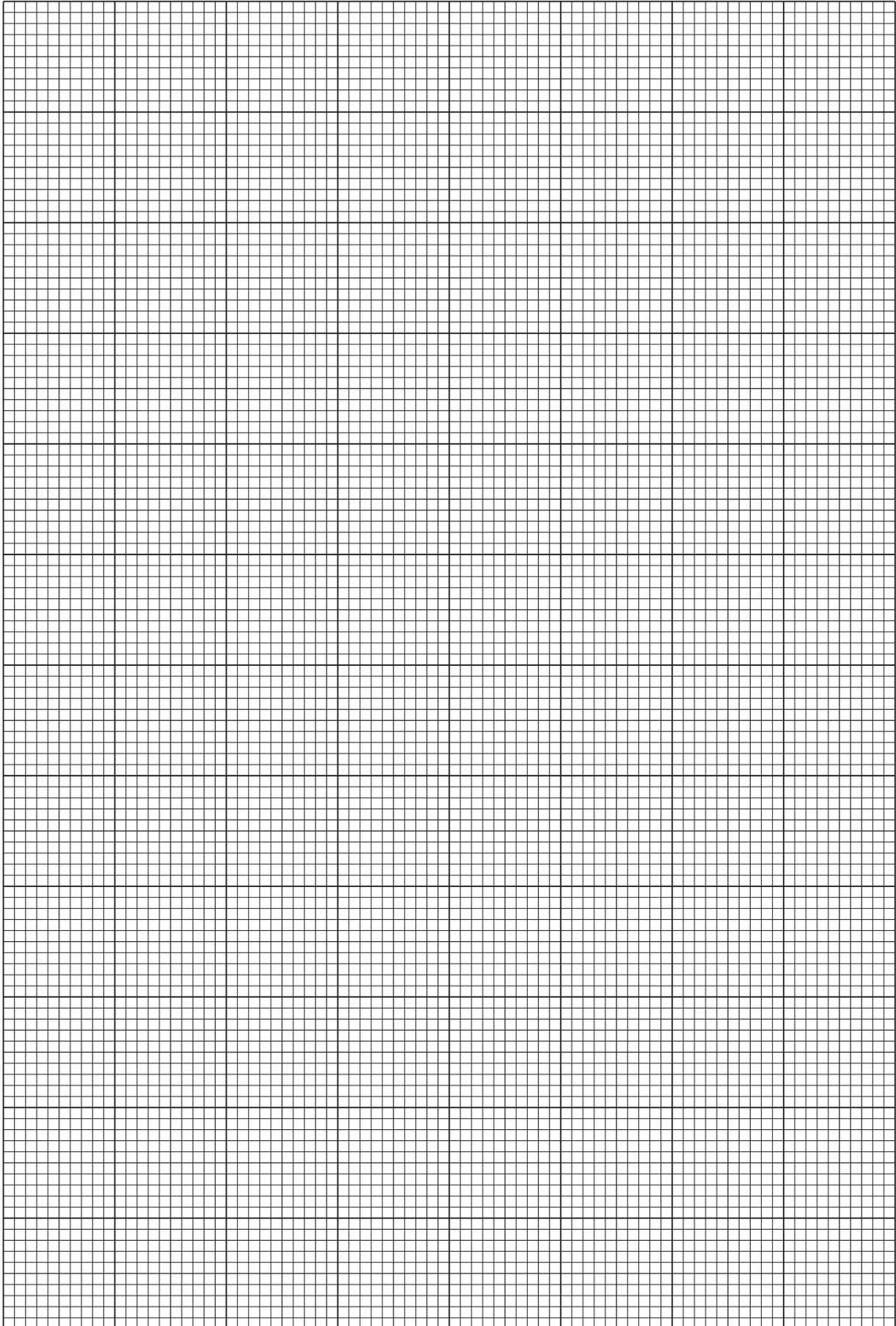
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[11]

- (e) Plot a graph of your results on the grid below to show the effect of the concentration of bile salts on the rate of hydrolysis of triglycerides.



[5]





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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 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.

**R1** is a transverse section of the spinal cord of a small mammal.

- (a) (i)** Make a low-power plan drawing of **R1**.

Label your plan drawing.

[6]

- (ii)** Use a ruler to measure the actual size of the specimen on slide **R1** and the size of your drawing between the same points. Put a line on your drawing to show the size that you have measured. Calculate the magnification of your drawing.

Show your working.

magnification ..... [2]

**(b)** Use the high-power lens of your microscope to locate a cell body of a motor neurone in **R1**.

Make a labelled drawing to show the cell body.

Annotate your drawing to indicate the functions of the structures you have drawn.

Use the eyepiece graticule and stage micrometer to measure the diameter of the cell body. Indicate the actual diameter on your drawing and show how you have derived your answer.

[8]

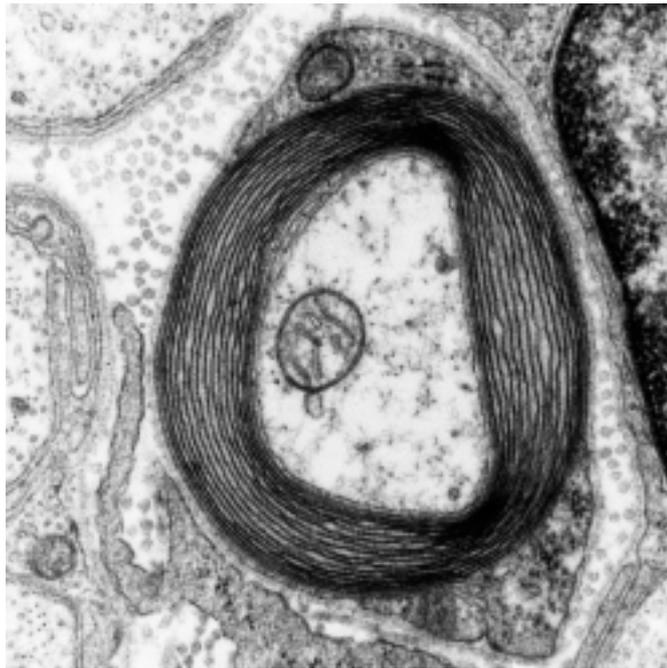
(c) Slide **R2** is a transverse section of part of the brain of a small mammal.

Compare, using a hand lens and your microscope, the structure and appearance of **R1** and **R2**.

Present your comparison as a table in the space below.

[5]

(d) Fig. 2.1 is an electron micrograph that shows a cross section of a neurone.



**Fig 2.1**

(i) Describe the appearance of the section of the neurone. You may use drawings or diagrams to illustrate your answer.

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[5]



(e) Fig. 2.2 is an electron micrograph that shows a junction between two neurones in the brain.

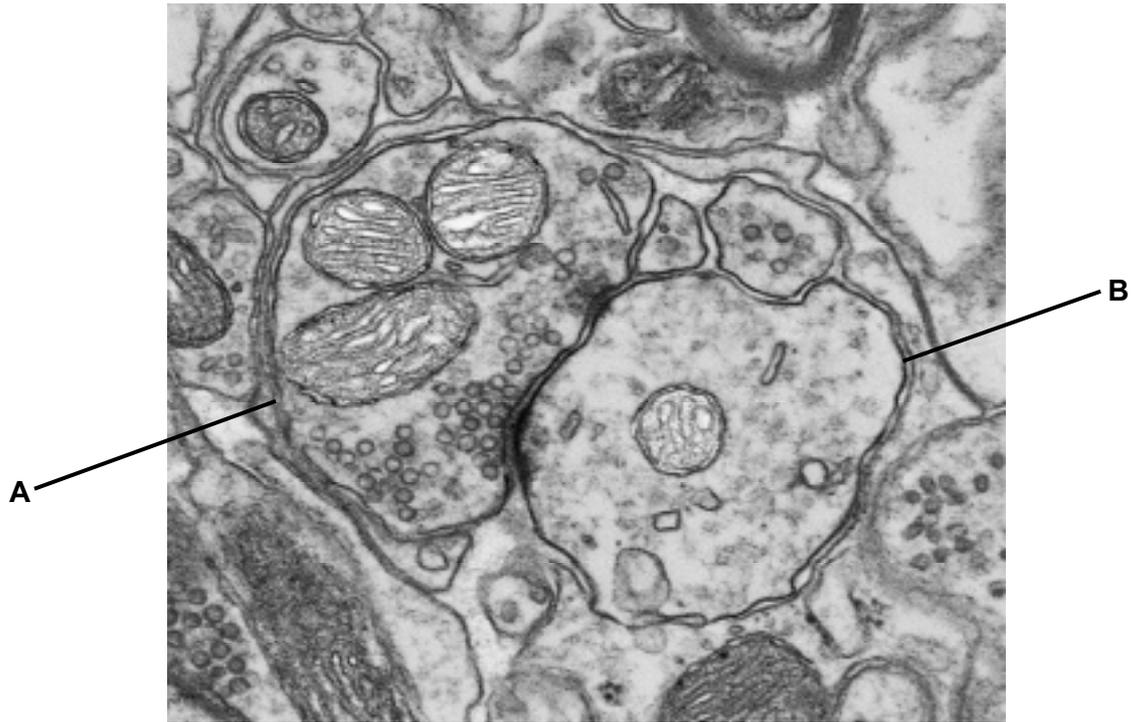


Fig 2.2

Identify neurones **A** and **B** and relate the appearance of these structures to their function. You may use the space opposite for any diagrams you may wish to draw to illustrate your answer.

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[5]

**[Total: 35]**

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*Copyright Acknowledgements:*

Question 2 Figure 2.1 Myelinated neuron, Road not taken © Wikimedia Commons.  
Question 2 Figure 2.2 Synapse nerve junction, © Thomas Deerinck, NCMIR/Science Photo Library

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