

Cambridge International Examinations

Cambridge Pre-U Certificate

BIOLOGY (PRINCIPAL)

Paper 4 Practical

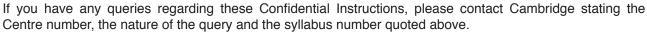
9790/04

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.

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

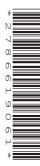


email info@cie.org.uk phone +44 1223 553554 fax +44 1223 553558

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







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. ×10 (equal to 16 mm or 2/3")
- high-power objective lens, e.g. x40 (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.

C corrosive MH moderate hazard

HH health hazard **T** acutely toxic

F flammable O oxidising

N 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 cm³ of dilute green tea, prepared by leaving a green tea bag in 200 cm³ 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 cm³ of three different buffer solutions, prepared as follows.

Prepare stock solutions of:

0.2 mol dm⁻³ disodium hydrogen phosphate-7-water, Na₂HPO₄.7H₂O, and

0.1 mol dm⁻³ citric acid monohydrate, C(OH)(COOH)(CH₂COOH)₂.H₂O

0.2 mol dm⁻³ 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 dm³.

 $0.1 \, \text{mol dm}^{-3}$ citric acid is prepared by dissolving 21.01 g of citric acid monohydrate **[MH]** in distilled water and making up to $1 \, \text{dm}^3$.

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

рН	volume of 0.2 mol dm ⁻³ disodium hydrogen phosphate-7-water/cm ³	volume of 0.1 mol dm ⁻³ citric acid monohydrate/cm ³
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 cm³ 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 cm³ 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 cm³ 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 cm³ of each of six L-dopa solutions prepared from a powder supplied by Cambridge.

A stock solution (50 mmol dm⁻³) should be prepared as follows.

Place 10g of the powder into a volumetric flask and add 80 cm³ of distilled water at approximately 80 °C. Shake vigorously. Use cold distilled water to make up to 100 cm³ 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.

volume of distilled water volume of 50 mmol dm⁻³ concentration of L-dopa $/\text{mmoldm}^{-3}$ L-dopa solution/cm³ $/cm^3$ 2 5 18 4 16 10 8 12 20 12 8 30 4 16 40 20 0 50

Table 1.1

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

- (vi) 100 cm³ of distilled water in a beaker labelled **distilled water**.
- (vii) 200 cm³ 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 ($15 \text{ mm} \times 150 \text{ mm}$).
 - (x) Rack or racks to contain at least thirteen test-tubes.
 - (xi) Two 5 cm³ syringes.

- (xii) Four 1 cm³ 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. ×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 × 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.
Dec	elaration (to be signed by the Supervisor)
	preparation of this practical examination has been carried out so as to maintain fully the security ne examination.
	Signed
	Name (in block capitals)
	Centre number
Cen	tre name
a cc	cripts are required by Cambridge to be despatched in more than one envelope, it is essential that opy of the relevant Supervisor's Report and the appropriate seating plan(s) are sent inside each elope .

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