Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/31**

Paper 3 Advanced Practical Skills 1 **May/June 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 queries 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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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

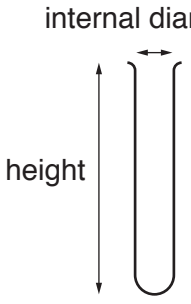
F flammable

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 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	✓
0.05% ascorbic acid solution in a beaker or container, labelled **V**, provided at room temperature (see **Preparation of materials**)	at least 50 cm^3	
0.02% ascorbic acid solution in a beaker or container, labelled **X**, 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	
0.1% DCPIP solution in a beaker or container, labelled **DCPIP**, provided at room temperature (see **Preparation of materials**)	at least 50 cm^3	
5 cm^3 syringe, with the means to wash it out, labelled **D**	1	
10 cm^3 syringes, with the means to wash them out	2	
Beakers or containers, maximum capacity 100 cm^3	5	
Test-tubes – large, maximum capacity 50 cm^3	6	
Test-tube rack(s) to hold 6 large test-tubes **or** test-tube rack to hold 5 large test-tubes with a container to hold 1 large test-tube	1	
Container with tap water (capacity approximately 200 cm^3), labelled **For washing**	1	
Container (capacity approximately 400 cm^3), labelled **For waste**	1	
White paper or card, approximately 10 cm × 10 cm	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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Preparation of materials

You will need the following stock solution:

1% ascorbic acid solution
This is prepared by putting 1.0 g of ascorbic acid into 50 cm^3 of distilled water in a beaker or container and stirring well. Make up to 100 cm^3 with distilled water.

(i) **V**, 0.05% ascorbic acid solution

This is prepared by putting 5 cm^3 of the 1% ascorbic acid stock solution into 95 cm^3 of distilled water and stirring well.

Prepare the 0.05% ascorbic acid solution **no more than two hours before** the examination. Keep covered to prevent evaporation and out of direct sunlight to prevent decomposition.

(ii) **X**, 0.02% ascorbic acid solution

This is prepared by putting 2 cm^3 of the 1% ascorbic acid stock solution into 98 cm^3 of distilled water and stirring well.

Prepare the 0.02% ascorbic acid solution **no more than two hours before** the examination. Keep covered to prevent evaporation and out of direct sunlight to prevent decomposition.

(iii) **DCPIP**, 0.1% DCPIP solution

This is prepared by putting 0.5 g of DCPIP in 400 cm^3 of distilled water and mixing well. Make up to 500 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
- **no** slide must 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**.

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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)(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**

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.

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

May/June 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 other competent biologist) should follow the steps in **Question 1** in order to obtain results for **1(a)(ii)** and **1(a)(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 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 (a)(ii)** and **1 (a)(iv)**

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BIOLOGY **9700/32**

Paper 3 Advanced Practical Skills 2 **May/June 2017**

CONFIDENTIAL INSTRUCTIONS

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Instructions for preparing apparatus

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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

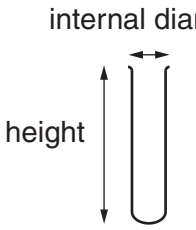
F flammable

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 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	✓
0.3% copper sulfate solution in a beaker or container, labelled **S**, provided at room temperature (see **Preparation of materials**)	at least 25 cm^3	
0.0001% copper sulfate solution in a beaker or container, labelled **X**, 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	
10% urea solution in a beaker or container, labelled **U**, provided at room temperature (see **Preparation of materials**)	at least 100 cm^3	
[HH] Urease solution in a beaker or container, labelled **E**, provided at room temperature (see **Preparation of materials**)	at least 30 cm^3	
Strips of red litmus paper, approximately 5 cm in length, in a small dry container, labelled **R**	2	
2 cm^3 or 3 cm^3 syringe, labelled **S** (for use with copper sulfate solution)	1	
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 (capacity approximately 100 cm^3)	6	
Test-tubes – large, maximum capacity 50 cm^3	7	
Test-tube rack(s) or container to hold 7 large test-tubes or test-tube rack to hold 5 large test-tubes with a container to hold 2 large test-tubes	1	
Blunt forceps	1	
Glass rod	1	
White paper or card, approximately 10 cm × 10 cm	1	
Container with tap water (capacity approximately 200 cm^3), labelled **For washing**	1	
Container with tap water (capacity approximately 200 cm^3), labelled **S 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

(i) **S**, 0.3% copper sulfate solution

You should **not** use anhydrous copper sulfate.
This is prepared by dissolving 0.3 g of copper sulfate pentahydrate ($CuSO_4.5H_2O$) in 80 cm^3 of distilled water and making up to 100 cm^3 with distilled water.

(ii) **X**, 0.0001% copper sulfate solution

You should **not** use anhydrous copper sulfate.

To prepare 0.0001% copper sulfate solution you must dilute 0.1% and 0.001%.

0.1% solution is prepared by dissolving 0.1 g of copper sulfate pentahydrate ($CuSO_4.5H_2O$) in 80 cm^3 of distilled water and making up to 100 cm^3 with distilled water.

Put 1 cm^3 of this 0.1% solution in a beaker and make up to 100 cm^3 with distilled water. This makes a 0.001% copper sulfate solution.

Put 10 cm^3 of this 0.001% solution in a beaker and make up to 100 cm^3 with distilled water. This makes **X**, a 0.0001% copper sulfate solution.

(iii) **U**, 10% urea solution
This is prepared by putting 10.0 g of urea (provided by Cambridge) in 80 cm^3 of distilled water and making up to 100 cm^3 with distilled water.

[HH] (iv) **E**, urease solution
This is prepared by putting 3 crushed tablets of urease (provided by Cambridge) in 80 cm^3 of distilled water and making up to 100 cm^3 with distilled water. The solution may remain cloudy.

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
- **no** slide must 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.

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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

- Urea
- Urease
- Slide **M1**

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

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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 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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Temperature of examination room ..... °C

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

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BIOLOGY **9700/33**

Paper 3 Advanced Practical Skills 1 **May/June 2017**

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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.

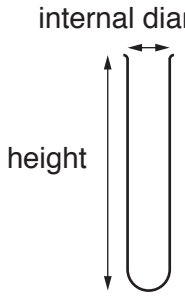
Each candidate must have uninterrupted use of the microscope for at least one hour.

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 a suitable beaker, or container, for removal of the solutions 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	✓
Mixture of 10 cm^3 of 0.02% starch suspension and 10 cm^3 of 0.2% glucose solution in a beaker or container, labelled **S1**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
20 cm^3 of 1.0% starch suspension in a beaker or container, labelled **S2**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
Mixture of 10 cm^3 of 0.02% starch suspension and 10 cm^3 of 0.2% glucose solution in a beaker or container, labelled **S3**, provided at room temperature (see **Preparation of materials**) *note: solutions **S1** and **S3** are the same*	at least 20 cm^3	
Mixture of 10 cm^3 0.002% starch suspension and 10 cm^3 of 20% glucose solution in a beaker or container, labelled **S4**, provided at room temperature (see **Preparation of materials**)	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 50 cm^3	
[N] Iodine solution in a beaker or container, labelled **iodine**, provided at room temperature and kept out of direct sunlight (see **Preparation of materials**)	at least 30 cm^3	
5 cm^3 syringes, with the means to wash them out	2	
2 cm^3 or 3 cm^3 syringes, with the means to wash them out	2	
Pipette, plastic or glass with a teat	1	
Test-tubes – small, maximum capacity 25 cm^3, suitable for heating	4	
Test-tube rack to hold 4 small 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 4 test-tubes, 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	
Thermometer, –10 °C to 110 °C	1	
Glass rod	1	
Spotting tile	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

The following stock solutions may be prepared the day before the examination and kept in covered containers.
However, solutions **S1**, **S2**, **S3** and **S4** for candidates (as in the Table 1.1) should be prepared on the day of the examination.

You will need the following stock solutions:

1% starch suspension
This is prepared by putting 1.0 g of starch into about 25 cm^3 of warm distilled water in a beaker or container. Mix to a paste. Make up to 100 cm^3 with warm distilled water. Heat to boiling for 1 to 2 minutes, stirring well. Allow to cool. This is used in **S2** and to make the 0.2% starch suspension.

0.2% starch suspension
This is prepared by adding 20 cm^3 of the **1%** starch solution to 80 cm^3 of distilled water and mixing well. This starch concentration is **not** required by the candidates but is needed to prepare the following two concentrations.

0.02% starch suspension
This is prepared by adding 10 cm^3 of the 0.2% starch solution to 90 cm^3 of distilled water and mixing well. This is used in **S1** and **S3**.

0.002% starch suspension
This is prepared by adding 10 cm^3 of the 0.02% starch solution to 90 cm^3 of distilled water and mixing well. This is used in **S4**.

20% glucose solution
This is prepared by sprinkling 20.0 g of glucose into 50 cm^3 of warm distilled water and making up to 100 cm^3 with distilled water. This is used in **S4**.

2% glucose solution
This is prepared by adding 10 cm^3 of the 20% glucose solution to 90 cm^3 of distilled water and mixing well. This glucose concentration is **not** required by the candidates but is needed to prepare the following concentration.

0.2% glucose solution
This is prepared by adding 10 cm^3 of the 2% glucose solution to 90 cm^3 of distilled water and mixing well. This is used in **S1** and **S3**.

(i) **S1**, **S2**, **S3** and **S4** should be made up (on the day of the examination) as in Table 1.1.

Table 1.1

solution	starch suspension/cm^3			glucose solution/cm^3	
	1%	0.02%	0.002%	20%	0.2%
S1		10			10
S2	20				
S3		10			10
S4			10	10	

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[Turn over

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

Stock solution: 0.1 mol dm^{-3}

This is prepared by putting 8.0 g of potassium iodide in a beaker or container. Add 2 cm^3 of distilled water to moisten the potassium iodide. Add 2.5 g of iodine (if necessary, crush to small pieces) to the moist potassium iodide, add 15 cm^3 of distilled water and stir well.

When no more iodine dissolves, add another 15 cm^3 of distilled water and stir well. Repeat with two more volumes of 15 cm^3 of distilled water and then make up to a total volume of 100 cm^3.

It is not essential that all the iodine dissolves. This gives a red-brown coloured 0.1 mol dm^{-3} iodine solution.

You **must** dilute this iodine solution to 0.01 mol dm^{-3} and this will form a **yellow/orange** solution.

Prepare a 0.01 mol dm^{-3} solution by taking 10 cm^3 of the **0.1 mol dm^{-3} stock solution** of iodine and making up to 100 cm^3 with distilled water.

Prepare the 0.01 mol dm^{-3} iodine solution **no more than one hour before** the examination. Keep the solution away from direct sunlight, for example in a brown glass bottle.

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
- **no** slide must 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(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 **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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This form should be completed and sent with the scripts.

SUPERVISOR'S REPORT

May/June 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 other 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 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 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(b)(iii)**

Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/34**

Paper 3 Advanced Practical Skills 2 **May/June 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 queries regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

email info@cie.org.uk
phone +44 1223 553554
fax +44 1223 553558

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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

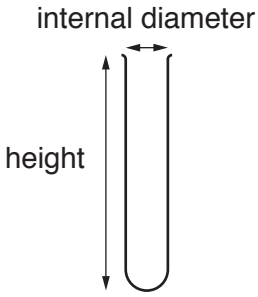
F flammable

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

In advance of the examination:
At least a week before the examination, prepare the plant extract (**10M**) and carry out the test for its activity.
See Preparation of materials

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 solutions 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	✓
Plant extract solution in a beaker or container, labelled **10M**, provided at room temperature (see **Preparation of materials**)	at least 100 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 100 cm^3	
50% plant extract solution in a beaker or container, labelled **U**, provided at room temperature (see **Preparation of materials**)	at least 40 cm^3	
[MH] 1 mol dm^{-3} sulfuric acid in a beaker or container, labelled **A**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
Potassium manganate(VII) solution in a beaker or container, labelled **K**, provided at room temperature (see **Preparation of materials**)	at least 20 cm^3	
10 cm^3 syringes, with the means to wash them out	2	
2 cm^3 or 3 cm^3 syringes, with the means to wash them out	2	
Beakers or containers, maximum capacity 100 cm^3	5	
Test-tubes – small, maximum capacity 15 cm^3	6	
Test-tube rack(s) to hold 6 small test-tubes	1	
White paper or card, approximately 10 cm × 10 cm	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

(i) **10M**, plant extract

This is prepared from approximately 15 g of spinach. Tear the leaves into small pieces and put them into a beaker (approximate capacity 400 cm^3). Add boiling distilled water to half fill the beaker. Stir well and allow to cool.

Pour off the liquid into a beaker and test this extract.

Test:
Put 1 cm^3 of 1 mol dm^{-3} sulfuric acid (**A**) and 1 cm^3 of 0.01% potassium manganate(VII) solution (**K**) into a test-tube. Mix well. Add 1 cm^3 of **10M** and time how long it takes for the mixture to turn from pink to colourless.

The time taken should be between 8 and 15 seconds.

If it takes **less time than 8 seconds** then dilute the plant extract.

If it takes **longer than 15 seconds**, then increase the number of leaves used to make the plant extract.

10M can be prepared the day before the examination. It should be stored in a covered container in a refrigerator.

10M should be at room temperature for the examination.

*Please note the Question paper will state that **10M** is a 10% solution.*

(ii) **U**, 50% plant extract solution

This is prepared by putting 50 cm^3 of **10M** into a beaker and making up to 100 cm^3 with distilled water.

*Please note the Question paper will state that **U** is an unknown concentration.*

[MH] **(iii)** **A**, 1.0 mol dm^{-3} sulfuric acid

This is prepared from (98%) sulfuric acid, by adding 55 cm^3 of this sulfuric acid to 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water.

This is an exothermic reaction, so **add the acid to the water**.

(iv) **K**, 0.01% potassium manganate(VII) solution

This is prepared by putting 1.0 g of potassium manganate(VII) into a beaker and making up to 100 cm^3 with distilled water. This makes a 1.0% solution.

Then put 1 cm^3 of this 1.0% solution into a beaker and make up to 100 cm^3 with distilled water. This makes the 0.01% potassium manganate(VII) solution.

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

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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
- **no** slide must be left on the stage of the microscope.

(ii) Slide **N1**

On receipt of the slides, please check that they are labelled **N1** 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

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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(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 **N1**

RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

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- 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

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SUPERVISOR'S REPORT

May/June 2017

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(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.

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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)(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 **9700/35**

Paper 3 Advanced Practical Skills 1 **May/June 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 queries 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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fax +44 1223 553558

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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

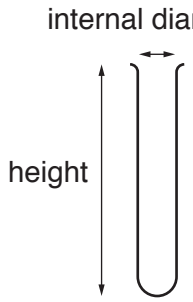
F flammable

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 a suitable beaker, or container, for removal of the solutions 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	✓
Mixture of 10 cm^3 of 1.0% starch suspension and 10 cm^3 of 2.0% glucose solution in a beaker or container, labelled **S**, provided at room temperature (see **Preparation of materials**) *note: the Question Paper will state that **S** is 1.0% starch suspension*	at least 20 cm^3	
0.5% glucose solution in a beaker or container, labelled **R**, provided at room temperature (see **Preparation of materials**) *note: the Question Paper will state that **R** is 1.0% reducing sugar solution*	at least 25 cm^3	
Distilled water in a beaker or container, labelled **E**, provided at room temperature *note: the Question Paper will state that **E** is amylase solution*	at least 20 cm^3	
Distilled water in a beaker or container, labelled **W**, provided at room temperature	at least 150 cm^3	
[MH][N] Benedict's solution (qualitative) in a beaker or container, labelled **Benedict's**, provided at room temperature	at least 30 cm^3	
15 cm length of Visking (dialysis) tubing in a beaker of distilled water, labelled **V**, provided at room temperature	1	
10 cm^3 syringes, with the means to wash them out	2	
5 cm^3 syringe, with the means to wash it out	1	
2 cm^3 or 3 cm^3 syringe, with the means to wash it out	1	
Beakers or containers, to hold 100 cm^3	5	
Beaker (capacity 75 cm^3 to 100 cm^3), labelled **X**	1	
Paperclip	1	
Test-tubes – large, maximum capacity 50 cm^3	6	
Test-tube rack to hold 6 large 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, labelled **hot water**. The Supervisor may use a thermostatically controlled water-bath to provide this hot water for candidates.	1	
Bunsen burner, bench mat, gauze and tripod to support water-bath	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	

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

Preparation of materials

You will need the following stock solutions:

1.0% starch suspension

This is prepared by putting 1.0 g of starch into approximately 5 cm^3 of warm distilled water in a beaker or container. Mix to a paste. Make up to 100 cm^3 with warm distilled water. Heat to boiling for 1 to 2 minutes, stirring well. Allow to cool.

2.0% glucose solution

This is prepared by sprinkling 2.0 g of glucose into 50 cm^3 of distilled water, stirring well. Make up to 100 cm^3 with distilled water.

(i) **S**, a mixture of equal volumes of 1.0% starch suspension and 2.0% glucose solution

This is prepared by adding 10 cm^3 of 1.0% starch suspension to 10 cm^3 of 2.0% glucose solution. Stir well.
*Note: the Question Paper will state that **S** is 1.0% starch suspension.*

(ii) **R**, 0.5% glucose solution

This is prepared by putting 25 cm^3 of 2.0% glucose solution into 75 cm^3 of distilled water. Stir well.
*Note: the Question Paper will state that **R** is 1.0% reducing sugar solution.*

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
- **no** slide must 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**.

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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)(iii)** and **1(a)(v)**.

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**

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

May/June 2017

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

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(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 other competent biologist) should follow the steps in **Question 1** in order to obtain results for **1(a)(iii)** and **1(a)(v)**. 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(a)(iii) and 1(a)(v)**