Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/36**

Advanced Practical Skills 2 **October/November 2014**

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

Answer **all** questions.

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	
1	
2	
Total	

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

CAMBRIDGE International Examinations

Before you proceed, read carefully through **the whole** of Question 1 and Question 2.

Plan the use of your **time** to make sure that you finish all the work that you would like to do.

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

If you have enough time, consider how you can improve the accuracy of your results, for example by obtaining and recording one or more additional measurements.

1 An enzyme, **E**, catalyses the hydrolysis (breakdown) of triglycerides into fatty acids and glycerol.

The substrate for **E** will be the triglycerides present in milk, labelled **M**.

The end-point of this hydrolysis can be determined by using an indicator, **B**, which changes colour to yellow when the fatty acids are produced.

You are required to:

- prepare different concentrations of the enzyme solution, **E**
- investigate the effect of different concentrations of **E** (independent variable) on the hydrolysis of triglycerides in milk.

You are provided with:

labelled	contents	hazard	volume /cm^3
E	5% enzyme solution	irritant	40
W	distilled water	none	60
B	indicator solution	stains	20
M	milk	none	40
A	solution of alkali	irritant	40

You are required to dilute the 5% enzyme solution, **E**, to provide a range of known concentrations using **simple** dilution.

Decide on the further concentrations of enzyme solution you will use in your investigation in addition to the 5% solution, **E**.

You will need to use 20 cm^3 of each enzyme solution.

(a) (i) Prepare the space below to show:

- the concentration of each enzyme solution
- the volumes of **E**
- the volumes of **W**.

[3]

Read step 1 to step 13 before proceeding.

Proceed as follows:

1. Prepare **all** the concentrations of enzyme solutions you have listed in **(a)(i)** in the containers provided.

You are required to investigate the effect of different concentrations of enzyme solutions on the hydrolysis of triglycerides in milk. The appearance of fatty acids can be detected using the indicator solution **B**.

Every 30 seconds, for a total of 180 seconds, a sample of milk will be removed from the test-tube and placed on a tile. You will need to have prepared this tile **before** you add the enzyme solutions.

[Turn over

2. Wipe the tile clean with a damp paper towel and then dry the tile.
Label the tile as shown in Fig. 1.1. The numbers indicate the sampling times in seconds. Put two drops of indicator solution, **B**, on the tile above each sampling time, as shown in Fig. 1.1.

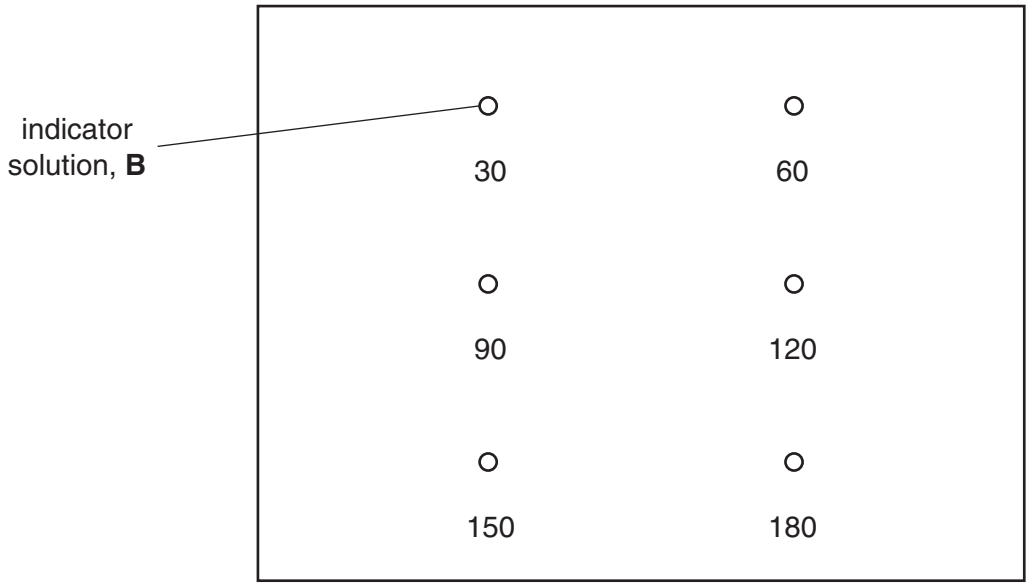

Fig. 1.1

3. Prepare a water-bath between 35 °C and 40 °C. You will need to add hot water/cold water to maintain the temperature of the water-bath between 35 °C and 40 °C for steps 7 to 12.

4. Put 2.5 cm^3 of **M** into a test-tube.

5. Put 2.5 cm^3 of **A** into the same test-tube.

6. Repeat steps 4 and 5 for each of the concentrations of enzyme solution you are going to investigate, including the 5% concentration, **E**.

7. Put all the test-tubes into the water-bath. Allow 2 minutes for the contents of the test-tubes to reach the same temperature as the water-bath.

The reaction will start as soon as you add the enzyme solutions so read steps 8 to 13 before proceeding.

8. Put 2.5 cm^3 of the 5% concentration, **E**, into one of the test-tubes, leaving the test-tube in the water-bath. Stir the contents of the test-tube and start timing.

9. After 30 seconds use the pipette to transfer two drops of the contents of the test-tube to the drop of **B**, labelled 30.

10. Repeat step 9, at 30 second intervals, until a drop changes to yellow (end-point).

11. Record the time taken to reach the end-point.

If the drop at 180 seconds does not reach the end-point, record 'more than 180' as your result.

Once you have recorded a time for the end-point remove this test-tube from the water-bath and proceed to step 12.

12. Wipe the tile clean with a damp paper towel and then dry the tile.
    Label the tile again as shown in Fig. 1.1.

13. Repeat steps 8 to 12 with the remaining concentrations of enzyme solutions.

(ii) Prepare the space below to record your results.

[5]

(iii) Identify **one significant** source of error in measuring the dependent variable in this investigation.

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.....

.....[1]

(iv) Describe **one** improvement to this investigation which would increase the confidence in your results.

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.....

.....[1]

You are required to use a sharp pencil for graphs.

(b) A student investigated an enzyme which hydrolyses starch to glucose over a period of 20 minutes. The student measured the mass of glucose present at four minute intervals.

The volumes and concentrations of starch and enzyme were kept the same (standardised).

(i) State **two other** variables that need to be standardised in this investigation.
Describe how you would standardise each of these variables.

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.....[3]

The results are shown in Table 1.1.

Table 1.1

time /min	mass of glucose /mg
4	1.90
8	3.15
12	3.90
16	4.00
20	4.05

(ii) Using the results in Table 1.1, calculate the rate of production of glucose between:

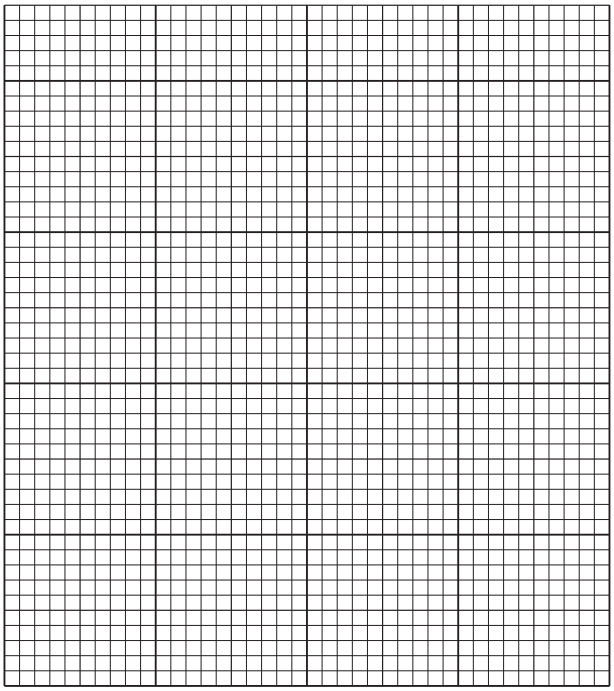
- 4 and 12 minutes

.....mg min^{-1}

- 12 and 20 minutes.

.....mg min^{-1}
[2]

(iii) Plot a graph of the data in Table 1.1.



[4]

(iv) Explain the reasons for the change in mass of glucose between:

- 0 and 12 minutes
- 12 and 20 minutes.

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.....[2]

[Total: 21]

You are required to use a sharp pencil for drawings.

M1 is a slide of a stained transverse section through a plant root.
This plant species grows worldwide.
You are not expected to be familiar with this specimen.

2 *To help draw a plan diagram with the correct shape and proportions of the tissues, an eyepiece graticule can be used to measure the layers of tissues, without the need to calibrate the eyepiece graticule scale.*

(a) (i) Explain how **one** observable feature on **M1** identifies this specimen as a root.

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.....[1]

(ii) Draw a large plan diagram of the part of the specimen on **M1** indicated by the shaded sector in Fig. 2.1.

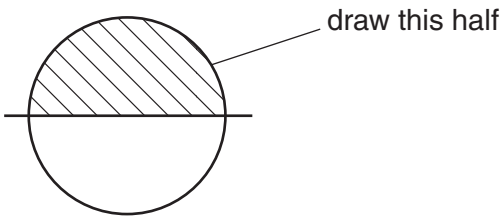

Fig. 2.1

Use **one** ruled label line and label to show the xylem.

[5]

(iii) Observe the xylem and the cortex of the specimen on **M1**.

Select:
- one group of **three** whole touching xylem vessels
- one group of **three** whole touching cortex cells.

Make a large drawing of each of these two groups of **three** cells.

Use **one** ruled label line and label to show **one** lumen on **one** of your drawings.

xylem vessels

cortex cells

[5]

Fig. 2.2 is a photomicrograph of part of a stained transverse section through a root of a different plant species. This plant species is found globally.

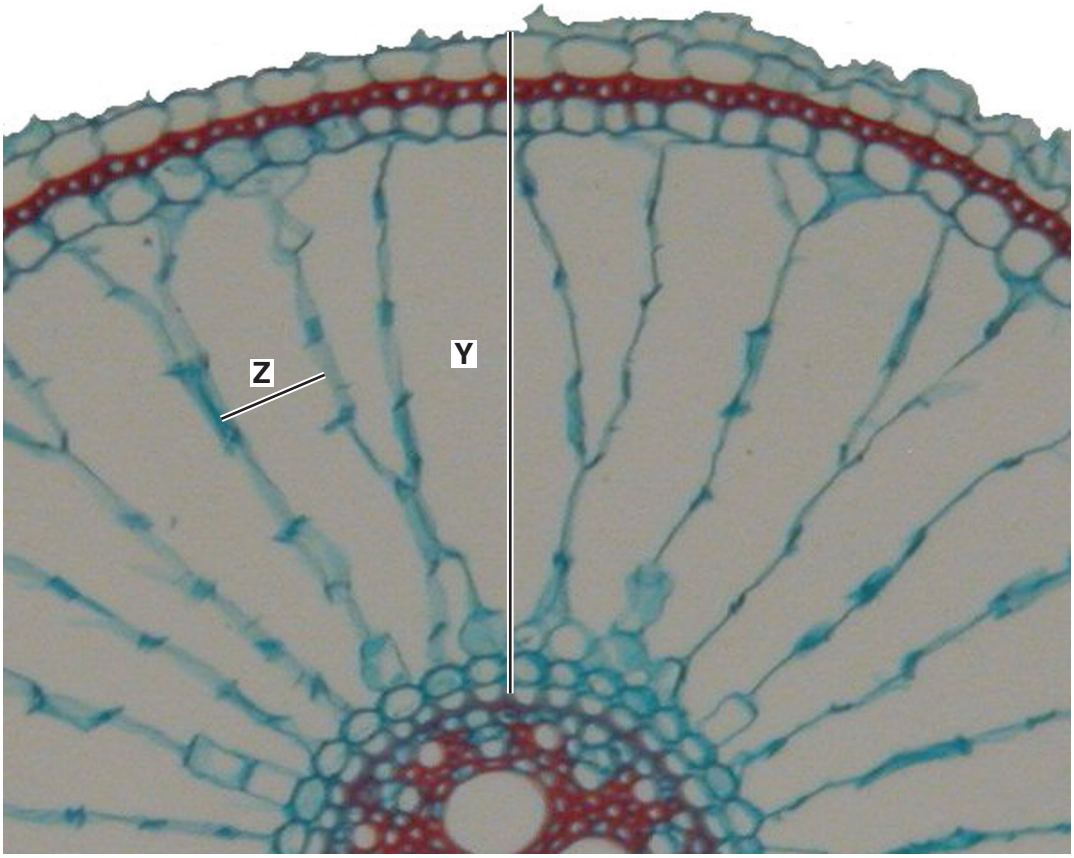

Fig. 2.2

(b) Use the lines **Y** and **Z** shown on Fig. 2.2 to calculate the ratio of **Y** to **Z**.

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

ratio .....[3]

(c) Prepare the space below so that it is suitable for you to record observable differences between the specimen on **M1** and Fig. 2.2.

Record your observations in the space you have prepared.

[5]

[Total: 19]

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