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**CHEMISTRY**

**5070/31**

Paper 3 Practical Test

**October/November 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 form 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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phone +44 1223 553554  
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This document consists of **8** printed pages.

## 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. Please also see under 'Apparatus' on the use of pipette fillers and eye protection.

In accordance with 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 and first aid.

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

## Preparing the Examination

**1 Access to the Question Paper is NOT permitted in advance of the examination.**

**2 Preparation of materials**

Where quantities are specified for each candidate, they are sufficient for the experiments described in the Question Paper to be completed.

**In preparing materials, the bulk quantity for each substance should be increased by 25%** as spare material should be available to cover accidental loss. More material may be supplied if requested by candidates, without penalty.

All solutions should be bulked and mixed thoroughly before use to ensure uniformity.

**Supervisors are asked to carry out any confirmatory tests given on page 4 to ensure the materials supplied are appropriate.**

**3 Labelling of materials**

Materials must be labelled as specified in these Confidential Instructions. Materials with a letter code (e.g. **P**, **Q**) should be so labelled, **without** the identities being included on the label – where appropriate, the identity of a letter-coded chemical is given in the Question Paper itself.

**4 Identity of materials**

It should also be noted that descriptions of solutions given in the Question Paper may not correspond exactly with the specification in these Confidential Instructions. **The candidates must assume the descriptions given in the Question Paper.**

**5 Size of group**

In view of the difficulty of the preparation of large quantities of solution of uniform concentration, it is recommended that the maximum number of candidates per group be 30 and that separate supplies of solutions be prepared for each group.

**Apparatus**

1 In addition to the fittings ordinarily contained in a chemical laboratory, the apparatus and materials specified below will be necessary.

2 Pipette fillers (or equivalent safety devices) and suitable eye protection should be used where necessary.

3 *For each candidate*

1 × 20 cm<sup>3</sup> or 25 cm<sup>3</sup> pipette

(It is essential that all candidates at a Centre have a pipette of the same capacity.)

1 × pipette filler

1 × 50 cm<sup>3</sup> burette

1 × burette stand

1 × burette clamp

1 × funnel for filling burette

1 × white tile

1 × conical flask or other suitable vessel for titration

a supply of test-tubes

1 × hard-glass test-tube

1 × test-tube rack

1 × test-tube holder

1 × stirring rod

1 × Bunsen burner

1 × heat-proof mat

2 × teat/dropping pipettes

1 × wash bottle containing distilled water

paper towels

## Chemicals Required

- It is *especially important* that great care is taken that the confidential information given below does not reach the candidates either directly or indirectly.
- Particular requirements

**N.B.** Small amounts of  $\text{NH}_3$  [C] [T] [N], which can cause respiratory distress in some people, may be produced. **The laboratory must be well ventilated.**

hazard	label	per candidate	identity	notes (Hazard symbols given refer to the raw materials.)
	<b>P</b>	150 cm <sup>3</sup>	0.08 mol/dm <sup>3</sup> sodium hydroxide solution	Dissolve 3.2 g of NaOH [C] in each dm <sup>3</sup> of solution.
	<b>Q</b>	150 cm <sup>3</sup>	0.10 mol/dm <sup>3</sup> hydrochloric acid	Dilute 8.5 cm <sup>3</sup> of concentrated (35–37%; approximately 11 mol/dm <sup>3</sup> ) hydrochloric acid [C] [MH] to 1 dm <sup>3</sup> .
[T][C] [N][F] [MH] [HH]	<b>methyl orange indicator</b> or <b>screened methyl orange indicator</b>	2 cm <sup>3</sup>	methyl orange indicator (or screened methyl orange indicator)	See preparation instructions for methyl orange indicator on page 30 of the 2017–2019 syllabus.
Supervisors are asked to carry out a standard acid/base titration between solutions <b>P</b> and <b>Q</b> to ensure that the concentrations of the two solutions fall within the given range. It is <b>essential</b> that 25.0 cm <sup>3</sup> of <b>P</b> reacts with between 19.0 cm <sup>3</sup> and 21.0 cm <sup>3</sup> of <b>Q</b> (or that 20.0 cm <sup>3</sup> of <b>P</b> reacts with between 15.0 and 17.0 cm <sup>3</sup> of <b>Q</b> ).				
[MH] [N]	<b>R</b>	15 cm <sup>3</sup>	1.0 mol/dm <sup>3</sup> NH <sub>3</sub>	See preparation instructions on page 30 of the 2017–2019 syllabus.
	<b>S</b>	10 cm <sup>3</sup>	‘10 vol’ hydrogen peroxide	Dilute 100 cm <sup>3</sup> of concentrated (‘100 volume’) hydrogen peroxide [C] to 1 dm <sup>3</sup> .
	<b>Universal Indicator paper</b>	1 piece	approximately 2 cm strip of Universal Indicator paper	
[C][N]	<b>aqueous zinc sulfate</b>	2 cm <sup>3</sup>	0.2 mol/dm <sup>3</sup> ZnSO <sub>4</sub>	Dissolve 57.5 g of ZnSO <sub>4</sub> ·7H <sub>2</sub> O [C] [MH] [N] in each dm <sup>3</sup> of solution.
	<b>aqueous chromium(III) chloride</b>	2 cm <sup>3</sup>	0.1 mol/dm <sup>3</sup> CrCl <sub>3</sub>	Dissolve 26.6 g of CrCl <sub>3</sub> ·6H <sub>2</sub> O [MH] in each dm <sup>3</sup> of solution.

	<b>aqueous sodium chloride</b>	2 cm <sup>3</sup>	0.1 mol/dm <sup>3</sup> NaCl	Dissolve 5.8 g of NaCl in each dm <sup>3</sup> of solution.
<b>[MH] [N]</b>	<b>acidified aqueous potassium manganate(VII)</b>	4 cm <sup>3</sup>	0.04 mol/dm <sup>3</sup> KMnO <sub>4</sub> 0.5 mol/dm <sup>3</sup> H <sub>2</sub> SO <sub>4</sub>	Dissolve 6.32 g of KMnO <sub>4</sub> <b>[O]</b> <b>[MH]</b> <b>[N]</b> in 1 dm <sup>3</sup> 0.5 mol/dm <sup>3</sup> H <sub>2</sub> SO <sub>4</sub> <b>[MH]</b> .
	<b>aqueous iron(II) sulfate</b>	2 cm <sup>3</sup>	0.2 mol/dm <sup>3</sup> FeSO <sub>4</sub> 0.05 mol/dm <sup>3</sup> H <sub>2</sub> SO <sub>4</sub>	Dissolve 55.6 g of FeSO <sub>4</sub> ·7H <sub>2</sub> O <b>[MH]</b> in 500 cm <sup>3</sup> of water and 50 cm <sup>3</sup> of 1 mol/dm <sup>3</sup> of H <sub>2</sub> SO <sub>4</sub> <b>[MH]</b> , and then dilute the solution with water to 1 dm <sup>3</sup> .

**3** The standard bench reagents specifically required are set out below. If necessary, they may be made available from a communal supply; however, the attention of the Invigilators should be drawn to the fact that such an arrangement may enhance the opportunity for malpractice between candidates.

hazard	label	identity	notes
<b>[MH]</b>	<b>dilute sulfuric acid</b>	0.5 mol/dm <sup>3</sup> H <sub>2</sub> SO <sub>4</sub>	
<b>[C]</b>	<b>aqueous sodium hydroxide</b>	1.0 mol/dm <sup>3</sup> NaOH	
	<b>aqueous silver nitrate</b>	0.05 mol/dm <sup>3</sup> silver nitrate	
	<b>aqueous potassium iodide</b>	0.1 mol/dm <sup>3</sup> KI	

See preparation instructions on page 30 of the 2017–2019 syllabus.

**4** The reagents, materials and apparatus to test the gases listed in the syllabus must be available to candidates. If necessary, they may be made available from a communal supply; however, the attention of the Invigilators should be drawn to the fact that such an arrangement may enhance the opportunity for malpractice between candidates.

hazard	label	identity	notes
<b>[MH]</b>	<b>limewater</b>	saturated aqueous calcium hydroxide, Ca(OH) <sub>2</sub>	See preparation instructions on page 30 of the 2017–2019 syllabus.
	red and blue litmus paper or Universal Indicator paper wooden splints		
	the apparatus normally used in the Centre in testing for carbon dioxide with limewater		

### During the Examination

- 1 The Supervisor, or other competent chemist, **must carry out the experiments in Question 1 and Question 2** and complete the table of readings on a spare copy of the Question Paper which should be labelled 'Supervisor's Results'.

**This should be done for:  
each session held and each laboratory used in that session, and each set of solutions supplied.**

**It is essential that each packet of scripts contains a copy of the applicable Supervisor's Results as the candidates' work cannot be assessed accurately without such information.**

- 2 The Supervisor must complete the Supervisor's Report on page 7 to show which candidates attended each session. If all candidates took the examination in one session, please indicate this on the Supervisor's Report. A copy of the Supervisor's Report must accompany each copy of the Supervisor's Results in order for the candidates' work to be assessed accurately.

The Supervisor must give details on page 8 of any particular difficulties experienced by a candidate, especially if the Examiner would be unable to discover this from the written answers.

### After the Examination

**Each envelope returned to Cambridge must contain the following items.**

- 1 The scripts of those candidates specified on the barcode label provided.
- 2 A copy of the Supervisor's Results relevant to the candidates in 1.
- 3 A copy of the Supervisor's Report, including details of any difficulties experienced by candidates (see pages 7 and 8).
- 4 The Attendance Register.
- 5 **A Seating Plan for each session/laboratory.**

**Failure to provide appropriate documentation in each envelope may cause candidates to be penalised.**

### Colour Blindness

With regard to colour blindness, it is permissible to advise candidates who request assistance on colours of, for example, precipitates and solutions (especially titration end-points). Please include with the scripts a note of the candidate numbers of such candidates.

Experience suggests that candidates who are red/green colour-blind – the most common form – do not generally have significant difficulty. Reporting such cases with the scripts removes the need for a Special Consideration Form.

## SUPERVISOR'S REPORT

**This form must be completed and sent to the Examiner in the envelope with the scripts.**

Centre number ..... Name of Centre .....

### 1 Supervisor's Results

Supervisors are asked to use a spare copy of the Question Paper to report their results for **Question 1 and Question 2** and enclose this copy of the Question Paper with the candidates' answers. This copy of the Question Paper should be clearly labelled 'Supervisor's Results'. Failure to enclose these results and this Supervisor's Report may lead to candidates being unavoidably penalised.

If candidates from more than one Centre are taking the examination, it is essential that a copy of the 'Supervisor's Results' should be sent with the scripts from **each Centre**.

### 2 The candidate numbers of candidates attending each session were:

*First Session*

*Second Session*

- 3 The Supervisor is invited to report details of any difficulties experienced by particular candidates, giving names and candidate numbers. This report should include reference to:
- (a) any general difficulties encountered in making preparation;
  - (b) difficulties due to faulty apparatus or materials;
  - (c) accidents involving apparatus or materials;
  - (d) assistance with respect to colour blindness.

Other cases of hardship, e.g. illness, temporary disability, should be reported direct to Cambridge on the Special Consideration Form.

- 4 **A plan of work benches, giving details by candidate numbers of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.**

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

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

**SIGNED** .....

**NAME (in block capitals)** .....

**NAME OF CENTRE** .....

**CENTRE NUMBER** .....

If the candidates' Centre number is different from the number of the Centre at which the examination was taken, the Supervisor should write **both Centre numbers in the spaces provided**.

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