Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



**BIOLOGY** **9700/35**

Advanced Practical Skills 1 **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 **15** printed pages and **1** blank page.




CAMBRIDGE International Examinations

**[Turn over**

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** Enzymes in yeast cells catalyse the hydrolysis (breakdown) of glucose and release carbon dioxide and ethanol.

You are required to investigate the effect of different concentrations of yeast cell suspension, **Y** (independent variable), on the hydrolysis of glucose using methylene blue solution, **M**, by:

- preparing different concentrations of the yeast cell suspension, **Y**
- adding glucose solution, **G**, to activate the yeast cell suspension, **Y**, so that **M** changes colour from blue to blue/green as a result of the activity of the enzymes in the yeast cells.

You are provided with:

| labelled | contents | hazard | volume /cm$^3$ |
|---|---|---|---|
| **Y** | 10% yeast cell suspension | none | 100 |
| **G** | glucose solution | none | 80 |
| **W** | distilled water | none | 150 |
| **M** | methylene blue solution | stains | 20 |

**If any methylene blue solution comes into contact with your skin wash it off immediately with water.**

**(a) (i)** Complete Fig. 1.1 to show how you will dilute **Y** to prepare a **serial** dilution.

You should use the two beakers shown in Fig. 1.1 and add as many extra beakers as you need to prepare a **serial** dilution.

You will need to prepare 20 $cm^3$ of each suspension.

For **each beaker**, complete Fig. 1.1 to show how you will dilute **Y** by:

- showing under each beaker the **concentration** and **volume** of the suspension in this beaker
- using one arrow, with a label above the beaker, to show the **concentration** and **volume** of yeast cell suspension added
- using another arrow, with a label above the beaker, to show the **volume** of water added.

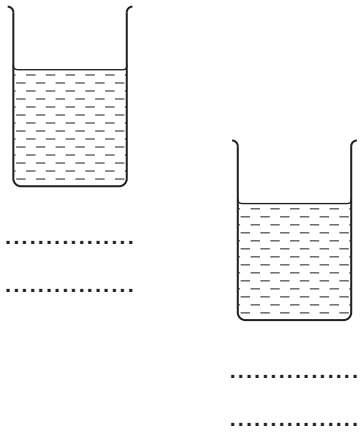



**Fig. 1.1**

[3]

1. Prepare **all** the concentrations of yeast cell suspension, as shown in Fig. 1.1 on page 3, in the containers provided.

You are required to put methylene blue solution with the yeast cell suspension and **G**.

When **G** is added to the yeast cell suspension the enzymes in the yeast cell suspension will start to catalyse the breakdown of glucose. Methylene blue solution changes colour as these enzymes become active as shown in Fig. 1.2.

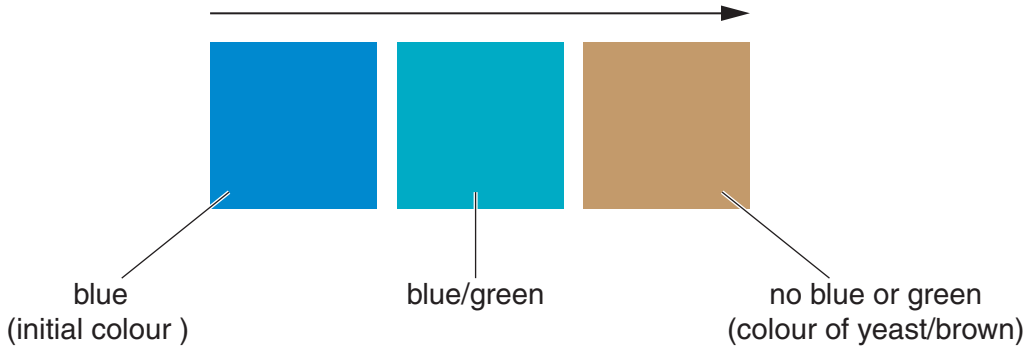



**Fig. 1.2**

5 minutes after adding **G** you are required to stop timing and record your observations of the concentrations of yeast cell suspension prepared in **(a)(i)**.

*Read step 2 to step 9 before proceeding.*

Proceed as follows:

2. In step 6 you will require a water-bath. Use the beaker or container provided to prepare a water-bath with warm water between 40 °C and 45 °C. You will need to add hot/cold water to maintain the temperature of the water-bath between 40 °C and 45 °C for steps 6 to 8.

3. Put 10 $cm^3$ of the 10% **Y** into your first test-tube.

4. Put 10 $cm^3$ of each of the other concentrations of yeast cell suspensions that you prepared in step 1 into separate test-tubes.

5. Put 1 $cm^3$ of **M** into each of the test-tubes.

*Note that the contents of the test-tubes might be different shades of blue.*

6. Put all the test-tubes into the water-bath between 40 °C and 45 °C and leave for two minutes.

You will start timing as soon as you add **G** (in step 7).

7. Leaving the test-tubes in the water-bath put 10 $cm^3$ of **G**, into each of the test-tubes and gently shake to mix the contents. Start timing.

   **Do not shake** the test-tubes again during the investigation.

8. After 5 minutes, stop timing and put the test-tubes in the test-tube rack in the order of the concentrations of yeast cell suspension.

9. Record your observations of each concentration of yeast cell suspension.

**(ii)** Prepare the space below to record your observations.

[5]

**(iii)** You used syringes to measure the volumes of the yeast cell suspension.

State the volume of the smallest division on the syringe .....

State the actual error in using the syringe.

actual error .....
[1]

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

.....

.....

.....[1]

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

.....

.....

.....[1]

You are required to use a sharp pencil for graphs.

Lactose, a disaccharide sugar, is the main carbohydrate of milk.
Some people cannot breakdown lactose and scientists have investigated ways to remove lactose from milk.
One type of yeast was found to contain the enzyme, **E**, that breaks down (hydrolyses) lactose.

**E** can be held within (immobilised) alginate beads and put into milk.

As the milk comes into contact with the alginate beads, **E** hydrolyses the lactose.

Scientists have investigated the effect of keeping the alginate beads in contact with the milk for different lengths of time and the percentage hydrolysis of lactose was found.

The volumes and concentration of lactose and **E** were kept the same (standardised).

**(b) (i)** State **two other** variables that need to be standardised in this investigation.

Describe how you would standardise each of these variables.

.....

.....

.....

.....

.....

.....

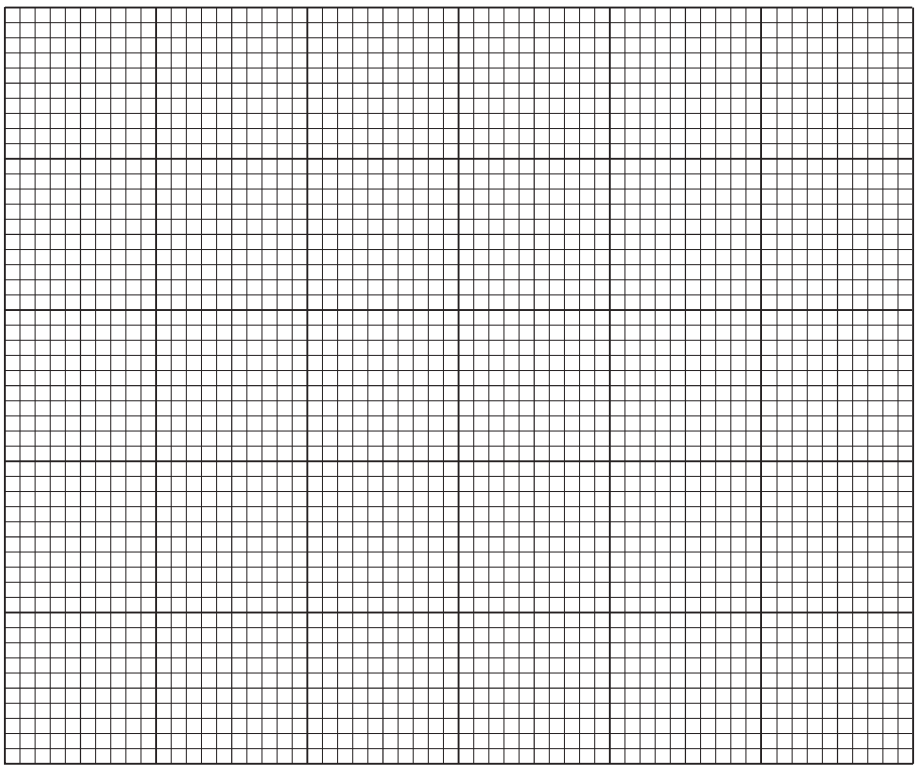
.....[3]

The results are shown in Table 1.1.

**Table 1.1**

| time alginate beads in contact with milk /minutes | percentage hydrolysis of lactose |
|---|---|
| 0 | 0 |
| 24 | 34 |
| 52 | 63 |
| 84 | 81 |
| 120 | 85 |

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



[4]

**(iii)** Using your graph state the percentage hydrolysis of lactose at 45 minutes.

.....%
[1]

**(iv)** Explain the reason for the difference in the results at 30 minutes and 70 minutes.

.....

.....

.....[1]

**(v)** Suggest a reason for the change in the trend after 90 minutes.

.....

.....

.....[1]

[Total: 21]

*You are required to use a sharp pencil for drawings.*

**2** Iodine solution and methylene blue solution are used as stains for biological material.

You are required to:

- observe the effect of using the different stains, iodine solution, **I**, and methylene blue solution, **M**, on thin sections of onion tissue, **S**
- observe and record the cells and their cell contents.

**Iodine** solution and **methylene blue** solution will stain your skin.

**If any iodine solution or methylene blue solution comes into contact with your skin wash off immediately with water.**

You are provided with:

- three pieces of onion tissue, in a dish labelled **S**
- iodine solution, **I**
- methylene blue solution, **M**
- distilled water, **DW**.

You are required to:

- prepare **three** microscope slides of onion tissue, one using iodine solution, **I**, one using methylene blue solution, **M**, and one using distilled water, **DW**
- use the microscope to observe the onion cells after **I**, **M** and **DW** have been added
- record your observations by using annotated drawings of **two** adjacent onion cells from each of the prepared slides.

Proceed as follows:

1. Label three dry and clean microscope slides, **I**, **M** and **DW** and put the slides on a paper towel.

2. Put a few drops of:

    - iodine solution onto slide **I**
    - methylene blue solution onto slide **M**
    - distilled water onto slide **DW**.

3. Remove a piece of the onion tissue from **S** and, using forceps or fingers peel off the inner concave epidermis as shown in Fig. 2.1.

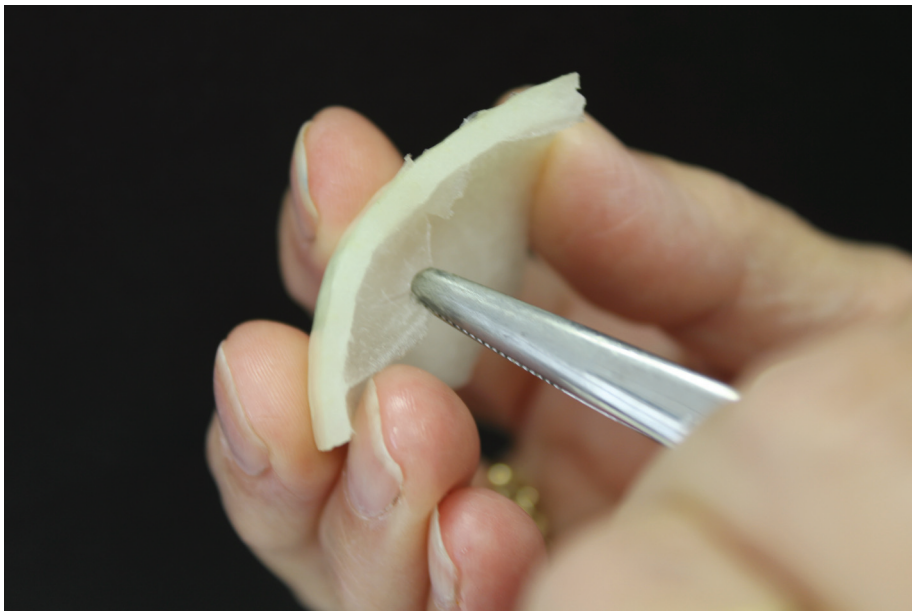


**Fig. 2.1**

4. Cut three pieces of the epidermis, each smaller than a coverslip.

5. Place one piece of the epidermis onto each of the slides as shown as Fig. 2.2.
If the epidermis is folded, you may need to add more drops of **I** or **M** or **DW** so that it floats or uncurls.

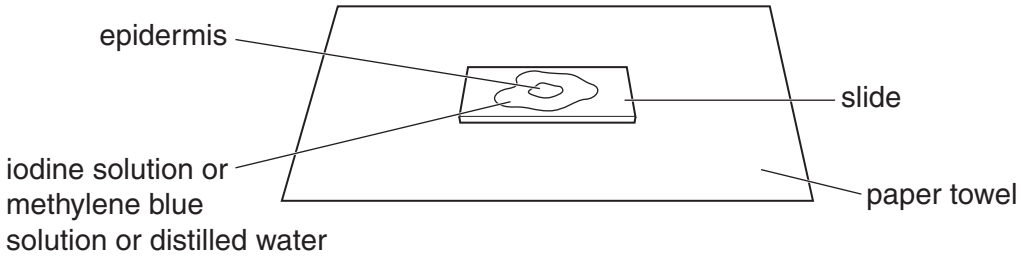



**Fig. 2.2**

6. Cover the epidermis on the slide with a coverslip and use a paper towel to remove any excess liquid that is outside the coverslip.

7. View the slide using the microscope. Look for the thinnest part of the section so that the cells and their contents can be observed.

   You may need to reduce the amount of light entering the microscope to observe the cells.

**(a) (i)** Make a large drawing of **two** adjacent cells with any observable cell contents from each of:

- slide **I**
- slide **M**
- slide **DW**.

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

*cells from slide **I***

*cells from slide **M***

*cells from slide **DW***

[6]

**(ii)** Describe **one** observable difference between the cells on slide **I** and the cells on slide **M**.

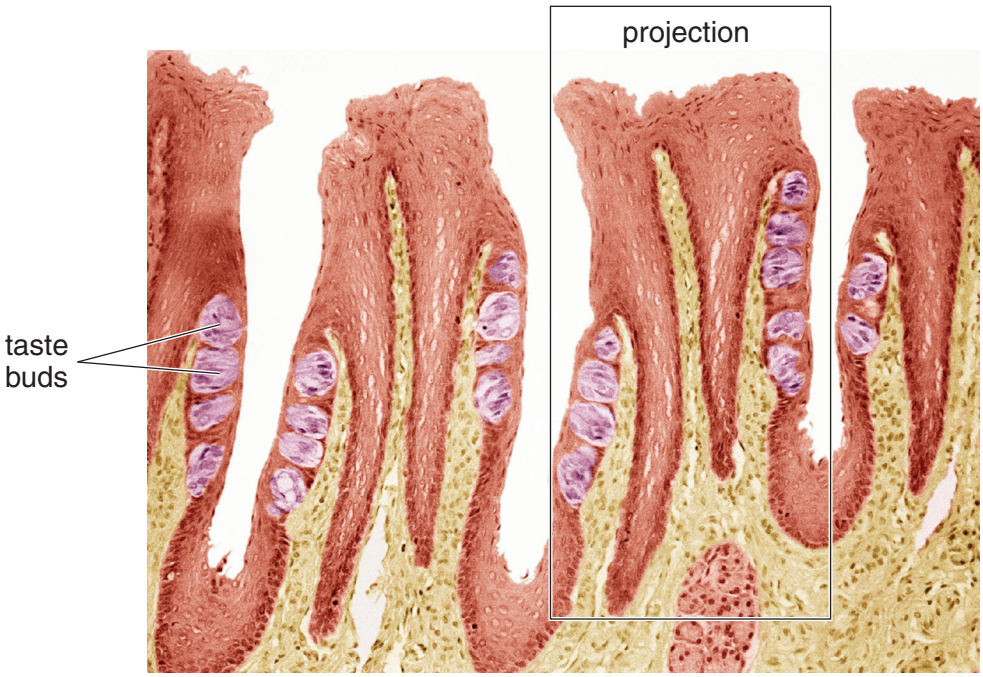
.....

.....[1]

**Question 2 continues on page 12**

**(b)** Fig. 2.3 is a photomicrograph of a stained transverse section through part of an organ from a mammal.

You are not expected to have studied this material.




magnification ×40

**Fig. 2.3**

**(i)** Suggest **one** observable feature shown by the specimen in Fig. 2.3 which supports the conclusion that this is part of an organ that may absorb molecules.

Explain how **this** feature may help the organ to increase the rate of absorption.

*feature* .....

*explanation* .....

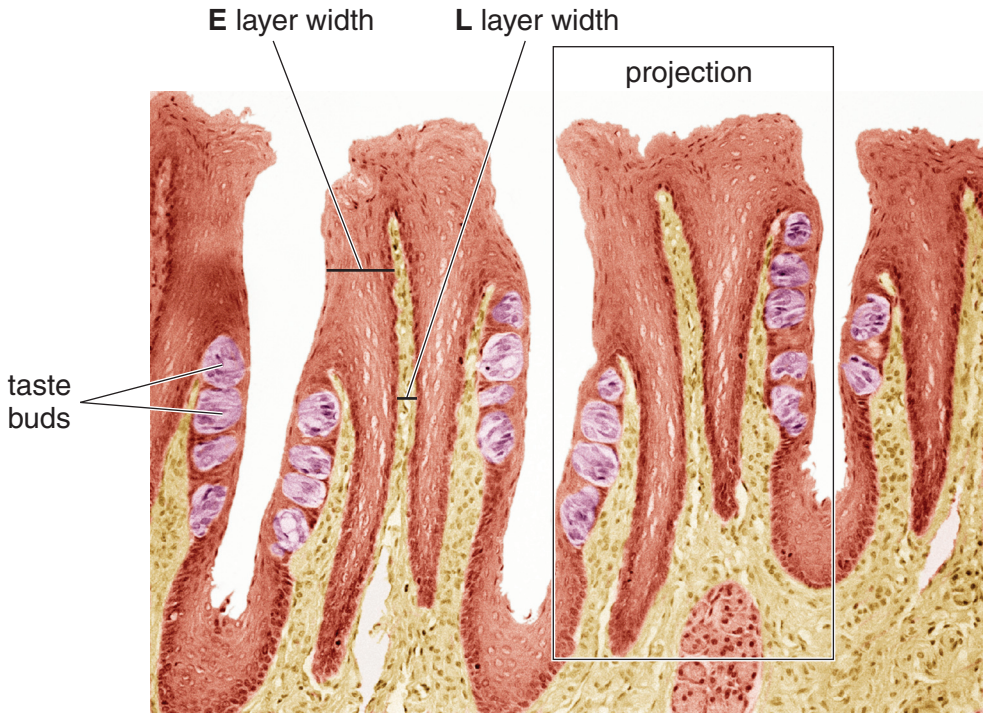
[1]

**(ii)** Draw a large plan diagram of the projection shown in Fig. 2.3.

[4]

**Question 2 continues on page 14**

*Fig. 2.3 is shown again here to help you to answer* **(c)(i)**




**(c)** Fig. 2.4 is a photomicrograph of a stained transverse section through the same organ as Fig. 2.3 but from a different mammal.

You are not expected to have studied this material.

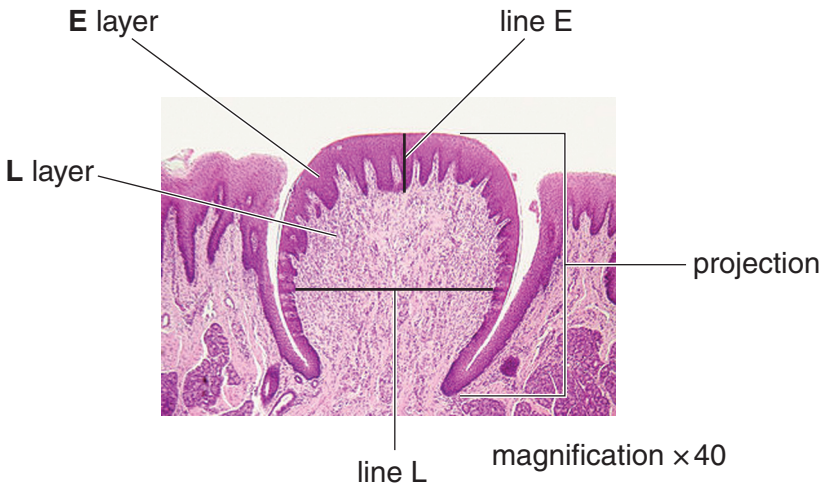



**Fig. 2.4**

**(i)** Prepare the space below so that it is suitable for you to show the observable differences between the specimens in Fig. 2.3 and in Fig. 2.4.

Record your observations in the space you have prepared.

[4]

**(ii)** Calculate the ratio of the width of **L** (line L) to the width of **E** (line E) shown within the area indicated on Fig. 2.4.

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

ratio .....[3]

[Total: 19]

**BLANK PAGE**