Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2615462080

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **May/June 2016**

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 or graphs.
Do **not** use staples, paperclips, 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.

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

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

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.

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

1 The enzyme, **E**, catalyses the hydrolysis (breakdown) of starch into glucose.

You are required to investigate the progress of this enzyme-catalysed reaction by **both**

- testing for the disappearance of starch
- testing for the appearance of glucose by finding the time taken for the decolourisation of potassium manganate(VII) solution.

To follow the progress of this reaction you will need to take samples from the reaction mixture at different times.

(a) (i) Decide how often you will take these samples including removing the last sample at 20 minutes.

State the times when you will remove the samples.

.....[1]

(ii) Decide how you will test a sample to show that the starch has disappeared.

State the reagent you will use .....

Describe how you will test each sample to show that the starch has disappeared and state the colour of any results you might collect.

test .....

.....

colour .....[1]

To test for the production of glucose, the change in the colour of potassium manganate(VII) solution is:

purple ⟶ colourless

Test-tube **Z** shows the colourless end-point.

You are provided with:

labelled	contents	hazard	volume/cm^3
E	amylase solution	harmful irritant	10
S	starch solution	none	40
A	sulfuric acid	irritant	20
P	potassium manganate(VII) solution	harmful	20

You are advised to wear suitable eye protection, especially when using the amylase solution, **E** and the sulfuric acid, **A**. If **either E** or **A** come into contact with your skin, wash off with cold water. **P** may stain your skin.

(b) When carrying out a practical procedure the hazards of using the solutions need to be considered. Then the level of risk needs to be assessed as low or medium or high.

State the hazard with the greatest level of risk when using the solutions then state the **level** of risk of the procedure: low or medium or high.

hazard .....

level of risk .....[1]

Proceed as follows:

1. Label the test-tubes with the sampling times that you stated in **(a)(i)**.
2. Put 2.5 cm^3 of **A** into each test-tube.
3. Put 1 cm^3 of **P** into each test-tube and gently shake to mix with **A**.

(c) Temperature may affect the rate of an enzyme-catalysed reaction.

(i) Use the thermometer to measure the temperature of the room.

State the temperature of the room. ..... [1]

Read step 4 to step 9 and note that the timer should not be stopped until you have the last end-point recorded.

*The reaction will start as soon as **E** is added to **S**.*

4. Put 30 cm^3 of **S** into a beaker.
5. Put 4 cm^3 of **E** into the beaker containing **S**.
6. Immediately stir the mixture in the beaker and start the timer.

7. At each of your sampling times:

   - test for the disappearance of starch as described in **(a)(ii)**
   - test for the appearance of glucose by removing 3 cm^3 of the mixture and putting it into the appropriately labelled test-tube, mixing well.

8. Record, in **(c)(ii)**, the time shown on the timer when the colourless end-point is reached (raw result). Do **not** stop the timer.

9. Repeat step 7 and step 8 for each of the times decided in **(a)(i)** until you have recorded the end-point for the last sample, removed at 20 minutes.

10. Calculate the time taken to reach **each** end-point (processed results).

(ii) Prepare the space below to record your results for:

- the test for starch
- the **raw** results for the appearance of glucose
- your **processed** results for the appearance of glucose.

[5]

(iii) Now measure the temperature of the room once again.

State the temperature of the room. .....

State the difference between this temperature and the temperature of the room you recorded in **(c)(i)**.

.....

State whether temperature was a significant error in this investigation.

.....[1]

(iv) Explain how a temperature rise of 30 °C might have affected the mixture of starch and amylase.

.....

.....

.....

.....

.....

.....

.....[3]

(v) This procedure investigated the progress of the hydrolysis of starch by amylase.

To modify this procedure for investigating a different variable, the time for the hydrolysis would be standardised.

Consider how you could modify this procedure to investigate the effect of **pH** on the activity of amylase.

Describe how the independent variable, **pH**, could be investigated.

.....

.....

.....

.....

Describe how the dependent variable could be measured.

.....

.....

.....[3]

(d) A student investigated the effect of starch concentration on the initial rate of reaction of amylase.

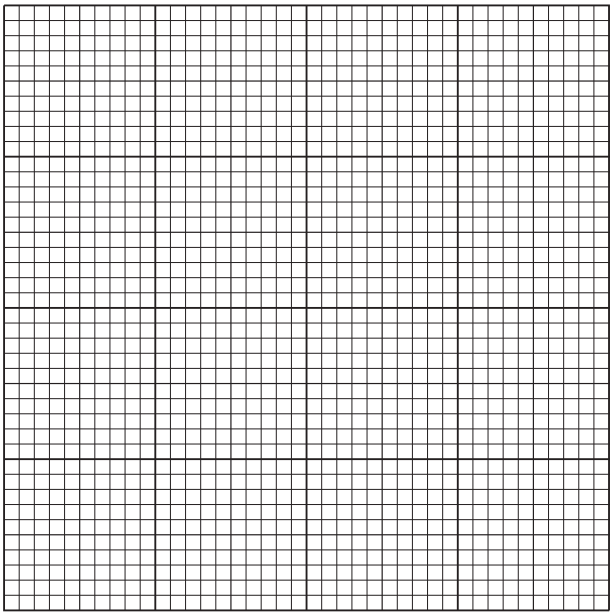
Table 1.1 shows the results for this investigation.

Table 1.1

percentage concentration of starch	initial rate of reaction of amylase /arbitrary units
0.00	0
0.50	100
1.25	215
1.75	285
2.50	340
3.25	340

You are required to use a sharp pencil for graphs.

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



[4]

(ii) Use the graph to estimate the Michaelis-Menten constant (K_m).

Show your working on the graph and in the space below.

K_m .....[3]

[Total: 23]

2 **N1** is a slide of a stained transverse section through a plant stem.

You are not expected to be familiar with this specimen.

You are required to use a sharp pencil for drawings.

(a) **(i)** Select a field of view so that you can observe the epidermis and the vascular bundles.

Draw a large plan diagram of the different tissues in the field of view to show
- **two** of the large vascular bundles
- the epidermis
- any other observable tissues.

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

You are expected to draw the correct shape and proportions of the different tissues.

[5]

(ii) Observe the cells in the centre of the stem (pith) in **N1**. These cells are not identical.

Select **one** group of **four** adjacent (touching) cells which show some of the differences between these cells.
Each cell of the group must touch at least **two** of the other cells.

Make a large drawing of this group of **four** cells.

Use **one** ruled label line and label to identify the cell wall of **one** cell.

[5]

(b) Fig. 2.1 is a photomicrograph of a stained transverse section through a root from a different type of plant.

You are not expected to be familiar with this specimen.

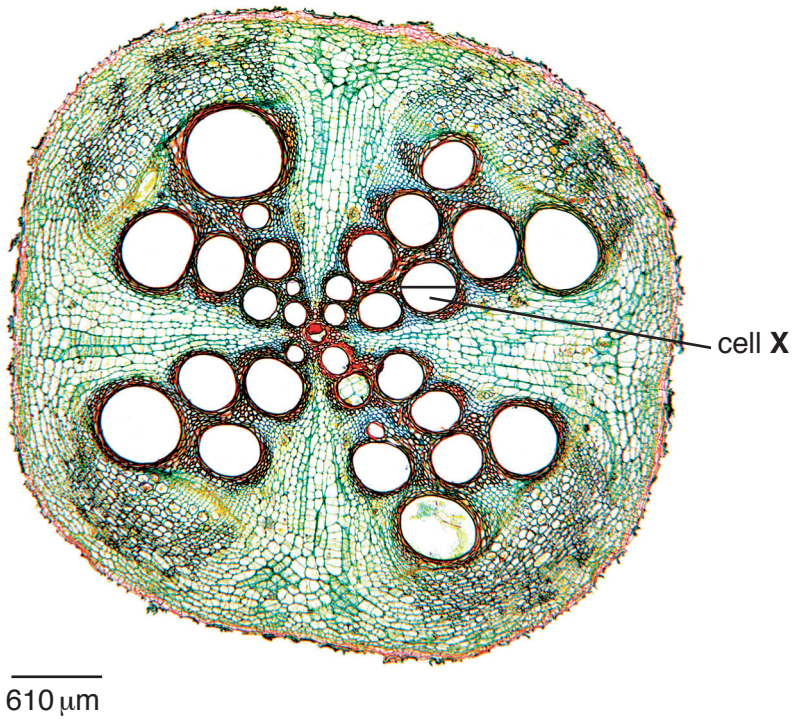


Fig. 2.1

(i) In Fig. 2.1 a line is drawn across the diameter of a cell, **X**.

Use this line and the scale bar to find the actual diameter of cell **X** in μm.

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

actual diameter ..... μm [3]

(ii) Prepare the space below so that it is suitable for you to record the observable differences between the stem on **N1** and the root in Fig. 2.1.

Record your observations in the space you have prepared.

[4]

[Total: 17]

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