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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1670827941

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.

© UCLES 2008

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]

© UCLES 2008

For Examiner's Use

(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]

© UCLES 2008

[Turn over

For Examiner's Use

(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.

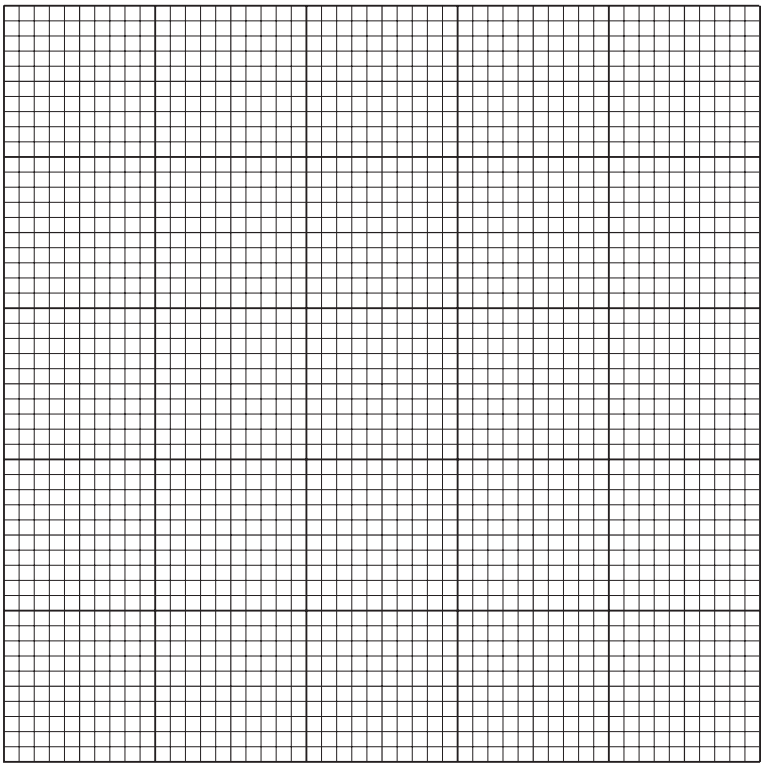
.....

..... [1]

© UCLES 2008

(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.

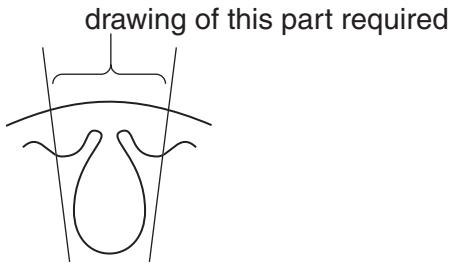


Fig. 2.1

[4]

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

For Examiner's Use

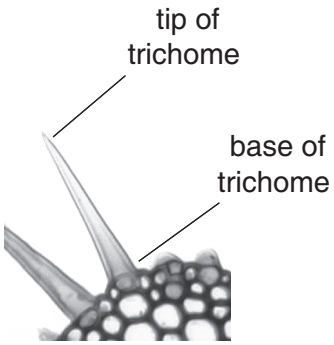


Fig. 2.2

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 ⅙" 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.

For Examiner's Use

.....

.....

..... [1]

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

.....

.....

..... [1]

© UCLES 2008

(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

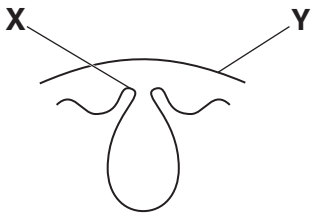


Fig. 2.3

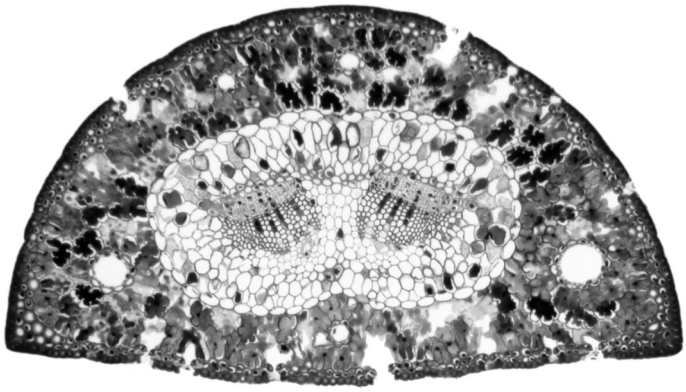
three cells from the inner layer (at **X**)

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]

© UCLES 2008

BLANK PAGE

BLANK PAGE

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.

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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3254083944

BIOLOGY **9700/32**

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.

Onion	
Celery	
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.

© UCLES 2008

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 investigate the effect of different strengths of sucrose solutions on plant leaf tissue.
You are provided with two lengths of plant leaf, labelled **P1**.
You are also provided with two sucrose solutions. The first, labelled **T1**, is a 0.6 mol dm^{-3} solution of sucrose. The second labelled **X1** is a sucrose solution of unknown strength.

Using the solution **T1** and the distilled water, make up 10 cm^3 of a range of four or five solutions ranging from 0.0 to 0.6 mol dm^{-3} of sucrose into the four or five large test-tubes. Label the test-tubes and place them next to the test-tube labelled **X1**.

Tick the material being used onion ..... celery .....

INSTRUCTIONS FOR ONION

Using a scalpel or sharp blade, trim the length of the leaf to 20 mm as accurately as you can. Then cut the plant leaf into vertical strips, each 20 mm long, as shown in Fig. 1.1.

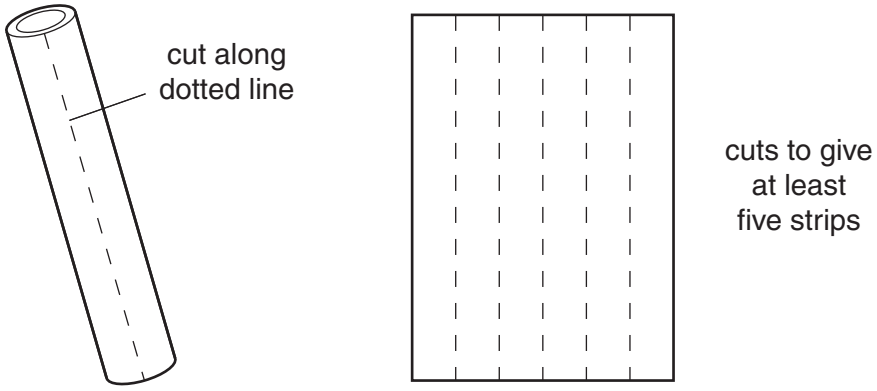


Fig. 1.1

Decide how many strips to add to each of the large test-tubes.

INSTRUCTIONS FOR CELERY

Using a scalpel or sharp knife, carefully cut off the outer layer (with ridges), in wide strips less than 5 mm thick as shown in Fig. 1.2.

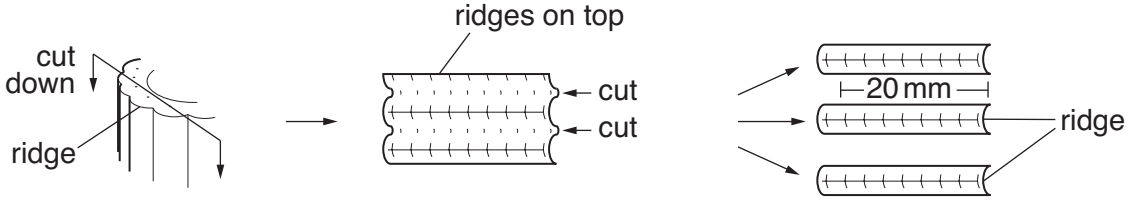


Fig. 1.2

Place the wide strip with the ridges on top on the cutting surface and cut into thin strips between the ridges as shown in Fig. 1.2. Then carefully cut to 20 mm lengths. Decide how many thin strips to add to each of the large test-tubes.

© UCLES 2008

Leave for at least 20 minutes once you have added the strips to the test-tubes.

While you are waiting you may start Question 1(e).

For Examiner's Use

Pour the solution and the strip(s) from one test-tube into a Petri dish.

Carefully remove a strip from the Petri dish and blot dry with a paper towel, re-measure without altering the strip and record your observations.

Repeat this procedure for each of the strips from the other test-tubes.

(a) Prepare and use the space below to record how you made up the solutions, the concentration, and the measurements you made, including **X1** and any observed changes to the strips.

[5]

(b) Estimate the concentration of sucrose solution **X1** from your observations.

..... [1]

(c) Describe and explain the results from **all** the solutions that you made.

For Examiner's Use

.....

.....

.....

.....

..... [3]

(d) **(i)** Identify **two** significant sources of error in this experiment.

1 .....

.....

2 .....

..... [2]

(ii) Suggest how you could improve this experiment.

.....

.....

.....

.....

..... [3]

(e) A student investigated the effect of sucrose concentration on the diameter of red blood cells.

The original diameter of the red blood cells was 7.0 μm.

The results are shown in Table 1.1.

Table 1.1

	concentration of sucrose solution / mol dm^{-3}				
	0.05	0.10	0.20	0.40	0.80
diameter of cell 1 / μm	8.4	7.2	6.6	5.7	2.3
diameter of cell 2 / μm	7.8	7.3	6.8	5.7	2.5
diameter of cell 3 / μm	8.1	7.4	7.0	5.5	2.4
mean diameter / μm	8.1	7.3	6.8		2.4
mean change in diameter / μm	+1.1	+0.3	−0.2		−4.6

© UCLES 2008

For Examiner's Use

(i) Complete **Table 1.1** by calculating the missing mean diameter and mean change in diameter for solution 0.40 mol dm^{-3}.

Write your answer in **Table 1.1**. [1]

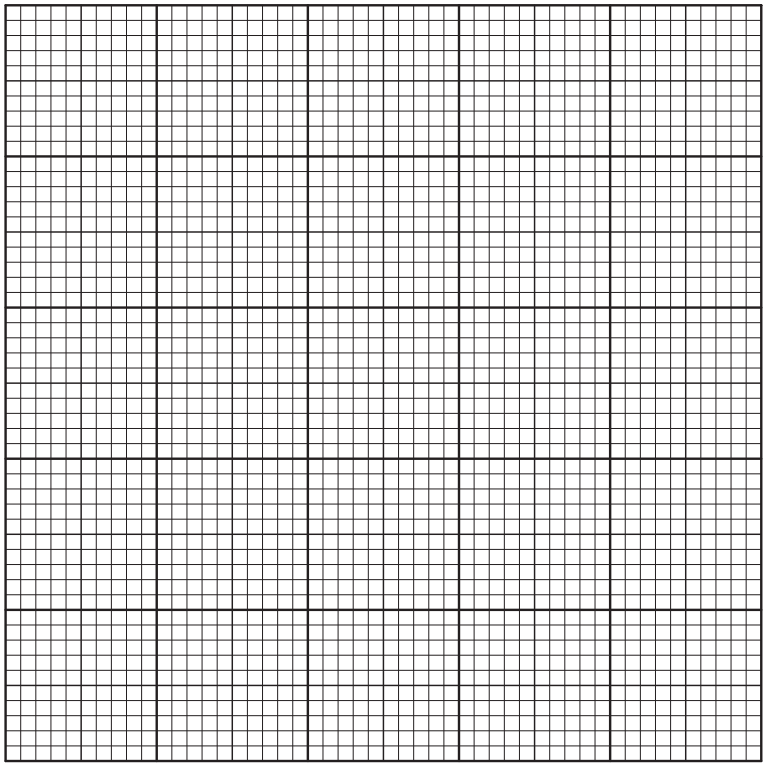
(ii) When the student first performed this investigation, the diameter of cell 2 in 0.20 mol dm^{-3} solution was 3.1 μm.

Explain why the student discarded this result and repeated the experiment with freshly made solutions.

.....

..... [1]

(iii) Plot a graph to show the effect of sucrose concentration on the mean diameter of red blood cells.



[3]

(f) The student's hypothesis was:

> The greater the concentration of sucrose solution, the greater the diameter of red blood cells.

Draw an appropriate conclusion to the student's experiment. You should include in your conclusion whether the experimental data support the hypothesis and you should produce a revised hypothesis if necessary.

.....

.....

.....

.....

..... [2]

[Total: 21]

For Examiner's Use

2 **K1** is a slide of a stained transverse section through a plant stem.

You are also provided with an eyepiece graticule that has been fitted to the eyepiece of your microscope and a stage scale (stage micrometer) printed on acetate sheet.

For Examiner's Use

(a) (i) Draw a large low-power plan diagram of a quarter of the specimen **K1** as shown in Fig. 2.1.

Labels are not required.

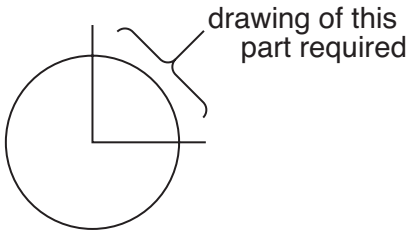


Fig. 2.1

[4]

For Examiner's Use

(ii) Carefully examine one of the larger vascular bundles using the low-power of your microscope.

Count the number of eyepiece graticule divisions across this vascular bundle from the outer edge towards the centre (radial width).

Indicate by drawing a line on your low power plan, precisely where you made your measurement.

number of eyepiece graticule divisions .....

Remove the slide **K1** 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 micrometer scale.
Count the number of eyepiece graticule divisions that match an exact number of stage micrometer scale divisions.

number of eyepiece graticule divisions .....

number of stage micrometer scale divisions .....

Use this information to calculate the actual radial width of the vascular bundle.

Show your working.

actual radial width of the vascular bundle ..... µm [4]

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

.....

..... [1]

© UCLES 2008

(iv) In the space below, make a large high-power drawing of phloem tissue only. Draw five cells that are in contact with each other. Include at least one companion cell in your drawing.

For Examiner's Use

[4]

© UCLES 2008

[Turn over

(b) **Fig. 2.2** is a photomicrograph showing a transverse section of a different stem.

For Examiner's Use

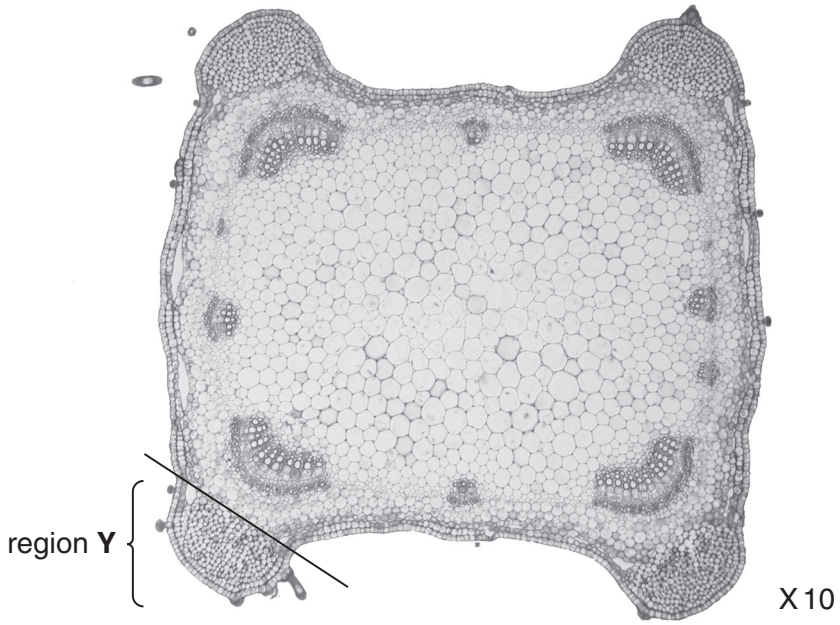


Fig. 2.2

(i) Suggest the purpose of region **Y** as shown on Fig. 2.2.

.....

..... [1]

(ii) Prepare the space below so that it is suitable for you to compare and contrast the stem on slide **K1** with the stem in **Fig. 2.2**.

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

[5]

[Total: 19]

© UCLES 2008

BLANK PAGE

BLANK PAGE

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.