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**BIOLOGY (PRINCIPAL)**

**9790/04**

Paper 4 Practical

**May/June 2018**

**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 Supervisor's Report on page 7 which must be completed and returned with the scripts.**



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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This 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 Confidential 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 a period of 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 suitable eye protection 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.

- |   |                           |
|---|---------------------------|
| <b>C</b> corrosive                            | <b>MH</b> moderate hazard |
| <b>HH</b> health hazard                       | <b>T</b> acutely toxic    |
| <b>F</b> flammable                            | <b>O</b> oxidising        |
| <b>N</b> hazardous to the aquatic environment |                           |

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. No additional apparatus or materials should be supplied unless specified.

*To be supplied by the Centre*

#### Question 1

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

- (i) 10 cm<sup>3</sup> of dilute green tea, prepared by leaving a green tea bag in 200 cm<sup>3</sup> of boiling distilled water for exactly 10 seconds giving a very pale yellow solution.

The dilute green tea should be supplied cold, in a specimen tube or small beaker labelled **X**.

- (ii) 20 cm<sup>3</sup> of three different buffer solutions, prepared as follows.

Prepare stock solutions of:

0.2 mol dm<sup>-3</sup> disodium hydrogen phosphate-7-water, Na<sub>2</sub>HPO<sub>4</sub>·7H<sub>2</sub>O, and

0.1 mol dm<sup>-3</sup> citric acid monohydrate, C(OH)(COOH)(CH<sub>2</sub>COOH)<sub>2</sub>·H<sub>2</sub>O

0.2 mol dm<sup>-3</sup> disodium hydrogen phosphate-7-water is prepared by dissolving 53.61 g of disodium hydrogen phosphate-7-water in distilled water and making up to 1 dm<sup>3</sup>.

0.1 mol dm<sup>-3</sup> citric acid is prepared by dissolving 21.01 g of citric acid monohydrate **[MH]** in distilled water and making up to 1 dm<sup>3</sup>.

The buffer solutions should be made up using the volumes of 0.1 mol dm<sup>-3</sup> citric acid and 0.2 mol dm<sup>-3</sup> disodium hydrogen phosphate-7-water shown below.

pH	volume of 0.2 mol dm <sup>-3</sup> disodium hydrogen phosphate-7-water/cm <sup>3</sup>	volume of 0.1 mol dm <sup>-3</sup> citric acid monohydrate/cm <sup>3</sup>
3.0	20.6	79.4
5.0	51.5	48.5
7.0	82.3	17.7

The pH should be checked with pH paper and/or a pH meter and adjusted (if necessary) by adding one or other of the two solutions.

Relative molecular masses:

disodium hydrogen phosphate-7-water = 268.07

citric acid monohydrate = 210.14

The buffer solutions should be supplied in specimen tubes or small beakers labelled **pH 3**, **pH 5** or **pH 7**.

- (iii) 30 cm<sup>3</sup> of an enzyme extract prepared from ripe bananas supplied in a beaker labelled **enzyme extract**.

This extract should be prepared as follows.

Cut a peeled, **ripe** banana into small pieces. Place the pieces of banana in a liquidiser with cold distilled water at a ratio of 100 g banana to 400 cm<sup>3</sup> water. Homogenise and then filter through two layers of muslin. This extract should be prepared on the morning of the examination and kept cool in a refrigerator until given to candidates when they start **Question 1**.

- (iv) 5 cm<sup>3</sup> of enzyme extract that has been brought to the boil and then boiled for three minutes. This should be supplied in a specimen tube or small beaker labelled **boiled enzyme**.

- (v) 20 cm<sup>3</sup> of each of six L-dopa solutions prepared from a powder supplied by Cambridge.

A stock solution (50 mmol dm<sup>-3</sup>) should be prepared as follows.

Place 10 g of the powder into a volumetric flask and add 80 cm<sup>3</sup> of distilled water at approximately 80 °C. Shake vigorously. Use cold distilled water to make up to 100 cm<sup>3</sup> and then filter through a coffee filter paper. Repeat the filtering through a second coffee filter paper. This stock solution should be prepared immediately before the examination.

Use the stock solution to prepare six solutions of L-dopa with the concentrations shown in Table 1.1.

**Table 1.1**

volume of 50 mmol dm <sup>-3</sup> L-dopa solution / cm <sup>3</sup>	volume of distilled water / cm <sup>3</sup>	concentration of L-dopa / mmol dm <sup>-3</sup>
2	18	5
4	16	10
8	12	20
12	8	30
16	4	40
20	0	50

The six solutions of L-dopa should be supplied in small beakers labelled **5, 10, 20, 30, 40** and **50** as appropriate.

- (vi) 100 cm<sup>3</sup> of distilled water in a beaker labelled **distilled water**.
- (vii) 200 cm<sup>3</sup> of distilled water in a beaker labelled **washing water**.
- (viii) Universal Indicator papers (pH 1 to 14) and a colour chart.
- (ix) 20 test-tubes (15 mm × 150 mm).
- (x) Rack or racks to contain at least thirteen test-tubes.
- (xi) Two 5 cm<sup>3</sup> syringes.

- (xii) Four 1 cm<sup>3</sup> syringes.
- (xiii) Thermometer (−10 °C to 110 °C).
- (xiv) Stirring rod.
- (xv) Stop-watch, stop-clock or bench timer.
- (xvi) Marker pen.
- (xvii) White card, approximately 297 mm × 210 mm (A4).
- (xviii) Beaker for waste, labelled **waste**.
- (xix) Protective gloves and suitable eye protection.
- (xx) Paper towels.

Extra supplies of all the solutions and apparatus listed above should be available if candidates request them. No other solutions or apparatus should be provided.

## Question 2

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

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

- (i) At least three flowers of *Alstroemeria* with pedicels attached as shown in Fig. 2.1.

The flowers provided to each candidate should be of different colours. They should be supplied to the candidates in a Petri dish, small tray or other suitable container. The stamens of one of the flowers should be almost completely enclosed by the petals; the other two flowers should be open as shown by those in Fig. 2.1.

The anthers of the open flowers should be developed enough to be covered in pollen.

*Alstroemeria* flowers are available from most florists and supermarkets.



**Fig. 2.1**

- (ii) Hand lens, e.g.  $\times 10$ .
- (iii) Transparent ruler (mm).
- (iv) Fine forceps.
- (v) Mounted needle.
- (vi) White tile.
- (vii) Sharp scalpel (e.g. Swann Morton handle No. 3 with blade No. 11) or single edged razor blade.

Extra supplies of all of the apparatus listed above should be available if candidates request them. No other apparatus should be provided.

*To be supplied by Cambridge*

### Question 1

- (i) Powder source of L-dopa. The quantity supplied by Cambridge will be sufficient for approximately  $1.5 \times$  the candidate entry.

### Question 2

- (i) Slide **C1**. The number of slides supplied by Cambridge will be equal to half of the candidate entry.

## RETURN OF EXAMINATION MATERIALS TO CAMBRIDGE

Please read the following instructions carefully.

Immediately after the examination the slides must be returned to Cambridge in the containers in which they were received, using the self-adhesive labels for the parcel. They must not be included in parcels of scripts.

Please clearly indicate your Centre number when returning slides.

Slides and containers not returned in good condition will be charged at the rate of £3 per item.

The address for the return of slides is:

Ian Couchman,  
Cambridge International Examinations Laboratory  
1 Hills Road  
Cambridge  
CB1 2EU

The slides may be purchased from Cambridge, rather than being returned, using the form enclosed with the slides.

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**SUPERVISOR'S REPORT**

**This Supervisor's Report must be completed and sent to the Examiner in the envelope with the scripts.**

*The Supervisor 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 directly to Cambridge on the normal 'Special Consideration Form'.

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 Supervisor)

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 Cambridge 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**.