



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
 General Certificate of Education
 Advanced Subsidiary Level and Advanced Level

CANDIDATE
 NAME

CENTRE
 NUMBER

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

CANDIDATE
 NUMBER

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|



BIOLOGY

9700/31

Paper 3 Advanced Practical Skills

May/June 2008

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Instructions to Supervisors

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

Answer **all** questions.
 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.
 You are advised to spend one hour on each question.

| | |
|--|--|
| The length of the smallest division on the stage micrometer scale | |
| | |
| For Examiner's Use | |
| 1 | |
| 2 | |
| Total | |

This document consists of **10** printed pages and **2** blank pages.



You are reminded that you have only one hour for each question in the practical examination. You should read carefully through the whole of each question and then plan your use of the time to make sure that you finish all of the work that you would like to do.

*For
Examiner's
Use*

- 1** You are required to carry out tests, using only the reagents provided, to identify each of the solutions **S1**, **S2** and **S3**.

One of the solutions is glucose, another a protein and the third a carbohydrate other than glucose.

You are required to identify each of the solutions, **S1**, **S2** and **S3**. You must use only the reagents provided.

- (a) (i)** Prepare and use the space below to record the test used, observations and conclusions.

[5]

(ii) Describe and explain how you identified the carbohydrate that was not glucose.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(iii) Use your results and the information in Table 1.1 to estimate the concentration of the glucose solution.

Table 1.1

| colour | glucose concentration / mol dm ⁻³ |
|--------|--|
| blue | 0.00 |
| green | 0.01 |
| yellow | 0.05 |
| red | 0.10 |

concentration of glucose solution [1]

(iv) Identify two sources of error in estimating the concentration of the solution.

1

.....

2

..... [2]

- (v) If you were to repeat **this** experiment to make a more accurate estimation of the glucose concentration, state how you would carry out your investigation.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (b) A student carried out an investigation on starch suspensions with various concentrations testing for starch with iodine in potassium iodide solution. To find the concentration of starch, the student used a colorimeter to determine the mean transmission of light through the solutions.

Five replicates were run, starting with fresh materials each run.

The data in **Table 1.2** were obtained.

Table 1.2

| percentage concentration of starch suspension | transmission of light/arbitrary units | | | | | |
|---|---------------------------------------|------------|-----------|------------|-----------|------|
| | first run | second run | third run | fourth run | fifth run | mean |
| 0.0 | 92 | 91 | 92 | 94 | 89 | 92 |
| 0.5 | 61 | 60 | 59 | 60 | 58 | 60 |
| 1.0 | 41 | 41 | 42 | 43 | 41 | 42 |
| 1.5 | 31 | 30 | 30 | 29 | 31 | |
| 2.0 | 25 | 23 | 25 | 23 | 24 | 24 |
| 2.5 | 22 | 23 | 21 | 23 | 21 | 22 |

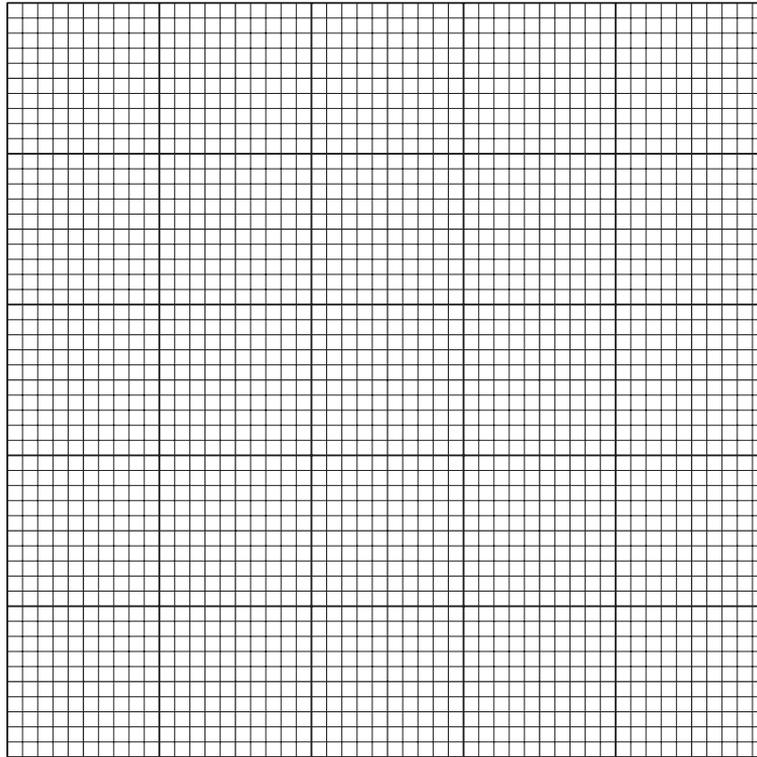
- (i) Complete **Table 1.2** by calculating the missing value. [1]
- (ii) When the student performed this investigation, the transmission for a 2.5% suspension of starch in the first run was 95 arbitrary units. Explain why the student discarded this result and repeated the experiment with a freshly made solution.

.....

..... [1]

(iii) Plot a graph of percentage concentration of starch suspension against the transmission of light using the student's results.

For
Examiner's
Use



[3]

(c) The student's hypothesis was:

Transmission of light is proportional to the concentration of starch suspension.

Draw an appropriate conclusion to the student's experiment.

You should include in your conclusion whether the experimental data support the hypothesis and produce a revised hypothesis, if necessary.

.....
.....
.....
.....

[2]

[Total : 21]

2 **J1** is a slide of a stained transverse section through the leaf of a xerophyte.

You are also provided with an eyepiece graticule that has been fitted to the eyepiece of your microscope and a stage micrometer scale.

*For
Examiner's
Use*

- (a) (i) Draw a large low-power plan diagram of a part of **J1** as shown in **Fig. 2.1**.
Labels are not required.

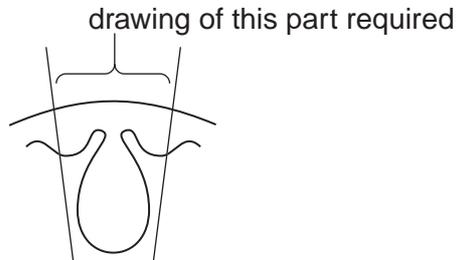


Fig. 2.1

[4]

(ii) **Fig. 2.2** is a photomicrograph of part of **J1**.

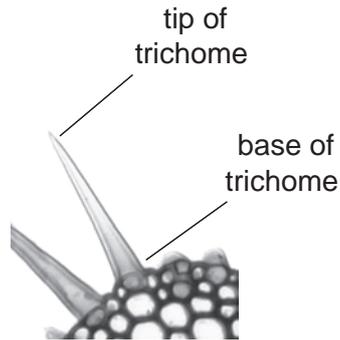


Fig. 2.2

Carefully examine a similar area of **J1** using the high-power of your microscope.

Put a ring round the number written on the objective lens.

×40 4 mm 1/6" other

Identify a trichome (hair).

Count the number of eyepiece graticule divisions across the width of the base of the trichome.

number of eyepiece graticule divisions

Remove the slide **J1** and replace it with the stage micrometer scale.

The length of the smallest division on the stage micrometer scale is mm.

Using the same magnification, adjust the focus until you can see the eyepiece graticule on top of the stage scale.

Count the number of eyepiece graticule divisions that match an exact number of stage scale divisions.

number of eyepiece graticule divisions

number of stage micrometer scale divisions

Use this information to calculate the actual width of the trichome on your slide **J1**.

Show your working.

actual width of trichome μm

[4]

(iii) Suggest how an error in measuring the trichome could occur.

.....
.....
..... [1]

*For
Examiner's
Use*

(iv) Suggest the purpose of the trichomes on the leaf of the xerophyte.

.....
.....
..... [1]

- (b) In the space below, make a large high-power drawing of three cells from the inner layer (at **X**) and three cells from the outer layer (at **Y**) of **J1**, as shown in **Fig. 2.3**.

*For
Examiner's
Use*

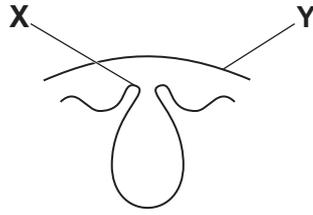


Fig. 2.3

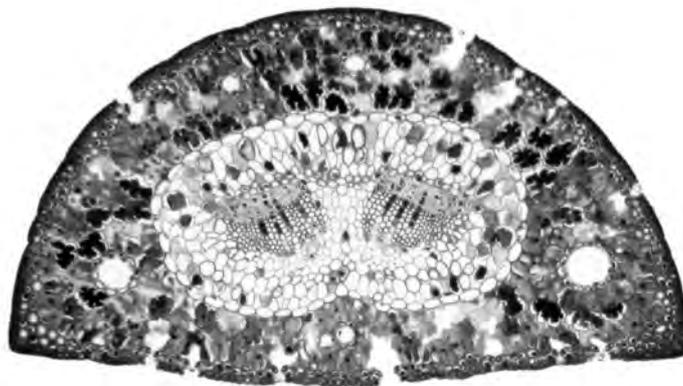
three cells from the inner layer (at **X**)

three cells from the outer layer (at **Y**)

[4]

(c) **Fig. 2.4** is a photomicrograph of a transverse section of a leaf of another xerophyte.

*For
Examiner's
Use*



× 50

Fig. 2.4

Prepare the space below so that it is suitable for you to compare and contrast the section on slide **J1**, with the section shown in **Fig. 2.4**.

Record your **observations** in the space that you have prepared.

[5]

[Total : 19]

[Paper total : 40]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.