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**BIOLOGY (PRINCIPAL)**

**9790/04**

Paper 4 Practical

**May/June 2016**

**CONFIDENTIAL INSTRUCTIONS**

**Great care should be taken to ensure that any confidential information given does not reach the candidates either directly or indirectly.**

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**The Supervisor's attention is drawn to the form on page 7 which must be completed and returned with the scripts.**



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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The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 3 Pre-U Certificate.

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

### Instructions for preparing apparatus

These instructions give details of the apparatus and materials required by each candidate for this paper. Sufficient information is given to permit the Centre to set up and test the apparatus and materials so that the candidates can be fairly assessed. **No access to the Question Paper is permitted in advance of the examination.**

If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made on the Supervisor's report.

Candidates must be provided with a microscope with:

- low-power objective lens, e.g.  $\times 10$  (equal to 16 mm or 2/3")
- high-power objective lens, e.g.  $\times 40$  (equal to 4 mm or 1/6")
- eyepiece graticule fitted within the eyepiece and visible in focus at the same time as the specimen.

Each candidate should have sole, uninterrupted use of the microscope for at least 60 minutes.

### HEALTH AND SAFETY

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Only those tests described in the Question Paper should be attempted. Pipette fillers and safety goggles should be used when 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.

Attention is drawn in particular to certain materials used in the examination. 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

The attention of Supervisors is drawn to any local regulations relating to safety, first-aid and disposal of chemicals.

'Hazard Data Sheets', relating to materials used in this examination, should be available from your chemical supplier.

### Instructions to Supervisors

Each candidate must be provided with the following apparatus and materials.

*To be supplied by the Centre.*

#### Question 1

Each candidate will require, for a period of at least 90 minutes:

- (i) At least 40 cm<sup>3</sup> of each of a 10% and a 1% betalain solution.

A stock betalain solution should be prepared as follows:

Peel and cut up 200 g of raw (uncooked) beetroot and liquidise with 100 cm<sup>3</sup> of distilled water. Pour the homogenate through several layers of muslin.

*The following procedures can be scaled up according to the number of candidates.*

#### Preparing 40 cm<sup>3</sup> of 10% betalain solution:

4 cm<sup>3</sup> of the stock betalain solution should be used to make a 10% betalain solution, as follows:

Add 4 cm<sup>3</sup> of stock betalain solution to 36 cm<sup>3</sup> distilled water and mix.

This should be provided to the candidates in a 100 cm<sup>3</sup> beaker, or other suitable container, labelled **10.0% betalain solution**.

#### Preparing 40 cm<sup>3</sup> of 1% betalain solution:

4 cm<sup>3</sup> of the 10% betalain solution should be used to make a 1% betalain solution, as follows:

Add 4 cm<sup>3</sup> of 10% betalain solution to 36 cm<sup>3</sup> distilled water and mix.

This should be provided to the candidates in a 100 cm<sup>3</sup> beaker, or other suitable container, labelled **1.0% betalain solution**.

- (ii) Four cores of raw (uncooked) beetroot tissue with a minimum length of 3 cm.

These should be prepared as follows:

Peel the beetroot. Use a size 6 cork borer to make several cores of beetroot tissue. The direction of the cores is not important and depends on the size of the individual beetroot. There is no need to trim the ends of the cores so that they are at right angles.

Provide the cores to the candidates in a beaker and cover with distilled water.

- (iii) Five discs of beetroot tissue that are approximately 4 mm in thickness (3–5 mm is acceptable). These can be cut from cores prepared as in (ii). The discs should be washed thoroughly in several changes of distilled water until no more pigment leaks from the discs. This may be done by running water from a tap into a container with the discs and letting the waste water drain away.

Provide the discs to the candidates in a specimen (sample) tube and cover with distilled water.

(iv) [F][MH][HH] 100 cm<sup>3</sup> of 100% alcohol (IMS / IDA) in a beaker labelled **100% alcohol**.

The beaker should be covered with cling film or equivalent.

(v) Eight specimen (sample) tubes.

(vi) 200 cm<sup>3</sup> distilled water in a beaker labelled **distilled water**.

(vii) 250 cm<sup>3</sup> distilled water in a beaker labelled **washing water**.

(viii) Ten test-tubes (15 mm × 150 mm).

(ix) Rack or racks to contain at least ten test-tubes.

(x) Four small beakers (e.g. 50 cm<sup>3</sup> or 100 cm<sup>3</sup>).

(xi) Three 10 cm<sup>3</sup> syringes.

(xii) Two 1 cm<sup>3</sup> syringes.

(xiii) Scalpel (e.g. Swann-Morton No. 11) or single-edged razor blade (also used in Question 2).

(xiv) Blunt forceps.

(xv) Spatula.

(xvi) Thermometer (−10 °C to 110 °C).

(xvii) Stirring rod.

(xviii) Two bungs to fit test-tubes.

(xix) Transparent ruler (cm/mm).

(xx) Marker pen.

(xxi) A piece of plain white card (to help determine colour intensity), approximately 10 cm × 10 cm.

(xxii) Stopwatch, stop clock or bench timer.

(xxiii) Candidates should have access to boiling water at the beginning of the procedure (e.g. from a kettle). Each candidate will require approximately 25 cm<sup>3</sup>.

They should **not** require apparatus for heating water.

(xxiv) Beaker for waste, labelled **waste**.

(xxv) Eight paper towels.

(xxvi) Protective gloves.

(xxvii) Eye protection.

Extra supplies of beetroot cores, specimen tubes, test-tubes, beakers, distilled water and 100% alcohol should be available if candidates request them.

**Question 2**

Each candidate must have sole, uninterrupted use of a microscope fitted with an eyepiece graticule for at least 60 minutes, as described on page 2.

Each candidate will require, for a period of at least 60 minutes:

- (i) Hand lens, e.g.  $\times 10$ .
- (ii) Stage micrometer.
- (iii) Transparent ruler (cm/mm).
- (iv) Fine forceps.
- (v) Blunt forceps.
- (vi) Mounted needle.
- (vii) Scalpel (e.g. Swann-Morton No. 11) or single-edged razor blade (also used in Question 1).
- (viii) Small beaker (e.g. 50 cm<sup>3</sup>) of distilled water, labelled **water**.
- (ix) Disposable, plastic, 3 cm<sup>3</sup> Pasteur pipette.
- (x) Three microscope slides and some cover slips.
- (xi) White tile, approximately 10 cm  $\times$  10 cm.
- (xii) Two filter papers.
- (xiii) Three paper towels.
- (xiv) A stem or stems of ivy-leaved toadflax, *Cymbalaria muralis*, with at least five of the larger leaves (see Fig. 2.1). *C. muralis* is often found growing on walls.



**Fig. 2.1**

The stems should be provided to candidates in a Petri dish or on a paper towel, labelled **K1**.

**Question 3**

No materials are required.

*To be supplied by CIE:*

**Questions 1, 2 and 3**

No materials to be supplied by CIE.

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- 3. Results for Question 1. These should be obtained by the Supervisor or other competent biologist out of sight of candidates. Separate results should be provided for each session held, each laboratory used in that session and each set of materials supplied.

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

**Declaration** (to be signed by the Principal)

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 .....

Centre name .....

If scripts are required by CIE to be despatched in more than one envelope, it is essential that a copy of the relevant Supervisor’s report and the appropriate seating plan(s) are sent inside **each envelope**.

