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**BIOLOGY**

**9700/36**

Paper 3 Advanced Practical Skills 2

**October/November 2016**

CONFIDENTIAL INSTRUCTIONS

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

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

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

### 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,  $\times 10$  (equal to 16 mm or  $\frac{2}{3}$ " )
- Low-power objective lens,  $\times 10$  (equal to 16 mm or  $\frac{2}{3}$ " )
- High-power objective lens,  $\times 40$  (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**  $\times 10$  or  $\times 40$  should be removed or replaced.

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

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

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

The following codes are used where relevant.

**C** = corrosive

**MH** = moderate hazard

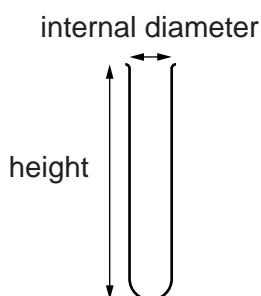
**HH** = health hazard

**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.

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

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

**Confidential Instructions**

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

**In advance of the examination:**

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

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

See **Preparation of materials**.

**For both Questions**

Each candidate will require:

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

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

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

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

## Question 1

Each candidate will require:

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

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

## Preparation of materials

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

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

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

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

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

**To prepare 0.01 mol dm<sup>-3</sup> sodium hydroxide solution for the bromothymol blue indicator:**

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

**To prepare bromothymol blue indicator:**

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

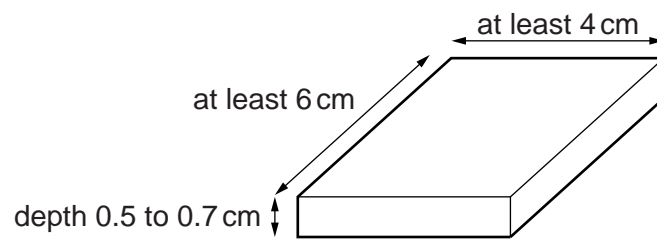
**To prepare the agar:**

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

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

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

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



**Fig. 1.1**

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

**Question 2**

Each candidate will require:

**(i) Slide M1**

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

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

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

**(ii) Microscope (as described on page 2)**

For each candidate:

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

## SUPERVISOR'S REPORT

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

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

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

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

## SEATING PLAN

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

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

## MATERIALS TO BE SUPPLIED by CAMBRIDGE

- Slide **M1**

## RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

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

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

or

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

Slides and boxes will be charged at the rate of £3 per slide and £1 per box.

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





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**This form should be completed and sent with the scripts**

**SUPERVISOR'S REPORT**

**October/November 2016**

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

- 1 Was any difficulty experienced in providing the necessary materials? If so, give brief details.
  
- 2 Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:
  - (a) difficulties arising from faulty specimens or microscopes;
  - (b) accidents to apparatus or materials;
  - (c) assistance provided in case of colour blindness;
  - (d) any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

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

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

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

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

Signed .....

Name (in block capitals) .....

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

Centre name .....

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

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



Temperature of examination room ..... °C

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

