Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/31**

Paper 3 Advanced Practical Skills 1 **May/June 2023**

CONFIDENTIAL INSTRUCTIONS

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

INSTRUCTIONS

- If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.
  email info@cambridgeinternational.org
  phone +44 1223 553554

DC (PQ) 337209/3

[Turn over

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

The following hazard codes are used in these confidential instructions, where relevant:

C	corrosive	**MH**	moderate hazard
HH	health hazard	**T**	acutely toxic
F	flammable	**O**	oxidising
N	hazardous to the aquatic environment		

Hazard data sheets relating to substances used in this exam should be available from your chemical supplier.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

Specific information for this practical exam

During the exam, the supervisor or other competent biologist (**not** the invigilator) should obtain the results needed for the supervisor's report by following the relevant steps in the question paper. The results should be recorded in the supervisor's report.

Organisation of the exam

- All candidates must have access to the materials required for Question 1 throughout the whole period of the exam.
- Half of the candidates will have access to the microscope and slide for a maximum time of one hour from the start of the exam. These candidates should start with Question 2. After one hour, or sooner if candidates have finished Question 2, they should move on to Question 1.
- For Question 2, two candidates are **not** permitted to share the same microscope and slide at the same time.
- The other candidates should start with Question 1. After one hour, these candidates should be given access to the microscope and slide. They should then move on to Question 2 as soon as they are ready.
- Candidates will only have access to the microscope and slide for one hour. They should be advised that they can answer any part of the exam paper not requiring the microscope and slide throughout the whole period of the exam.
- Access arrangements to microscopes and slides, including instructions on which question to start with and timings, must be explained to candidates before the start of the exam.

Materials to be supplied by Cambridge International

- Slide **J1**

  On receipt of the slides, check that they are labelled **J1** and that no slides are broken. The slides must **not** be viewed in advance of the exam. The material on the slides is confidential and must **not** be disclosed to candidates.

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

Return of slides to Cambridge International

Immediately after the exam, the slides must be:

- returned to Cambridge International in the boxes in which they were received, using the self-adhesive label supplied. 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 International. The order form must **not** be included in the packet of scripts. Slides and boxes will be charged at the rate of £3.25 per slide plus £1 per box.

If the slides are **not** returned or purchased by the deadline stated on the order form, the charge will be £3.75 per slide plus £1 per box.

Materials and apparatus for Question 1

Each candidate will need:

materials and apparatus for each candidate	quantity	✓
7.0% yeast suspension, labelled **Y**, provided at room temperature (see **Preparation of materials**)	at least 15 cm^3	
3.0% (10 vol) hydrogen peroxide solution in a beaker, labelled **H**, provided at room temperature (see **Preparation of materials**)	at least 30 cm^3	
2.0% sodium alginate solution in a beaker, labelled **S**, provided at room temperature (see **Preparation of materials**)	at least 30 cm^3	
1.5% calcium chloride solution in a beaker, labelled **C**, provided at room temperature (see **Preparation of materials**)	at least 30 cm^3	
pH 3 buffer in a beaker, labelled **B3**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH 4 buffer in a beaker, labelled **B4**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH 6 buffer in a beaker, labelled **B6**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH 7 buffer in a beaker, labelled **B7**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH 8 buffer in a beaker, labelled **B8**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
pH 6 buffer in a beaker, labelled **U**, provided at room temperature (see **Preparation of materials**)	at least 10 cm^3	
10 cm^3 syringe	1	
5 cm^3 syringes	4	
Beaker, capacity 50–100 cm^3	1	
Test-tubes, small, capacity 20–30 cm^3	6	
Test-tube, large, capacity 40–50 cm^3	1	
Test-tube rack to hold 6 small test-tubes	1	
Test-tube rack to hold 1 large test-tube	1	
Petri dish, at least 1 cm depth	1	
Blunt forceps	1	
Container with approximately 200 cm^3 tap water, labelled **For washing**	1	
Container, capacity at least 400 cm^3, labelled **For waste**	1	
Paper towels	12	
Glass marker pen (permanent)	1	
Stop-clock or timer showing seconds	1	
Glass rod	1	
Suitable eye protection	1	

Preparation of materials

S, **C**, **B3**, **B4**, **B6**, **B7**, **B8** and **U** may be prepared the day before the exam. They should be kept in a covered container in a refrigerator overnight.

S, **C**, **B3**, **B4**, **B6**, **B7**, **B8** and **U** should be at room temperature before the start of the exam.

- **Y**, 7.0% yeast suspension

  This is prepared by putting 7 g of yeast into a beaker and making up to 100 cm^3 with distilled water. Mix well.

- **H**, 3.0% hydrogen peroxide

  This is prepared by putting 50 cm^3 of 6% (20 vol) hydrogen peroxide **[MH]** into a beaker and making up to 100 cm^3 with distilled water. Mix well.

- **S**, 2.0% sodium alginate solution

  This is prepared by sprinkling 2 g of sodium alginate into a beaker with 50 cm^3 of warm distilled water, stirring well and making up to 100 cm^3 with warm distilled water. Continue stirring until dissolved. You may need to heat gently to dissolve the sodium alginate.
  Cool to room temperature.

- **C**, 1.5% calcium chloride solution

  This is prepared by putting 1.5 g of calcium chloride into a beaker with 80 cm^3 of distilled water and making up to 100 cm^3 with distilled water. Mix well.

- **B3**, **B4**, **B6**, **U** buffers at pH 3, pH 4 and pH 6

  The buffers should be prepared using the following stock solutions:

  1 dm^3 of 0.1 mol dm^{-3} citric acid

  This is prepared by putting 21.0 g of citric acid monohydrate ($C_6H_8O_7 \cdot H_2O$) **[MH]** in 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water. Mix well.

  1 dm^3 of 0.1 mol dm^{-3} tri-sodium citrate

  This is prepared by putting 25.8 g of anhydrous tri-sodium citrate in 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water. Mix well.

  Then 100 cm^3 of each buffer can be prepared as in the table:

buffer	pH	0.1 mol dm^{-3} citric acid / cm^3	0.1 mol dm^{-3} tri-sodium citrate / cm^3	distilled water / cm^3
B3	3.0	46.4	3.6	50
B4	4.0	33.0	17.0	50
B6	6.0	10.0	40.0	50
U	6.0	10.0	40.0	50

- **B7**, buffer at pH 7

  This buffer should be prepared using the following stock solutions:

  1 dm^3 of 0.1 mol dm^{-3} sodium hydroxide

  This is prepared by putting 4.0 g of sodium hydroxide **[MH]** in 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water. Mix well.

1 dm^3 of 0.1 mol dm^{-3} potassium dihydrogen (ortho) phosphate

This is prepared by putting 13.6 g of potassium dihydrogen phosphate **[MH]** in 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water. Mix well.

Then 100 cm^3 of pH 7 buffer can be prepared as in the table:

buffer	pH	0.1 mol dm^{-3} NaOH / cm^3	0.1 mol dm^{-3} potassium dihydrogen phosphate / cm^3	distilled water / cm^3
B7	7.0	18.5	31.5	50

- **B8, buffer at pH 8**

  This buffer should be prepared using the following stock solutions:

  1 dm^3 of 0.1 mol dm^{-3} citric acid

  As prepared for buffers **B3**, **B4**, **B6** and **U**.

  1 dm^3 of 0.2 mol dm^{-3} disodium hydrogenphosphate

  This is prepared by putting 53.6 g of disodium hydrogenphosphate(V)-7-water **[MH]** in 500 cm^3 of distilled water and making up to 1 dm^3 with distilled water. Mix well.

  Then 100 cm^3 of the buffer can be prepared as in the table:

buffer	pH	0.2 mol dm^{-3} disodium hydrogenphosphate / cm^3	0.1 mol dm^{-3} citric acid / cm^3
B8	8.0	97.3	2.7

Materials and apparatus for Question 2

Each candidate will need:

materials and apparatus for each candidate	quantity	✓
Microscope with: ● an eyepiece lens, ×10 magnification ● a low-power objective lens, ×10 magnification ● a high-power objective lens, ×40 magnification	1 between 2	
Slide **J1**	1 between 2	

Preparation of materials

- Microscope

  Any lenses which are **not** ×10 or ×40 should be removed or replaced.

  For each candidate:
  – the microscope must be set up on low power
  – the slide must **not** be on the stage of the microscope.

Supervisor's report

Syllabus and component number	9	7	0	0	/	3	1
Centre number							

Centre name .....

Time of the practical session .....

Laboratory name/number .....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:
- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Temperature of exam room ..... °C

Results for Question **1(a)(i)**.

Results for Question **1(a)(iv)**.

Declaration

1 Each packet that I am returning to Cambridge International contains all of the following items:
- the scripts of the candidates specified on the bar code label provided
- the supervisor's results relevant to these candidates
- the supervisor's reports relevant to these candidates
- seating plans for each practical session, referring to each candidate by candidate number
- the attendance register.

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed ..... (supervisor)

Name (in block capitals) .....