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 2017**

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 regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

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

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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.

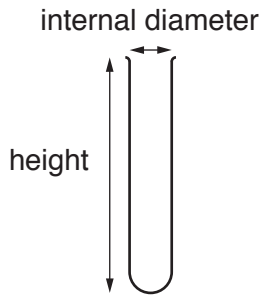
Each candidate must have uninterrupted use of the microscope for at least one hour.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and suitable eye protection 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	**MH**	moderate hazard
HH	health hazard	**T**	acutely toxic
F	flammable	**O**	oxidising
N	hazardous to the aquatic environment		



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

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 suitable beakers or containers for removal of the solutions using syringes
- 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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Question 1

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
1.0 mol dm^{-3} sucrose solution in a beaker or container, labelled **S**, provided at room temperature (see **Preparation of materials**)	at least 200 cm^3	
Pieces of potato in a beaker or container, labelled **P** (see **Preparation of materials**)	at least 7 pieces	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 200 cm^3	
[HH] Methylene blue solution, labelled **M**, provided at room temperature (see **Preparation of materials**)	at least 15 cm^3	
10 cm^3 or 20 cm^3 syringes, with the means to wash them out	2	
2 cm^3 or 3 cm^3 syringe, with the means to wash it out	1	
Pipettes, plastic or glass with a teat	2	
Beakers or containers (capacity 75 cm^3 to 100 cm^3)	5	
Test-tubes – large (to hold more than 25 cm^3 but no more than 50 cm^3)	5	
Test-tube rack to hold 5 large test-tubes	1	
Test-tubes – small (capacity 20 cm^3 to 30 cm^3)	5	
Test-tube rack to hold 5 small test-tubes	1	
Glass rod	1	
Ruler, marked in mm	1	
Scalpel or sharp blade	1	
White tile or surface for cutting	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	
Stop-clock 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

1.0 mol dm^{-3} sucrose solution may be prepared the day before the examination.
It should be kept in a covered container in a refrigerator.

0.5% methylene blue solution may be prepared the day before the examination.
It should be kept in a covered container.

The solutions must be at **room temperature** for the examination.

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

This is prepared by sprinkling 68.4 g of sucrose, a little at a time, onto the surface of 80 cm^3 of distilled water, stirring continuously as you sprinkle. Make up to 200 cm^3 with distilled water.

(ii) P, at least 7 pieces of peeled potato wrapped in a damp paper towel in a covered dish, labelled **P**

You may use any variety of the white (or Irish) potato, *Solanum tuberosum*.

Cut each piece of potato with a cross-sectional area of 1.5 cm × 1 cm.
Each candidate should be provided with a mixture of different lengths, varying from 4.5 cm to 6 cm.

The potato pieces for each candidate should be prepared on the day of the examination.

[HH] (iii) M, 0.5% methylene blue solution

This is prepared by putting 0.5 g of methylene blue into 80 cm^3 of distilled water and stirring continuously. Make up to 100 cm^3 with distilled water.

Question 2

Each candidate will require:

materials and apparatus for each candidate	quantity	✓
Potato starch in suspension in a beaker or container, labelled **F**, provided at room temperature (see **Preparation of materials**)	at least 15 cm^3	
Maize starch in suspension in a beaker or container, labelled **G**, provided at room temperature (see **Preparation of materials**)	at least 15 cm^3	
Microscope slides and coverslips	2	
Forceps (blunt)	1	
Glass rods	2	
Seeker or mounted needle	1	
Pipettes, plastic or glass with teat with the means to wash them out	2	
Black card or paper, approximately 10 cm × 5 cm	1	
Paper towels	8	
Glass marker pen	1	

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Preparation of materials

(i) Microscope with an eyepiece graticule fitted into the eyepiece lens (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.

(ii) **F**, potato starch suspension

This is prepared by putting 1.5 g of potato starch into 100 cm^3 of distilled water. Stir well.

Do not use soluble potato starch.

(iii) **G**, maize starch suspension

This is prepared by putting 1.5 g of maize starch into 100 cm^3 of distilled water. Stir well.

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)(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

There are 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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This form should be completed and sent with the scripts

SUPERVISOR'S REPORT

October/November 2017

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)(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 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 Supervisor)

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(b)(iii)**

Cambridge International AS & A Level

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BIOLOGY **9700/33**

Paper 3 Advanced Practical Skills 1 **October/November 2017**

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Candidates must be provided with a microscope with:

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- 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 suitable eye protection should be used where necessary.

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The following codes are used where relevant.

C corrosive

HH health hazard

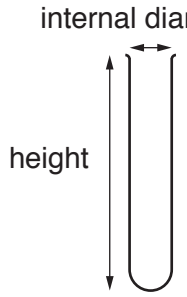
F flammable

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.

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Confidential Instructions

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 suitable beakers or containers for removal of the solutions using syringes
- 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	✓
[HH] plant extract solution in a beaker or container, labelled **E**, provided at room temperature (see **Preparation of materials**)	at least 40 cm^3	
[C] 6% (20 vols) hydrogen peroxide solution in a beaker or container, labelled **H**, provided at room temperature	at least 70 cm^3	
pH4 buffer in a beaker or container, labelled **B4**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH5 buffer in a beaker or container, labelled **B5**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH7 buffer in a beaker or container, labelled **B7**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH9 buffer in a beaker or container, labelled **B9**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH10 buffer in a beaker or container, labelled **B10**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH5 buffer in a beaker or container, labelled **U**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
Liquid detergent in a beaker or container, labelled **D**, with a pipette with a teat (see **Preparation of materials**)	at least 10 cm^3	
5 cm^3 syringe, with the means to wash it out	1	
2 cm^3 or 3 cm^3 syringes, with the means to wash them out	2	
Test-tubes – small (capacity 20 cm^3 to 30 cm^3) (test-tubes provided to a candidate should have the same dimensions)	6	
Test-tube rack(s) to hold 6 small test-tubes	1	
Glass rod	1	
Strip of graph paper, with **2 mm** divisions and at least 2 cm wide and at least 2 cm longer than the test-tube provided (see **Preparation of materials**)	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	
Stop-clock 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

In advance of the examination test the plant extract as described in **(i)** to make sure it will be active (produces foam on the top). If the plant extract is frozen, defrost before the examination and re-test to check it is still active. The buffers may be prepared the day before the examination and kept in covered containers.

[HH] (i) **E**, plant extract solution

The plant extract solution can be prepared using approximately 45 g of peeled sweet potato or peeled white potato (for example Irish, *Solanum tuberosum*).
Cut the plant material into small pieces and, with approximately 75 cm^3 of water, grind using a pestle and mortar, or liquidise.

Strain the mixture through a fine sieve or muslin and retain the liquid plant extract solution. This may contain small pieces of plant material.

This should produce approximately 60 cm^3 of plant extract solution.

Test the activity of the extract
Put 2 cm^3 of plant extract solution into a small test-tube.
Add 1 drop of detergent, do **not** mix.
Add 5 cm^3 of hydrogen peroxide solution.

Within 30 seconds, the mixture should actively produce bubbles and a foam.

If the foam does not form then more plant material should be used to produce the extract.

If the foam reaches the top of the test-tube within 1 minute, either dilute the plant extract solution or dilute the hydrogen peroxide solution and re-test.

The plant extract may be prepared the day before the examination and kept in a refrigerator in a covered container **or** the plant extract may be prepared at any time before the examination and then frozen.
The extract should be defrosted before the examination.

Before the examination, the extract should be tested to make sure it is still active.

The extract **must** be at room temperature for the examination.

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(ii) **B4**, **B5** and **B7**, buffers at pH4, pH5 and pH7

Phosphate-citrate buffer to make pH4, pH5 and pH7

You will need to prepare stock solutions of 0.2 mol dm^{-3} disodium hydrogen phosphate and 0.1 mol dm^{-3} citric acid.

0.2 mol dm^{-3} disodium hydrogen phosphate (Na_2HPO_4) is prepared using **one** of the following:

types of disodium hydrogen phosphate	mass / g
$Na_2HPO_4.2H_20$ MW = 178.05	35.6
$Na_2HPO_4.7H_20$ MW = 268.07	53.7
$Na_2HPO_4.12H_20$ MW = 358.14	71.6

This is prepared by dissolving the appropriate mass of disodium hydrogen phosphate in 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water.

0.1 mol dm^{-3} citric acid is prepared by dissolving 19.2 g of citric acid in 500 cm^3 of distilled water in a beaker and making up to 1 dm^3 with distilled water.

To prepare 100 cm^3 of **B4**, **B5** and **B7** buffers, use the table below to mix the stock solutions.

pH	0.2 mol dm^{-3} disodium hydrogen phosphate / cm^3	0.1 mol dm^{-3} citric acid / cm^3	distilled water / cm^3
4	19.3	30.7	50
5	25.7	24.3	50
7	43.6	6.4	50

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(iii) **B9** and **B10**, buffers at pH9 and pH10

Glycine-sodium hydroxide (NaOH) buffer to make pH9 and pH10

You will need to prepare stock solutions of 0.2 mol dm^{-3} glycine solution and 0.2 mol dm^{-3} sodium hydroxide solution.

0.2 mol dm^{-3} glycine is prepared by dissolving 15.0 g in 500 cm^3 of distilled water and making up to 1 dm^3.

0.2 mol dm^{-3} NaOH **[MH]** is prepared by dissolving 8.0 g of sodium hydroxide **[C]** in 500 cm^3 of distilled water and making up to 1 dm^3.

To prepare 100 cm^3 of **B9** and **B10** buffers, use the table below to mix the stock solutions.

pH	0.2 mol dm^{-3} glycine /cm^3	0.2 mol dm^{-3} sodium hydroxide /cm^3	distilled water /cm^3
9	25	4.4	70.6
10	25	13.6	61.4

(iv) **D**, liquid detergent

This should be of a type which is used for hand washing apparatus and **not** that used in a dishwasher. Using a pipette, it should be easy to release the detergent as separate drops.

(v) Graph paper

This may be prepared by gluing an A4 sheet of 2 mm grid graph paper onto a piece of card. The strip should be cut approximately 1 mm each side of the thicker vertical lines showing the 2 cm width and can be provided the width of the A4 sheet.

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Question 2

Each candidate will require:

(i) Microscope with an eyepiece graticule fitted into the eyepiece lens (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.

(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**.

SUPERVISOR'S REPORT

The Supervisors' 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 a competent biologist (not the Invigilator), should follow the steps in **Question 1**, in order to obtain results for **1(b)(i)** and **1(b)(iv)**.

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**

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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 plus £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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October/November 2017

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(b) accidents to apparatus or materials;

(c) assistance provided in case of colour blindness;

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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 Enclosed 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 Supervisor)

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(b)(i)** and **1(b)(iv)**.

Cambridge International AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **October/November 2017**

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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.

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HH health hazard

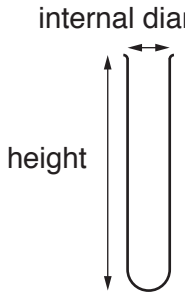
F flammable

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.

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Confidential Instructions

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 suitable beakers or containers for removal of the solutions using syringes
- 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	✓
Visking tubing, in a beaker or container (capacity approximately 250 cm^3), in at least 100 cm^3 of distilled water, labelled **V**. A few extra pieces should be available on request.	one at least 15 cm in length	
Paperclip	1	
7% yeast in 2% sucrose solution in a beaker or container, labelled **Y**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 100 cm^3	
[F][MH][HH] 0.04% bromothymol blue solution in a beaker or container with a means of removing drops (e.g. pipette, plastic or glass with teat), labelled **B**, provided at room temperature (see **Preparation of materials**). This indicator evaporates so should be kept covered.	at least 10 cm^3	
10 cm^3 syringes	2	
Beaker or container (capacity 75 cm^3 to 100 cm^3), labelled **A**	1	
Spotting tile or white tile	1	
Glass rods	2	
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	
Stop-clock 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

In advance of the examination check that the yeast will become active (with froth on the top). Some yeast will require more time to become active. Do **not** use brewer's yeast as this does not always work actively enough in the time.

The 2% sucrose solution may be prepared the day before the examination and kept in covered containers in a refrigerator.
The 0.04% bromothymol blue solution may be prepared the day before the examination and kept in covered containers.
The 7% yeast in 2% sucrose solution should be prepared 30 minutes before the candidates start **Question 1**. It will have cooled down before the candidates use it but it may still be warm.

(i) **Y**, 7% yeast in 2% sucrose solution

The 2% sucrose solution is prepared by sprinkling 2 g of sucrose, a little at a time, onto the surface of 80 cm^3 of distilled water, stirring continuously as you sprinkle. Make up to 100 cm^3 with distilled water.

Start preparing the 7% yeast in 2% sucrose solution 30 minutes before the candidates start **Question 1**:
In a large container add 7 g of dried yeast to 40 cm^3 of warm 2% sucrose solution.

Stir and make up to 100 cm^3 with warm sucrose solution. This should be kept at a temperature of 35 °C to 40 °C for approximately 30 minutes.

To help put the 20 cm^3 of **Y** into the beaker for the candidate, it is suggested that the yeast suspension is poured into a second beaker, leaving the froth behind.

[F] (ii) **B**, 0.04% bromothymol blue solution
[MH][HH]

To prepare bromothymol blue indicator:

- put 0.1 g of bromothymol blue powder into a beaker or container
- put 50 cm^3 of ethanol (IMS) into the same beaker and mix well to dissolve the bromothymol blue indicator
- make up to 250 cm^3 with distilled water.

If the indicator is **not blue** then add as few drops as possible of 0.3% sodium carbonate solution, until the indicator turns blue.

To prepare the 0.3% sodium carbonate put 0.3 g of anhydrous sodium carbonate in 80 cm^3 of distilled water. Make up to 100 cm^3 with distilled water.
The indicator should be kept in covered containers to prevent evaporation.

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Question 2

Each candidate will require:

(i) Microscope with an eyepiece graticule fitted into the eyepiece lens (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.

(ii) 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**.

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

SUPERVISOR'S REPORT

The Supervisors' 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 competent biologist (not the Invigilator), should follow the steps in **Question 1**, in order to obtain results for **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 **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 plus £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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SUPERVISOR'S REPORT

October/November 2017

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 normal 'Special Consideration Form' as detailed in the Handbook for Centres.

3 During the examination the Supervisor or competent biologist should follow the steps in **Question 1** in order to obtain results for **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 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 Enclosed 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 Supervisor)

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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Temperature of examination room ..... °C

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

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 2017**

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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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 suitable eye protection 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

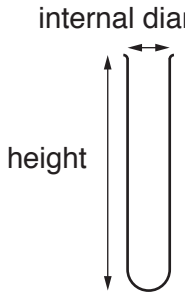
F flammable

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.

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Confidential Instructions

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 suitable beakers or containers for removal of the solutions using syringes
- 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	✓
Distilled water in a beaker or container, labelled **U1**, provided at room temperature	at least 20 cm^3	
0.2% glucose solution in a beaker or container, labelled **U2**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
1% glucose solution in a beaker or container, labelled **U3**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
2% glucose solution in a beaker or container, labelled **G**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 20 cm^3	
[MH] [N] Benedict's solution (qualitative) in a beaker or container, labelled **Benedict's**, provided at room temperature	at least 20 cm^3	
5 cm^3 syringes, with the means to wash them out	3	
Beaker or container (capacity 75 cm^3 to 100 cm^3)	1	
Test-tubes – large (capacity 30 cm^3 to 50 cm^3), suitable for heating	5	
Test-tube rack(s) to hold 5 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 400 cm^3), with water between 45 °C and 50 °C, suitable for heating as a water-bath. 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	
Stop-clock 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

G, **U2** and **U3** may be prepared the day before the examination. They should be kept in covered containers in a refrigerator.
The solutions must be at room temperature for the examination.

(i) **G**, 2% glucose solution

This is prepared by sprinkling 2 g of glucose into 80 cm^3 of distilled water in a beaker or container. Stir well. Make up to 100 cm^3 with distilled water.

(ii) **U2**, 0.2% glucose solution

This is prepared by putting 10 cm^3 of **G** into 90 cm^3 of distilled water. Stir well.

(iii) **U3**, 1% glucose solution

This is prepared by putting 50 cm^3 of **G** into 50 cm^3 of distilled water. Stir well.

Question 2

Each candidate will require:

(i) Microscope with an eyepiece graticule fitted into the eyepiece lens (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.

(ii) 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**.

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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)(i)** and **1(a)(vii)**.

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 plus £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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SUPERVISOR'S REPORT

October/November 2017

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 normal 'Special Consideration Form' as detailed in the Handbook for Centres.

3 During the examination the Supervisor (or competent biologist) should follow the steps in **Question 1** in order to obtain results for **1(a)(i)** and **1(a)(vii)**. 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. Enclosed 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 Supervisor)

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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Temperature of examination room ..... °C

Results for **Question 1(a)(i)** and **1(a)(vii)**

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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 2017**

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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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 suitable eye protection 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

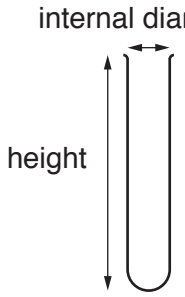
F flammable

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.

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Confidential Instructions

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 suitable beakers or containers for removal of the solutions using syringes
- 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	✓
Milk, in a beaker or container, labelled **M**, provided at room temperature (see **Preparation of materials**)	at least 100 cm^3	
[HH] 10% calcium chloride solution in a beaker or container, labelled **C**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
[HH] 1% rennet solution, in a beaker or container, labelled **E**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
Distilled water, in a beaker or container, labelled **W**, provided at room temperature	at least 100 cm^3	
5 cm^3 syringes, with the means to wash them out	2	
10 cm^3 syringes, with the means to wash them out	2	
Beakers or containers (capacity 75 cm^3 to 100 cm^3)	4	
Test-tubes – large (capacity 30 cm^3 to 50 cm^3), suitable for heating	7	
Test-tube rack(s) to hold 7 large test-tubes **or** test-tube rack to hold 5 test-tubes plus a container to hold 2 large test-tubes	1	
Beaker (capacity approximately 400 cm^3), with water between 50 °C and 60 °C, labelled **Hot water** The Supervisor may use a thermostatically controlled water-bath to provide additional hot water if requested by candidates.	1	
Beaker (capacity approximately 400 cm^3), with cold water below 30 °C, labelled **Cold water**	1	
Beaker or container (capacity 400 cm^3), labelled **water-bath**, to act as a water-bath and suitable for holding 4 large test-tubes at a time	1	
Thermometer, –10 °C to 110 °C	1	
Black card or paper, approximately 100 mm × 100 mm	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	
Stop-clock 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

C, **M** and **E** can be prepared the day before the examination and put in covered containers. **M** and **E** should be kept in a refrigerator.
The solutions must be at room temperature for the examination.

(i) **M**, 100 cm^3 of fresh full fat milk

Any source of fresh full fat milk may be used. UHT milk is also acceptable.

[HH] **(ii)** **E**, 1% rennet solution

This is prepared by putting 1 cm^3 of rennet solution (supplied by Cambridge) into 80 cm^3 of distilled water and stirring continuously. Make up to 100 cm^3 with distilled water.

[HH] **(iii)** **C**, 10% calcium chloride solution

This is prepared by putting 10 g of calcium chloride-6-water into 70 cm^3 of distilled water and stirring continuously. Make up to 100 cm^3 with distilled water.

Question 2

Each candidate will require:

(i) Microscope with an eyepiece graticule fitted into the eyepiece lens (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.

(ii) 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**.

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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)**, **1(a)(iii)** and **1(a)(vii)**.

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**
- Rennet solution

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 plus £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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SUPERVISOR'S REPORT

October/November 2017

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 normal 'Special Consideration Form' as detailed in the Handbook for Centres.

3 During the examination the Supervisor (or competent biologist) should follow the steps in **Question 1** in order to obtain results for **1(a)(ii)**, **1(a)(iii)** and **1(a)(vii)**. 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. Enclosed 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 Supervisor)

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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Temperature of examination room ..... °C

Results for **Question 1(a)(ii)**, **1(a)(iii)** and **1(a)(vii)**

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