Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/31**

Paper 3 Advanced Practical Skills 1 **October/November 2016**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given, including the identity of material on microscope slides where appropriate, does not reach the candidates either directly or indirectly.

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If you have any problems or queries regarding these Instructions, please contact CIE
by e-mail: info@cie.org.uk
by phone: +44 1223 553554
by fax: +44 1223 553558
stating the Centre number, the nature of the query and the syllabus number quoted above.

This document consists of **8** printed pages.

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Instructions for preparing apparatus

These instructions give details of the apparatus required by each candidate for each experiment in this paper. A summary of the questions that will be presented to the candidates is included, where appropriate, to allow the biology teacher to test the apparatus appropriately. **No access to the Question Paper is permitted in advance of the examination.**

Candidates must be provided with a microscope with:

- Eyepiece lens, ×10 (equal to 16 mm or $\frac{2}{3}''$)
- Low-power objective lens, ×10 (equal to 16 mm or $\frac{2}{3}''$)
- High-power objective lens, ×40 (equal to 4 mm or $\frac{1}{6}''$)
- Eyepiece graticule fitted within the eyepiece and visible in focus at the same time as the specimen.

To avoid confusion, only the lenses specified above should be fitted in the microscopes to be used in the examination. Any lenses which are **not** ×10 or ×40 should be removed or replaced.

Each candidate must have sole, uninterrupted, use of the microscope for at least one hour.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

In accordance with the COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant.

C = corrosive

HH = health hazard

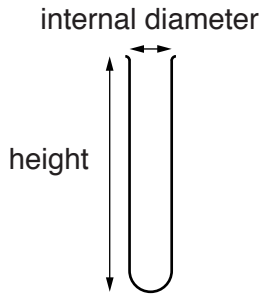
F = flammable

N = hazardous to the aquatic environment

MH = moderate hazard

T = acutely toxic

O = oxidising



When small test-tubes are provided, it is expected that these are approximately 150 mm in height.

If other dimensions of apparatus are required, these will be specified.

Centres are reminded that they are **not** permitted to open the Question Paper envelopes before the examination. Centres should also refer to the Handbook for Centres.

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Confidential Instructions

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For both Questions

Each candidate will require:

- ruler, marked in mm (note: for Question 2 this must be a clear plastic ruler)
- clean and dry apparatus, e.g. glassware and syringes (without a needle)
- solutions supplied in a suitable beaker or container for removal of the solution using a syringe
- fresh solutions, materials and rinsing water where appropriate.

More of the solutions should be available if requested by candidates.

If a candidate breaks any of the apparatus, or loses any of the materials supplied, the matter should be rectified and a note made in the Supervisor's Report.

Solutions should be disposed of in accordance with local safety regulations.

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Question 1

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
1% reducing sugar solution in a beaker or container, labelled **R**, provided at room temperature (see **Preparation of materials**)	at least 50 cm^3	
Milk in a beaker or container, labelled **M1**, provided at room temperature (see **Preparation of materials**)	at least 40 cm^3	
Milk in a beaker or container, labelled **M2**, provided at room temperature (see **Preparation of materials**)	at least 40 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 50 cm^3	
Benedict's solution (qualitative) in a beaker or container, labelled **Benedict's**, provided at room temperature	at least 50 cm^3	
10 cm^3 syringes with the means to wash them out	2	
5 cm^3 syringe with the means to wash it out	1	
Beakers or containers, to hold 50 cm^3	5	
Test-tubes – large, to hold more than 25 cm^3 but no more than 50 cm^3, suitable for heating	7	
Test-tube rack(s) to hold seven large test-tubes **or** test-tube rack to hold five large test-tubes plus a container to hold two large test-tubes	1	
Test-tube holder to hold hot test-tubes	1	
Bunsen burner, bench mat, gauze and tripod to support water-bath	1	
Beaker (capacity approximately 300 cm^3), with water at 40–45 °C, suitable for heating as a water-bath and labelled **hot water**. The Supervisor may use a thermostatically controlled water-bath to provide the hot water for candidates.	1	
Thermometer, –10 °C to 110 °C	1	
Container with tap water (capacity approximately 200 cm^3), labelled **For washing**	1	
Container (capacity approximately 400 cm^3), labelled **For waste**	1	
Paper towels	8	
Glass marker pen	1	
Stopclock or timer showing seconds	1	
Suitable eye protection	1	

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It is advisable to wear suitable eye protection when handling chemicals.

Preparation of materials

(i) **R**, 1% reducing sugar solution

This is prepared by sprinkling 1.0 g of glucose in 80 cm^3 of warm distilled water, stirring and then making up to 100 cm^3 with distilled water.
R can be prepared the day before the examination. It should be in a covered container in a refrigerator. **R** should be at room temperature for the examination.

(ii) **M1**, 10% dried milk solution

This is prepared by dissolving 10 g of dried milk powder in 50 cm^3 distilled water, stirring and then making up to 100 cm^3 with distilled water. Continue to stir until all of the milk powder has dissolved.

(iii) **M2**, 0.05% dried milk solution

This is prepared by putting 1 cm^3 of **M1** into 99 cm^3 of distilled water and stirring well. This makes a 0.1% solution.
50 cm^3 of this 0.1% solution should be mixed with 50 cm^3 of distilled water to make **M2**. This makes a 0.05% solution.

Question 2

Each candidate will require:

(i) Clear plastic ruler, marked in mm (see page 3)

(ii) Slide **J1**

On receipt of the slides, please check that they are labelled **J1** and that no slides are broken. The material is **confidential** (so **must not** be disclosed to candidates) and the slides should **not** be viewed in advance of the examination.

The number of slides supplied by Cambridge will be equal to half the candidate entry.

Therefore, half the candidates should start on **Question 2** and the other candidates should start on **Question 1**.

(iii) Microscope (as described on page 2)

For each candidate:
- the microscope **must** be set up on low power
- the slide must **not** be left on the stage of the microscope.

SUPERVISOR'S REPORT

The Supervisor's Report is essential in order to allow the Examiners to assess all candidates as fairly as possible and should always be completed by every Centre.

During the examination, the Supervisor or other competent biologist (not the Invigilator), should follow the steps in **Question 1**, in order to obtain results for **1(a)(iii)** and **1(a)(vi).**

The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**.

These results should be written in the Supervisor's Report, **not** on a spare question paper.

SEATING PLAN

Provide a **seating plan** of work benches, on separate paper, giving details of the places occupied by the candidates for **each question** using each candidate's number.

The Supervisor's Report and the candidates' seating plan should be enclosed with each packet of scripts.

MATERIALS TO BE SUPPLIED BY CAMBRIDGE

- Slide **J1**

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

Immediately after the examination the microscope slides **must** be:

- returned to Cambridge in the containers in which they were received, using the self-adhesive label. The slides must **not** be included in the packet of scripts.

or

- purchased using the order form enclosed with the slides, which should be completed and returned to Cambridge. The order form must **not** be included in the packet of scripts.

Slides and boxes will be charged at the rate of £3 per slide and £1 per box.
If the items are not returned or purchased by the deadline stated on the order form, they will be charged at £3.50 per slide plus £1 per box.

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.

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This form should be completed and sent with the scripts

SUPERVISOR'S REPORT

October/November 2016

The Supervisor or Teacher responsible for the subject should provide the following information.

1 Was any difficulty experienced in providing the necessary materials? If so, give brief details.

2 Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

(a) difficulties arising from faulty specimens or microscopes;

(b) accidents to apparatus or materials;

(c) assistance provided in case of colour blindness;

(d) any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

All other cases of individual hardship, e.g. illness or disability, should be reported direct to Cambridge on the 'Special Consideration Form' as detailed in the Handbook for Centres.

3 During the examination the Supervisor or a competent biologist should follow the steps in **Question 1** in order to obtain results for **1(a)(iii)** and **1(a)(vi).** The Supervisor should use the same solutions as those provided to the candidates, and work **out of the sight of the candidates**. These results should be written on page 8, which should be enclosed with the candidates' scripts. If the scripts are in several packets, please ensure that a copy of the Supervisor's Report is enclosed with each packet of scripts.

4 Enclose a **seating plan** of work benches with the scripts, giving details of the candidate numbers for the places occupied by the candidates for **each question**.

Declaration (to be signed by the Principal or the Examinations Officer)

The preparation of this practical examination has been carried out so as to maintain the security of the examination.

Signed .....

Name (in block capitals) .....

Centre number (of enclosed scripts) .....

Centre name .....

If scripts are despatched in more than one envelope, it is essential that **each envelope** includes a copy of the:

- relevant Supervisor's Report
- appropriate seating plan(s).

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[Turn over

Temperature of examination room .....°C

Results for **Question 1(a)(iii) and 1(a)(vi)**

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BIOLOGY **9700/33**

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[Turn over

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- High-power objective lens, ×40 (equal to 4 mm or $\frac{1}{6}''$)
- Eyepiece graticule fitted within the eyepiece and visible in focus at the same time as the specimen.

To avoid confusion, only the lenses specified above should be fitted in the microscopes to be used in the examination. Any lenses which are **not** ×10 or ×40 should be removed or replaced.

Each candidate must have uninterrupted use of the microscope for at least one hour.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

In accordance with the COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

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C = corrosive

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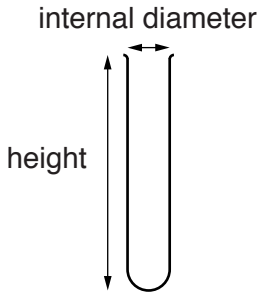
F = flammable

N = hazardous to the aquatic environment

MH = moderate hazard

T = acutely toxic

O = oxidising



When small test-tubes are provided, it is expected that these are approximately 150 mm in height.

If other dimensions of apparatus are required, these will be specified.

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Confidential Instructions

No access to the Question Paper is permitted in advance of the examination.

In advance of the examination:
the day before the examination or at least one hour before the start of the examination put pieces of onion epidermis into 1.0 mol dm^{-3} sucrose solution.
See **Preparation of materials**.

For both Questions

Each candidate will require:
- ruler, marked in mm
- clean and dry apparatus, e.g. glassware and syringes (without a needle)
- solutions supplied in a suitable beaker or container for removal of the solution using a syringe
- fresh solutions, materials and rinsing water where appropriate.

More of the solutions should be available if requested by candidates.

If a candidate breaks any of the apparatus, or loses any of the materials supplied, the matter should be rectified and a note made in the Supervisor's Report.

Solutions should be disposed of in accordance with local safety regulations.

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[Turn over

Question 1

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
Piece of onion tissue covered by 1.0 mol dm^{-3} sucrose solution in a beaker or container, labelled **U** (see **Preparation of materials**)	1	
Microscope (as described on page 2) • **must** be set up on low power • no slide must be left on the stage of the microscope.	1	
Microscope slides and coverslips	2	
Forceps (blunt)	1	
Scalpel or sharp blade	1	
Seeker or mounted needle	1	
Pipette, plastic or glass with teat	1	
White tile or surface for cutting	1	
1.0 mol dm^{-3} sucrose solution in a beaker or container, labelled **S**, provided at room temperature (see **Preparation of materials**)	at least 50 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 100 cm^3	
1.0 mol dm^{-3} hydrochloric acid in a beaker or container, labelled **H**, provided at room temperature	at least 50 cm^3	
Sodium hydrogencarbonate (bicarbonate) powder in a petri dish or suitable shallow dish, labelled **A**, with a spatula	approximately 5 g	
Benedict's solution (qualitative) in a beaker or container, labelled **Benedict's**, provided at room temperature	at least 50 cm^3	
10 cm^3 syringes with the means to wash them out	2	
2 cm^3 or 3 cm^3 or 5 cm^3 syringes with the means to wash them out	2	
Beaker or container, maximum capacity 100 cm^3	5	
Beaker or container (capacity approximately 400 cm^3), approximately half full with cold tap water, labelled **C**	1	
Test-tubes, maximum capacity 25 cm^3, suitable for heating	6	
Test-tube rack to hold 6 test-tubes	1	
Test-tube holder to hold hot test-tubes	1	
Beaker (capacity approximately 400 cm^3), with water at 45 °C to 50 °C, suitable for heating as a water-bath and large enough to hold 6 test-tubes and labelled **hot water**. The Supervisor may use a thermostatically controlled water-bath to provide the hot water for candidates.	1	
Bunsen burner, bench mat, gauze and tripod to support water-bath	1	

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Container with water (capacity approximately 200 cm^3), labelled **For washing**	1	
Container (capacity approximately 200 cm^3), labelled **For waste**	1	
Glass rod	1	
Paper towels	8	
Glass marker pen	1	
Stopclock or timer showing seconds	1	
Suitable eye protection	1	

It is advisable to wear suitable eye protection when handling chemicals.

Preparation of materials

The sucrose solution may be prepared the day before the examination and kept covered to prevent evaporation.
Onion tissue may be prepared the day before the examination or at least one hour before the start of the examination and put into the 1.0 mol dm^{-3} sucrose solution.
These should be put into a refrigerator overnight but removed to reach room temperature before the start of the examination.

(i) **S**, 1.0 mol dm^{-3} sucrose solution

This is prepared by dissolving 34.2 g of sucrose in 80 cm^3 of distilled water and making up to 100 cm^3 with distilled water.

Some of this solution is needed to soak the pieces of onion, **U**.

(ii) **U**, 1.0 mol dm^{-3} sucrose solution containing pieces of onion

Preparation of pieces of onion

- Candidates should **not** be given red onion. Onions with white flesh should be used, either with dry brown scales (yellow onion) or with dry white scales (white onion).
- The onions must be as fresh as possible to avoid the effects of storage.
- The pieces of onion **must** be prepared at least one hour before the start of the examination and left in **U** with the containers covered to prevent evaporation. They may be prepared the day before the examination as described above.

Cut the onion pieces as shown in Fig. 1.1.

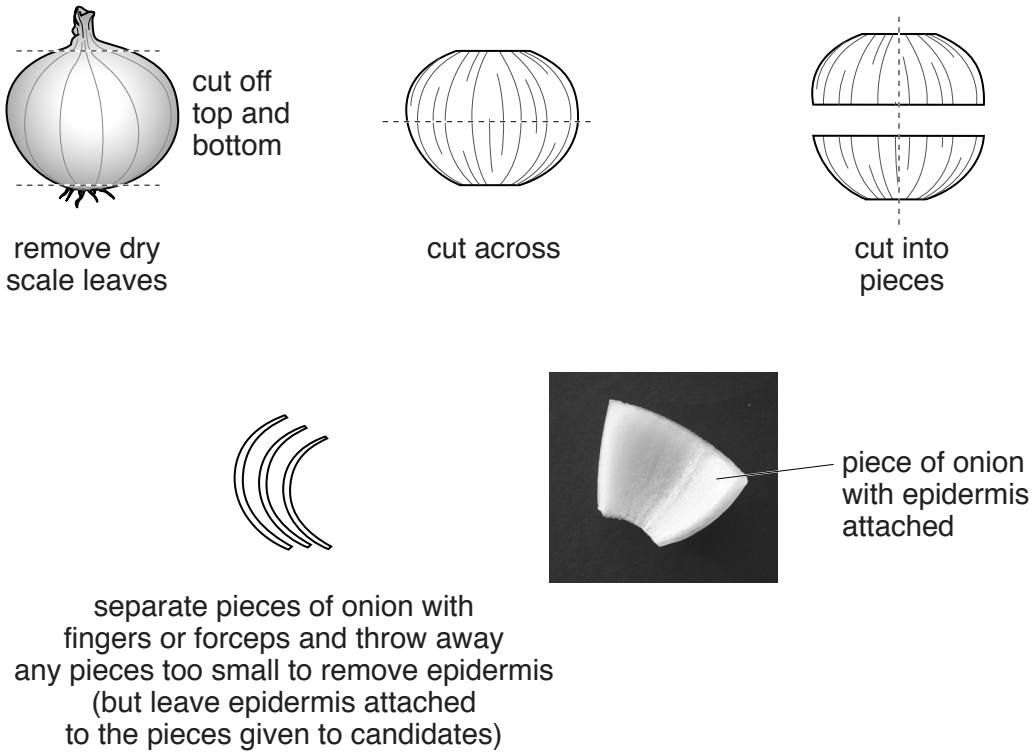


Fig. 1.1

Put the number of pieces of onion required for all candidates, with some spares, into large containers with enough of 1.0 mol dm^{-3} of sucrose solution to submerge the onion pieces. Cover the containers.

Before the examination, ensure that the solution containing the piece of onion for each candidate is at room temperature.

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Question 2

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
0.01% starch solution in a beaker or container, labelled **P1,** provided at room temperature and covered to prevent evaporation (see **Preparation of materials**)	at least 10 cm^3	
1.0% starch solution in a beaker or container, labelled **P2**, provided at room temperature and covered to prevent evaporation (see **Preparation of materials**)	at least 10 cm^3	
0.05% starch solution in a beaker or container, labelled **P3**, provided at room temperature and covered to prevent evaporation (see **Preparation of materials**).	at least 10 cm^3	
[N] Iodine solution in a beaker or container, labelled **iodine**, provided at room temperature and kept out of direct sunlight. This **must** be prepared as in **Preparation of materials**.	at least 10 cm^3	
Spotting tile or white tile	1	
Pipettes, plastic or glass with teat with the means to wash them out	2	
Container with tap water (capacity approximately 100 cm^3), labelled **For washing**	1	
Container (capacity approximately 100 cm^3), labelled **For waste**	1	
Paper towels	8	

Preparation of materials

You will need the following stock solution:

1.0% starch stock solution, P2

This is prepared by putting 1 g of starch into 10 cm^3 of warm distilled water in a beaker or container and stirring well. Make up to 100 cm^3 with distilled water, boil for approximately 2 minutes, stirring well, then cool to room temperature.

(i) **P1**, 0.01% starch solution

This is prepared by putting 1 cm^3 of the 1.0% starch stock solution into 99 cm^3 of distilled water and stirring well.

(ii) **P3**, 0.05% starch solution

This is prepared by putting 5 cm^3 of the 1.0% starch stock solution into 95 cm^3 of distilled water and stirring well.

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(iii) **[N] iodine**, 0.01 mol dm^{-3} iodine solution

This is prepared by firstly making a 0.1 mol dm^{-3} iodine solution.
Put 8 g of potassium iodide into a beaker or container. Moisten the potassium iodide with a few drops of distilled water. Add 2.54 g of iodine to the potassium iodide and stir well. Make up to 100 cm^3 by adding small volumes of distilled water and stirring well. Continue to stir until the iodine has dissolved.

Then put 10 cm^3 of **this** iodine solution (0.1 mol dm^{-3}) into a beaker or container and make up to 100 cm^3 with distilled water, this makes the 0.01 mol dm^{-3} required for candidates.

This solution must be made up immediately before the start of the examination and kept out of direct sunlight.

SUPERVISOR'S REPORT

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During the examination, the Supervisor or other competent biologist (not the Invigilator) should follow the steps in **Question 1** in order to obtain results for **1(b)(ii)** and **1(b)(iii)** and **Question 2(a)(ii)**.

The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**.

These results should be written in the Supervisor's Report, **not** on a spare question paper.

SEATING PLAN

Provide a **seating plan** of work benches, on separate paper, giving details of the places occupied by the candidates for **each question** using each candidate's number.

The Supervisor's Report and the candidates' seating plan should be enclosed with each packet of scripts.

NO MATERIALS TO BE SUPPLIED by CAMBRIDGE

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

There are no materials to return to Cambridge.

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These results should be written on page 12, which should be enclosed with the candidates' scripts. If the scripts are in several packets, please ensure that a copy of the Supervisor's Report is enclosed with each packet of scripts.

4 Enclose a **seating plan** of work benches with the scripts, giving details of the candidate numbers for the places occupied by the candidates for **each question**.

Declaration (to be signed by the Principal or the Examinations Officer)

The preparation of this practical examination has been carried out so as to maintain the security of the examination.

Signed .....

Name (in block capitals) .....

Centre number (of enclosed scripts) .....

Centre name .....

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- relevant Supervisor's Report
- appropriate seating plan(s).

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[Turn over

Temperature of examination room .....°C

Result for **Questions 1(b)(ii) and 1(b)(iii)**

Results for Question **2(a)(ii)**

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Cambridge International AS & A Level

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BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **October/November 2016**

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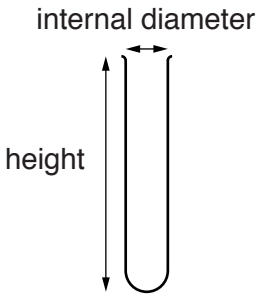
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MH = moderate hazard

T = acutely toxic

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Confidential Instructions

No access to the Question Paper is permitted in advance of the examination.

In advance of the examination:

- Prepare a copy of page 10 (**Protractors for measuring**) onto A4 sized paper for each candidate.
- Soak the pieces of potato the day before the examination.

See **Preparation of materials**

For both Questions

Each candidate will require:
- ruler, marked in mm
- clean and dry apparatus, e.g. glassware and syringes (without a needle)
- solutions supplied in a suitable beaker or container
- fresh solutions, materials and rinsing water where appropriate.

More of the solutions and materials should be available if requested by candidates.

If a candidate breaks any of the apparatus, or loses any of the materials supplied, the matter should be rectified and a note made in the Supervisor's Report.

Solutions should be disposed of in accordance with local safety regulations.

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[Turn over

Question 1

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
One sheet of four protractors (see **Preparation of materials**)	1	
6.0% sodium chloride solution in a beaker or container, labelled **S1**, provided at **room temperature** and covered to prevent evaporation. Two pieces of potato should be put into the solution the day before the examination (see **Preparation of materials**). *Please note this is intentionally not the same as the concentration stated on the Question Paper.*	approximately 100 cm^3 (must cover two pieces of potato)	
1.5% sodium chloride solution in a beaker or container, labelled **S2**, provided at **room temperature** and covered to prevent evaporation. Two pieces of potato should be put into the solution the day before the examination (see **Preparation of materials**). *Please note this is intentionally not the same as the concentration stated on the Question Paper.*	approximately 100 cm^3 (must cover two pieces of potato)	
3.0% sodium chloride solution in a beaker or container, labelled **S3**, provided at **room temperature** and covered to prevent evaporation. Two pieces of potato should be put into the solution the day before the examination (see **Preparation of materials**). *Please note this is intentionally not the same as the concentration stated on the Question Paper.*	approximately 100 cm^3 (must cover two pieces of potato)	
4.0% sodium chloride solution in a beaker or container, labelled **S4**, provided at **room temperature** and covered to prevent evaporation. Two pieces of potato should be put into the solution the day before the examination (see **Preparation of materials**). *Please note this is intentionally not the same as the concentration stated on the Question Paper.*	approximately 100 cm^3 (must cover two pieces of potato)	
Forceps (blunt)	1	
Knife or sharp blade or scalpel	1	
Mounted needle or seeker	1	
White tile or cutting surface	1	
Container (capacity approximately 200 cm^3), labelled **For waste**	1	
Paper towels	8	
Glass marker pen	1	
Suitable eye protection	1	

It is advisable to wear suitable eye protection when handling chemicals.

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The plant tissue **must** be prepared the day before the examination and put into the solutions **S1**, **S2**, **S3** and **S4**.

The containers, with **S1**, **S2**, **S3** and **S4**, should be covered and put into a refrigerator overnight but removed to reach **room temperature** before the start of the examination.

Each candidate requires two pieces of the soaked plant tissue in each of the solutions **S1**, **S2**, **S3** and **S4**.

Preparation of materials

(i) **Protractors for measuring**, one sheet of 4 protractors
This is prepared by photocopying the whole of page 10 and putting this sheet into a clear plastic wallet or laminating it.
Spare copies should be available on request. Do **not** cut the sheet into separate individual protractors.

(ii) **S1**, 6.0% sodium chloride solution

This is prepared by putting 6 g of sodium chloride into 25 cm^3 of distilled water in a beaker and making up to 100 cm^3 with distilled water, stirring well.

(iii) **S2**, 1.5% sodium chloride solution

This is prepared by putting 1.5 g of sodium chloride into 25 cm^3 of distilled water in a beaker and making up to 100 cm^3 with distilled water, stirring well.

(iv) **S3**, 3.0% sodium chloride solution

This is prepared by putting 3 g of sodium chloride into 25 cm^3 of distilled water in a beaker and making up to 100 cm^3 with distilled water, stirring well.

(v) **S4**, 4.0% sodium chloride solution

This is prepared by putting 4 g of sodium chloride into 25 cm^3 of distilled water in a beaker and making up to 100 cm^3 with distilled water, stirring well.

(vi) **Pieces of plant tissue**
8 pieces of plant tissue are required for each candidate, two pieces for each of the concentrations of sodium chloride solution **S1**, **S2**, **S3** and **S4**.
A candidate can request further samples of plant tissue.

You may use any variety of the white (or Irish) potato, *Solanum tuberosum*. The potatoes should be as fresh as possible to avoid the effects of storage.

To prepare the potato

- Remove the outer skin.
- Cut slices of potato 1 cm thick and 6–9 cm long, e.g. with a large kitchen knife.
- Cut each slice into strips with the same cross-sectional area, 1 cm × 0.5 cm. Do **not** use cork borers as this may compress the tissues.
- Cut these strips to **different** lengths at least 6 cm long but no longer than 9 cm. There must be enough for 8 strips per candidate plus some spares.
- Put equal numbers of strips into each of the solutions **S1**, **S2**, **S3** and **S4** so that all the strips are submerged in the sodium chloride solution. Cover and put in the refrigerator.

Before the start of the examination, for each candidate, put **S1**, **S2**, **S3** and **S4** into labelled beakers or containers. Remove two strips of potato, of **different** lengths, from each concentration and put into the beaker containing the **appropriate** concentration of sodium chloride solution. Make sure both strips are submerged in the liquid. Cover the beakers or containers.

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Question 2

Each candidate will require:

(i) Slide **L1**

On receipt of the slides, please check that they are labelled **L1** and that no slides are broken. The material is **confidential** (so **must not** be disclosed to candidates) and the slides should **not** be viewed in advance of the examination.

The number of slides supplied by Cambridge will be equal to half the candidate entry.

Therefore, half the candidates should start on **Question 2** and the other candidates should start on **Question 1**.

(ii) Microscope (as described on page 2)

For each candidate:
- the microscope **must** be set up on low power
- the slide must **not** be left on the stage of the microscope.

SUPERVISOR'S REPORT

The Supervisor's Report is essential in order to allow the Examiners to assess all candidates as fairly as possible and should always be completed by every Centre.

During the examination, the Supervisor or other competent biologist (not the Invigilator) should follow the steps in **Question 1** in order to obtain results for **1(a)(iv)** and **1(a)(vi)**.

The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**.

These results should be written in the Supervisor's Report, **not** on a spare question paper.

SEATING PLAN

Provide a **seating plan** of work benches, on separate paper, giving details of the places occupied by the candidates for **each question** using each candidate's number.

The Supervisor's Report and the candidates' seating plan should be enclosed with each packet of scripts.

MATERIALS TO BE SUPPLIED by CAMBRIDGE for this examination

- Slide **L1**

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RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

Immediately after the examination the microscope slides **must** be:

- returned to Cambridge in the containers in which they were received, using the self-adhesive label. The slides must **not** be included in the packet of scripts.

or

- purchased using the order form enclosed with the slides, which should be completed and returned to Cambridge. The order form must **not** be included in the packet of scripts.

Slides and boxes will be charged at the rate of £3 per slide and £1 per box.
If the items are not returned or purchased by the deadline stated on the order form, they will be charged at £3.50 per slide plus £1 per box.

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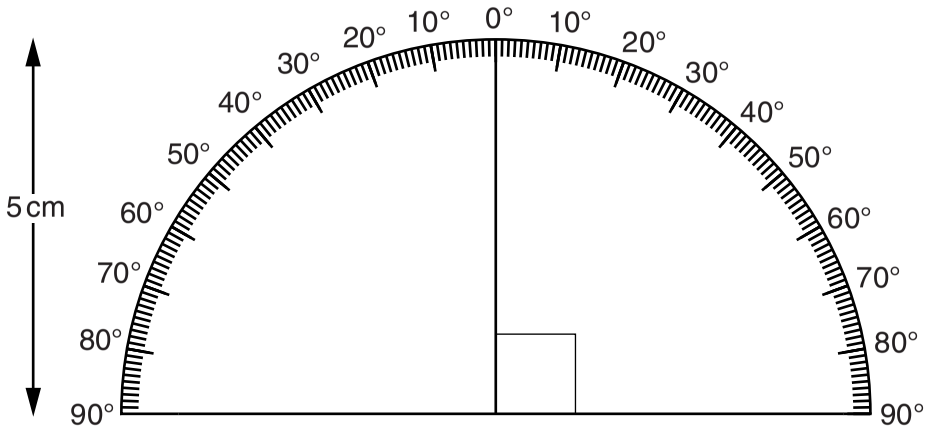
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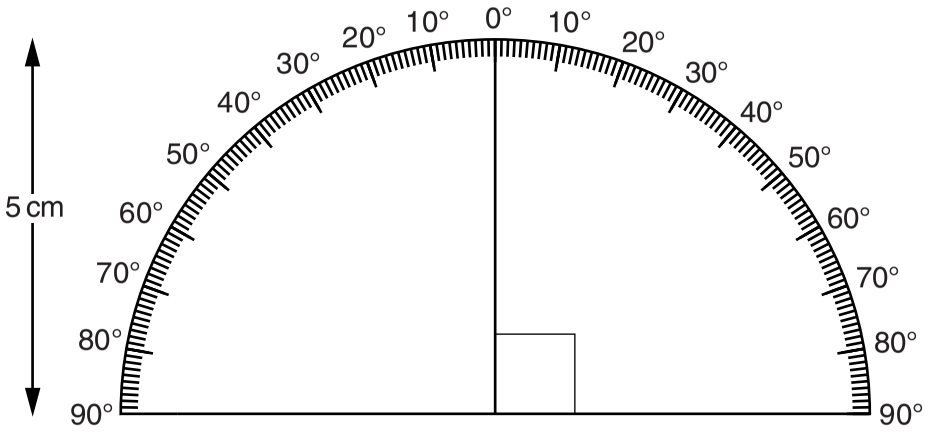
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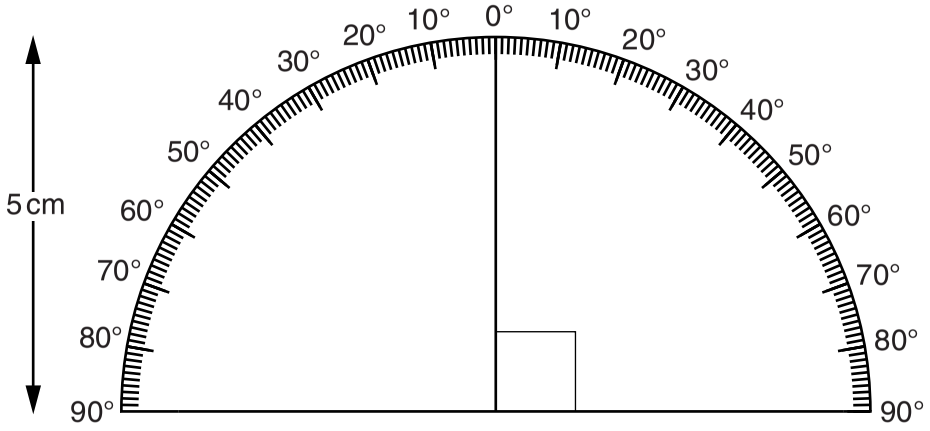
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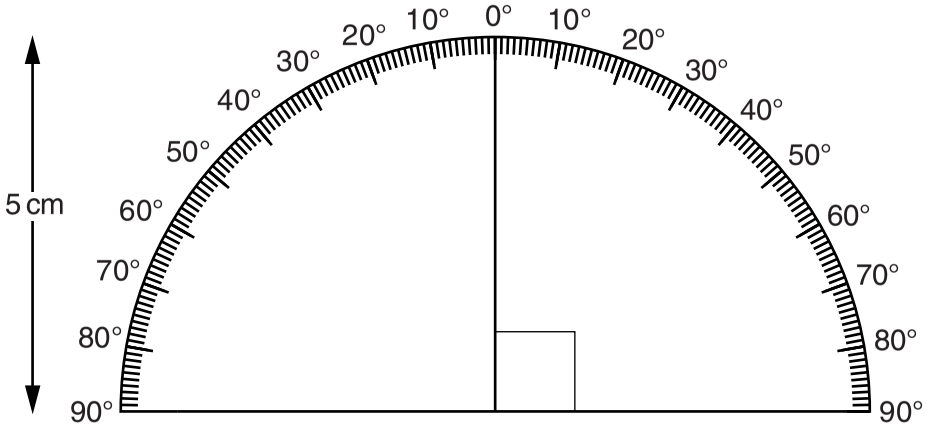
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Protractors for measuring









This form should be completed and sent with the scripts.

SUPERVISOR'S REPORT

October/November 2016

The Supervisor or Teacher responsible for the subject should provide the following information.

1 Was any difficulty experienced in providing the necessary materials? If so, give brief details.

2 Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

(a) difficulties arising from faulty specimens or microscopes;

(b) accidents to apparatus or materials;

(c) assistance provided in case of colour blindness;

(d) any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

All other cases of individual hardship, e.g. illness or disability, should be reported direct to Cambridge on the 'Special Consideration Form' as detailed in the Handbook for Centres.

3 During the examination, the Supervisor or a competent biologist should follow the steps in **Question 1** in order to obtain results for **1(a)(iv)** and **1(a)(vi)**. The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**. These results should be written on page 12, which should be enclosed with the candidates' scripts. If the scripts are in several packets, please ensure that a copy of the Supervisor's Report is enclosed with each packet of scripts.

4 Enclose a **seating plan** of work benches with the scripts, giving details of the candidate numbers for the places occupied by the candidates for **each question**.

Declaration (to be signed by the Principal or the Examinations Officer)

The preparation of this practical examination has been carried out so as to maintain the security of the examination.

Signed .....

Name (in block capitals) .....

Centre number (of enclosed scripts) .....

Centre name .....

If scripts are despatched in more than one envelope, it is essential that **each envelope** includes a copy of the:

- relevant Supervisor's Report
- appropriate seating plan(s).

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[Turn over

Temperature of examination room .....°C

Results for **Question 1(a)(iv)** and **1(a)(vi)**

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Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **October/November 2016**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given, including the identity of material on microscope slides where appropriate, does not reach the candidates either directly or indirectly.

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If you have any problems or queries regarding these Instructions, please contact CIE
by e-mail: info@cie.org.uk
by phone: +44 1223 553554
by fax: +44 1223 553558
stating the Centre number, the nature of the query and the syllabus number quoted above.

This document consists of **9** printed pages and **3** blank pages.

DC (LK/FD) 116090/2
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[Turn over

Instructions for preparing apparatus

These instructions give details of the apparatus required by each candidate for each experiment in this paper. A summary of the questions that will be presented to the candidates is included, where appropriate, to allow the biology teacher to test the apparatus appropriately. **No access to the Question Paper is permitted in advance of the examination.**

Candidates must be provided with a microscope with:

- Eyepiece lens, ×10 (equal to 16 mm or $\frac{2}{3}''$)
- Low-power objective lens, ×10 (equal to 16 mm or $\frac{2}{3}''$)
- High-power objective lens, ×40 (equal to 4 mm or $\frac{1}{6}''$)
- Eyepiece graticule fitted within the eyepiece and visible in focus at the same time as the specimen.

To avoid confusion, only the lenses specified above should be fitted in the microscopes to be used in the examination. Any lenses which are **not** ×10 or ×40 should be removed or replaced.

Each candidate must have uninterrupted use of the microscope for at least one hour.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

In accordance with the COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant.

C = corrosive

HH = health hazard

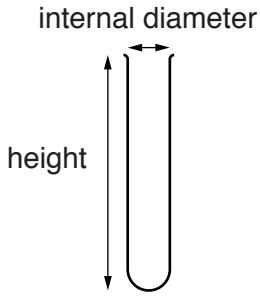
F = flammable

N = hazardous to the aquatic environment

MH = moderate hazard

T = acutely toxic

O = oxidising



When small test-tubes are provided, it is expected that these are approximately 150 mm in height.

If other dimensions of apparatus are required, these will be specified.

Centres are reminded that they are **not** permitted to open the Question Paper envelopes before the examination. Centres should also refer to the Handbook for Centres.

If there are any difficulties with any aspect of setting up this practical examination that the Centre is not able to resolve, it is essential for Centres to contact the Product Manager as soon as possible by **e-mail** info@cie.org.uk, by **fax** +44 1223 553558 or by **phone** +44 1223 553554.

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Confidential Instructions

No access to the Question Paper is permitted in advance of the examination.

In advance of the examination:

The day before the examination the plant tissue, **P**, must be prepared.

The container should be covered and put in a refrigerator overnight but removed to reach room temperature before the start of the examination.
See **Preparation of materials**.

For both Questions

Each candidate will require:
- ruler, marked in mm
- clean and dry apparatus, e.g. glassware and syringes (without a needle)
- solutions supplied in a suitable beaker or container for removal of the solution using a syringe
- fresh solutions, materials and rinsing water where appropriate.

More of the solutions and materials should be available if requested by candidates.

If a candidate breaks any of the apparatus, or loses any of the materials supplied, the matter should be rectified and a note made in the Supervisor's Report.

Solutions should be disposed of in accordance with local safety regulations.

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[Turn over

Question 1

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
Pieces of potato tissue, in tap water, in a beaker or container with a suitable cover to prevent evaporation, labelled **P**, provided at room temperature (see **Preparation of materials**)	3 pieces	
[F][HH] 25% ethanol in a beaker or container, labelled **E**, provided at room temperature (see **Preparation of materials**) *note: this concentration is intentionally different to that stated in the Question Paper.*	at least 40 cm^3	
[F][HH] 10% ethanol in a beaker or container, labelled **U**, provided at room temperature (see **Preparation of materials**) *note: this concentration is intentionally different to that stated in the Question Paper.*	at least 15 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 250 cm^3	
5 cm^3 syringes with the means to wash them out	2	
Beaker or container, maximum capacity 100 cm^3	5	
Beaker or container, maximum capacity 100 cm^3, labelled **R**	1	
Test-tubes The test-tubes provided must be large enough to allow the pieces of potato to fit.	6	
Test-tube rack to hold 6 test-tubes	1	
Glass rod	1	
White tile or surface for cutting	1	
Knife or sharp blade or scalpel	1	
White card or white paper, approximately 10 cm × 10 cm	1	
Container with tap water (capacity approximately 200 cm^3), labelled **T**	1	
Container with water (capacity approximately 200 cm^3), labelled **For washing**	1	
Container (capacity approximately 400 cm^3), labelled **For waste**	1	
Paper towels	8	
Glass marker pen	1	
Stopclock or timer showing seconds	1	
Suitable eye protection	1	

It is advisable to wear suitable eye protection when handling chemicals.

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Preparation of materials

The plant tissue, **P**, must be prepared the day before the examination and kept covered to prevent evaporation.
The container should be covered and put in a refrigerator overnight but removed to reach **room temperature** before the start of the examination.

(i) **P**, pieces of plant tissue, in water, in a beaker or container with a suitable cover to prevent evaporation

You may use any variety of the white (or Irish) potato, *Solanum tuberosum*. The potato should be as fresh as possible to avoid the effects of storage.

3 pieces of potato are needed per candidate. However, a candidate can request further samples of potato.

To prepare the potato

- Remove the outer skin.
- Cut slices of potato 0.5 cm thick e.g. with a large kitchen knife.
- Cut each slice of potato into strips with the same cross-sectional area, 0.5 cm × 0.5 cm. Do **not** use cork borers as this may compress the tissues.
- Cut the potato strips into approximately 5 cm lengths.
- Put the prepared potato into a shallow tray so that the pieces do not overlap and **cover** with freshly prepared 0.1% methylene blue solution.

To prepare 0.1% methylene blue solution

- Put 0.1 g of methylene blue into 80 cm^3 of distilled water in a beaker and make up to 100 cm^3 with distilled water.

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

On the day of the examination prepare the potato pieces as follows:

- Pour off the methylene blue solution
- Add tap water to cover the pieces
- Pour off the water and then add fresh tap water
- Repeat four times
- Add enough fresh tap water to cover 3 pieces of the potato ready to put out for the candidate in a beaker or container, labelled **P**. The tap water in **P** may still be blue
- Cover to prevent evaporation.

[F][HH] **(ii)** **E**, 25% ethanol

This is prepared by putting 25 cm^3 of 99% ethanol into 50 cm^3 distilled water then making up to 100 cm^3 with distilled water.

[F][HH] **(iii)** **U**, 10% ethanol

This is prepared by putting 10 cm^3 of 99% ethanol into 50 cm^3 distilled water then making up to 100 cm^3 with distilled water.

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Question 2

Each candidate will require:

(i) Slide **K1**

On receipt of the slides, please check that they are labelled **K1** and that no slides are broken. The material is **confidential** (so **must not** be disclosed to candidates) and the slides should **not** be viewed in advance of the examination.

The number of slides supplied by Cambridge will be equal to half the candidate entry.

Therefore, half the candidates should start on **Question 2** and the other candidates should start on **Question 1**.

(ii) Microscope (as described on page 2)

For each candidate:
- the microscope **must** be set up on low power
- the slide must **not** be left on the stage of the microscope.

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SUPERVISOR'S REPORT

The Supervisor's Report is essential in order to allow the Examiners to assess all candidates as fairly as possible and should always be completed by every Centre.

During the examination, the Supervisor or other competent biologist (not the Invigilator) should follow the steps in **Question 1** in order to obtain results for **1(a)(ii)** and **1(a)(iii)**.

The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**.

These results should be written in the Supervisor's Report, **not** on a spare question paper.

SEATING PLAN

Provide a **seating plan** of work benches, on separate paper, giving details of the places occupied by the candidates for **each question** using each candidate's number.

The Supervisor's Report and the candidates' seating plan should be enclosed with each packet of scripts.

MATERIALS TO BE SUPPLIED by CAMBRIDGE

- Slide **K1**

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

Immediately after the examination the microscope slides **must** be:

- returned to Cambridge in the containers in which they were received, using the self-adhesive label. The slides must **not** be included in the packet of scripts.

or

- purchased using the order form enclosed with the slides, which should be completed and returned to Cambridge. The order form must **not** be included in the packet of scripts.

Slides and boxes will be charged at the rate of £3 per slide and £1 per box.
If the items are not returned or purchased by the deadline stated on the order form, they will be charged at £3.50 per slide plus £1 per box.

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This form should be completed and sent with the scripts.

SUPERVISOR'S REPORT

October/November 2016

The Supervisor or Teacher responsible for the subject should provide the following information.

1 Was any difficulty experienced in providing the necessary materials? If so, give brief details.

2 Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

(a) difficulties arising from faulty specimens or microscopes;

(b) accidents to apparatus or materials;

(c) assistance provided in case of colour blindness;

(d) any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

All other cases of individual hardship, e.g. illness or disability, should be reported direct to Cambridge on the 'Special Consideration Form' as detailed in the Handbook for Centres.

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4 Enclose a **seating plan** of work benches with the scripts, giving details of the candidate numbers for the places occupied by the candidates for **each question**.

Declaration (to be signed by the Principal or the Examinations Officer)

The preparation of this practical examination has been carried out so as to maintain the security of the examination.

Signed .....

Name (in block capitals) .....

Centre number (of enclosed scripts) .....

Centre name .....

If scripts are despatched in more than one envelope, it is essential that **each envelope** includes a copy of the:

- relevant Supervisor's Report
- appropriate seating plan(s).

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[Turn over

Temperature of examination room .....°C

Results for **Questions 1(a)(ii) and 1(a)(iii)**

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Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/36**

Paper 3 Advanced Practical Skills 2 **October/November 2016**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given, including the identity of material on microscope slides where appropriate, does not reach the candidates either directly or indirectly.

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If you have any problems or queries regarding these Instructions, please contact CIE
by e-mail: info@cie.org.uk
by phone: +44 1223 553554
by fax: +44 1223 553558
stating the Centre number, the nature of the query and the syllabus number quoted above.

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

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CAMBRIDGE International Examinations

Instructions for preparing apparatus

These instructions give details of the apparatus required by each candidate for each experiment in this paper. A summary of the questions that will be presented to the candidates is included, where appropriate, to allow the biology teacher to test the apparatus appropriately. **No access to the Question Paper is permitted in advance of the examination.**

Candidates must be provided with a microscope with:

- Eyepiece lens, ×10 (equal to 16 mm or $\frac{2}{3}''$)
- Low-power objective lens, ×10 (equal to 16 mm or $\frac{2}{3}''$)
- High-power objective lens, ×40 (equal to 4 mm or $\frac{1}{6}''$)
- Eyepiece graticule fitted within the eyepiece and visible in focus at the same time as the specimen.

To avoid confusion, only the lenses specified above should be fitted in the microscopes to be used in the examination. Any lenses which are **not** ×10 or ×40 should be removed or replaced.

Each candidate must have sole, uninterrupted, use of the microscope for at least one hour.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and safety goggles should be used where necessary.

In accordance with the COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant.

C = corrosive

HH = health hazard

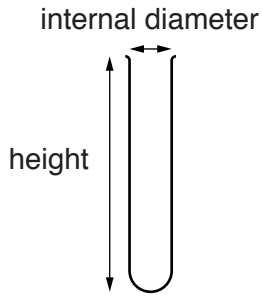
F = flammable

N = hazardous to the aquatic environment

MH = moderate hazard

T = acutely toxic

O = oxidising



When small test-tubes are provided, it is expected that these are approximately 150 mm in height.

If other dimensions of apparatus are required, these will be specified.

Centres are reminded that they are **not** permitted to open the Question Paper envelopes before the examination. Centres should also refer to the Handbook for Centres.

If there are any difficulties with any aspect of setting up this practical examination that the Centre is not able to resolve, it is essential for Centres to contact the Product Manager as soon as possible by **e-mail** info@cie.org.uk, by **fax** +44 1223 553558 or by **phone** +44 1223 553554.

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Confidential Instructions

No access to the Question Paper is permitted in advance of the examination.

In advance of the examination:

The day before the examination the agar containing sodium hydroxide and bromothymol blue solution can be prepared.

It is essential that the agar does not dry out after it has set. To prevent drying out the containers may be wrapped in a plastic bag or similar overnight but removed to reach room temperature before the start of the examination.
See **Preparation of materials**.

For both Questions

Each candidate will require:

- ruler, marked in mm
- clean and dry apparatus, e.g. glassware and syringes (without a needle)
- solutions supplied in a suitable beaker or container for removal of the solution using a syringe
- fresh solutions, materials and rinsing water where appropriate.

More of the solutions should be available if requested by candidates.

If a candidate breaks any of the apparatus, or loses any of the materials supplied, the matter should be rectified and a note made in the Supervisor's Report.

Solutions should be disposed of in accordance with local safety regulations.

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[Turn over

Question 1

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
Agar containing sodium hydroxide and bromothymol blue solution, on a white tile, labelled **B**, covered by a damp paper towel (see **Preparation of materials**)	one block	
1 mol dm^{-3} hydrochloric acid in a beaker or container, labelled **A**, provided at room temperature (see **Preparation of materials**)	at least 50 cm^3	
0.5 mol dm^{-3} hydrochloric acid in a beaker or container, labelled **U**, provided at room temperature (see **Preparation of materials**)	at least 30 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 100 cm^3	
10 cm^3 syringes with the means to wash them out	2	
Beakers or containers (minimum capacity approximately 50 cm^3)	6	
Knife or sharp blade or scalpel	1	
White tile or surface for cutting	1	
White card or white paper, approximately 10 cm × 10 cm	1	
Forceps (blunt)	1	
Glass rod	1	
Container with tap water (capacity approximately 200 cm^3), labelled **For washing**	1	
Container (capacity approximately 200 cm^3), labelled **For waste**	1	
Paper towels	8	
Glass marker pen	1	
Stopclock or timer showing seconds	1	
Suitable eye protection	1	

It is advisable to wear suitable eye protection when handling chemicals.

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Preparation of materials

The agar containing sodium hydroxide and bromothymol blue solution, on a white tile, labelled **B** may be prepared the day before the examination.

To prevent drying out the containers may be wrapped in a plastic bag or similar overnight but removed to reach room temperature before the start of the examination.

(i) **B**, agar containing bromothymol blue indicator

B, can be prepared the day before the examination, but to prevent drying out the containers must be wrapped in a plastic bag or similar.

To prepare bromothymol blue indicator you need to dissolve bromothymol blue powder using sodium hydroxide solution.

To prepare 0.01 mol dm^{-3} sodium hydroxide solution for the bromothymol blue indicator:

- Using forceps, put 4 g of sodium hydroxide into a beaker or container with 80 cm^3 of distilled water
- Mix well to dissolve
- Make up to 100 cm^3 with distilled water. This is the stock solution of 1 mol dm^{-3} sodium hydroxide solution
- Put 1 cm^3 of this stock solution into a beaker or container and make up to 100 cm^3 with distilled water. This makes the 0.01 mol dm^{-3} sodium hydroxide solution.

To prepare bromothymol blue indicator:

- Put 0.1 g of bromothymol blue powder into a beaker or container
- Put 16 cm^3 of 0.01 mol dm^{-3} sodium hydroxide solution into the same beaker and mix well to dissolve the bromothymol blue indicator
- Make up to 250 cm^3 with distilled water.

To prepare the agar:

- Put 10 g of agar ('technical' not 'nutrient') into 450 cm^3 of distilled water
- Heat to 95 °C, stirring until dissolved
- Remove from the heat and allow to cool to 60 °C
- Put 50 cm^3 of the bromothymol blue indicator into the cooled agar and mix well.
- If the colour of the agar is green add additional sodium hydroxide (0.01 mol dm^{-3}) to the agar until a blue colour is achieved.
- Pour the agar into shallow, flat containers so that the depth of the agar is between 0.5 cm and 0.7 cm.
- These containers must be placed on a horizontal flat surface so that the agar sets to an even depth. Keep the agar in cool conditions in order to set firmly.

It is essential that the agar does not dry out after it has set. To prevent drying out the containers may be wrapped in a plastic bag or similar.

Just before the examination, cut the agar into blocks measuring at least 6 cm × 4 cm as shown in Fig. 1.1 on page 6.

Cut enough blocks so that each candidate has **one** block at least 6 cm × 4 cm, on a white tile or chopping board, covered by a damp paper towel, labelled **B**.

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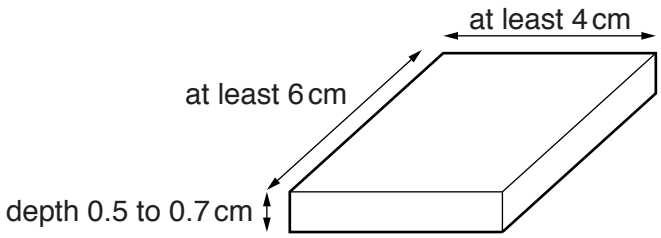


Fig. 1.1

(ii) **U**, 0.5 mol dm^{-3} dilute hydrochloric acid
This is prepared by adding 15 cm^3 of **A** (1 mol dm^{-3}) to 15 cm^3 of distilled water in a beaker.

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Question 2

Each candidate will require:

(i) Slide **M1**

On receipt of the slides, please check that they are labelled **M1** and that no slides are broken. The material is **confidential** (so **must not** be disclosed to candidates) and the slides should **not** be viewed in advance of the examination.

The number of slides supplied by Cambridge will be equal to half the candidate entry.

Therefore, half the candidates should start on **Question 2** and the other candidates should start on **Question 1**.

(ii) Microscope (as described on page 2)

For each candidate:
- the microscope **must** be set up on low power
- the slide must **not** be left on the stage of the microscope.

SUPERVISOR'S REPORT

The Supervisor's Report is essential in order to allow the Examiners to assess all candidates as fairly as possible and should always be completed by every Centre.

During the examination, the Supervisor or other competent biologist (not the Invigilator) should follow the steps in **Question 1**, in order to obtain results for **1(b)(ii)** and **1(b)(iii)**.

The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**.

These results should be written in the Supervisor's Report, **not** on a spare question paper.

SEATING PLAN

Provide a **seating plan** of work benches, on separate paper, giving details of the places occupied by the candidates for **each question** using each candidate's number.

The Supervisor's Report and the candidates' seating plan should be enclosed with each packet of scripts.

MATERIALS TO BE SUPPLIED by CAMBRIDGE

- Slide **M1**

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

Immediately after the examination the microscope slides **must** be:

- returned to Cambridge in the containers in which they were received, using the self-adhesive label. The slides must **not** be included in the packet of scripts.

or

- purchased using the order form enclosed with the slides, which should be completed and returned to Cambridge. The order form must **not** be included in the packet of scripts.

Slides and boxes will be charged at the rate of £3 per slide and £1 per box.
If the items are not returned or purchased by the deadline stated on the order form, they will be charged at £3.50 per slide plus £1 per box.

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This form should be completed and sent with the scripts

SUPERVISOR'S REPORT

October/November 2016

The Supervisor or Teacher responsible for the subject should provide the following information.

1 Was any difficulty experienced in providing the necessary materials? If so, give brief details.

2 Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

(a) difficulties arising from faulty specimens or microscopes;

(b) accidents to apparatus or materials;

(c) assistance provided in case of colour blindness;

(d) any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

All other cases of individual hardship, e.g. illness or disability, should be reported direct to Cambridge on the 'Special Consideration Form' as detailed in the Handbook for Centres.

3 During the examination, the Supervisor or a competent biologist should follow the steps in **Question 1** in order to obtain results for **1(b)(ii)** and **1(b)(iii)**. The Supervisor should use the same solutions as those provided to the candidates and work **out of the sight of the candidates**. These results should be written on page 12, which should be enclosed with the candidates' scripts. If the scripts are in several packets, please ensure that a copy of the Supervisor's Report is enclosed with each packet of scripts.

4 Enclose a **seating plan** of work benches with the scripts, giving details of the candidate numbers for the places occupied by the candidates for **each question**.

Declaration (to be signed by the Principal or the Examinations Officer)

The preparation of this practical examination has been carried out so as to maintain fully the security of the examination.

Signed .....

Name (in block capitals) .....

Centre number (of enclosed scripts) .....

Centre name .....

If scripts are despatched in more than one envelope, it is essential that **each envelope** includes a copy of the:

- relevant Supervisor's Report
- appropriate seating plan(s).

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[Turn over

Temperature of examination room .....°C

Results for **Question 1(b)(ii)** and **1(b)(iii)**

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