Rewarding Learning

ADVANCED
General Certificate of Education
2025

Centre Number

Candidate Number

Chemistry

Assessment Unit A2 3

assessing

Further Practical Chemistry

Practical Booklet A

ACH31

[ACH31]

THURSDAY 8 MAY, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink and use a dark HB pencil for drawings and graphs.
Do not write with a gel pen.
Answer **all three** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 30.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You may use a scientific calculator.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.
Follow all health and safety instructions.
Safety glasses must be worn at all times.
You may not have access to notes, textbooks and other material to assist you.
The apparatus and materials required to complete the task(s) are provided.

14557

08ACH3101

BLANK PAGE

DO NOT WRITE ON THIS PAGE

1 You are provided with an organic compound labelled **P**.

All volumes of 5 cm^3 or less in this question may be measured approximately using a graduated disposable pipette.

(a) Describe the appearance of **P**.

_____ [1]

(b) Carry out the following tests and record your observations.

Test	**Observations**
1. Place the piece of universal indicator paper on a white tile. Place one drop of **P** on the universal indicator paper.	
2. Place 5 cm^3 of **P** into a boiling tube. Add the piece of magnesium ribbon. Record all observations over a five minute period.	
3. Place 5 cm^3 of **P** into a boiling tube. In a fume cupboard, add 2 cm^3 of bromine water to the boiling tube. Return to your workstation, stopper the boiling tube and shake it vigorously. Allow the contents to settle.	
4. Place 5 cm^3 of **P** into a boiling tube. Place a thermometer in the boiling tube and record the initial temperature. Add one spatula measure of sodium carbonate. Stir with the thermometer, record all observations and the final temperature when the reaction is complete.	

[10]

[Turn over

2 You are provided with a solid labelled **G**.

All volumes of 5 cm^3 or less in this question may be measured approximately using a graduated disposable pipette.

(a) Place two spatula measures of solid **G** in a boiling tube. Heat gently for two minutes. Record four observations.

1. _____

2. _____

3. _____

4. _____ [4]

(b) **(i)** Add approximately 40 cm^3 of deionised water to a 100 cm^3 beaker. Add one spatula measure of solid **G** to the beaker and stir using a glass rod.

Record your observations. **Keep the contents of the beaker for (b)(ii).**

_____

_____ [1]

(ii) Add 5 cm^3 of sodium hydroxide solution to the beaker from **(b)(i)**. Place the beaker on a white tile. Add 1 cm^3 of potassium manganate(VII) solution to the beaker. Record your observations.

_____

_____

_____ [3]

(c) Dissolve one spatula measure of solid **G** in approximately 20 cm^3 of deionised water in a 100 cm^3 beaker. Add 5 cm^3 of this solution into a boiling tube. Add 5 cm^3 of sodium hydroxide solution. Add 2 cm^3 of copper(II) sulfate solution dropwise. Gently shake the boiling tube and record your observations.

_____

_____

Place the boiling tube into a beaker of freshly boiled water and leave for three minutes. Record your observations.

_____

_____

In a fume cupboard, add 3 cm^3 of concentrated hydrochloric acid to the boiling tube and shake **gently**. Record your observations. Leave your boiling tube in the fume cupboard.

_____

_____ [4]

3 You are provided with a solid labelled **X**.

All volumes of 5 cm^3 or less in this question may be measured approximately using a graduated disposable pipette.

(a) Using a 100 cm^3 beaker, dissolve all the sample of solid **X** in approximately 50 cm^3 of deionised water. Describe the appearance of the solution.

_____ [1]

Keep this solution of X for parts (b) to (e).

(b) Add 2 cm^3 of the solution of **X** to a test tube. Add 1 cm^3 of sodium hydroxide solution dropwise and then add a further 2 cm^3 of sodium hydroxide solution. Record your observations.

_____

_____ [2]

(c) Add 2 cm^3 of the solution of **X** to a test tube. Add 5 drops of potassium thiocyanate solution dropwise to the test tube. Shake gently. Record your observations.

_____ [1]

(d) Add 2 cm^3 of the solution of **X** to a test tube. Add 2 cm^3 of dilute nitric acid followed by 2 cm^3 of silver nitrate solution. Shake gently. Record your observations.

_____ [1]

(e) Add 2 cm^3 of the solution of **X** to a test tube. Add one spatula measure of sodium carbonate to the test tube. Record your observations.

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
Total Marks	

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

General Information

1 tonne = 10^6 g
1 metre = 10^9 nm
One mole of any gas at 293 K and a pressure of 1 atmosphere (10^5 Pa) occupies a volume of 24 dm^3
Avogadro Constant = 6.02×10^{23} mol^{-1}
Planck Constant = 6.63×10^{-34} J s
Specific Heat Capacity of water = 4.2 J g^{-1} K^{-1}
Speed of Light = 3×10^8 m s^{-1}

Characteristic absorptions in IR spectroscopy

Wavenumber/cm^{-1}	Bond	Compound
550–850	C–X (X = Cl, Br, I)	Haloalkanes
750–1100	C–C	Alkanes, alkyl groups
1000–1300	C–O	Alcohols, esters, carboxylic acids
1450–1650	C=C	Arenes
1600–1700	C=C	Alkenes
1650–1800	C=O	Carboxylic acids, esters, aldehydes, ketones, amides, acyl chlorides
2200–2300	C≡N	Nitriles
2500–3200	O–H	Carboxylic acids
2750–2850	C–H	Aldehydes
2850–3000	C–H	Alkanes, alkyl groups, alkenes, arenes
3200–3600	O–H	Alcohols
3300–3500	N–H	Amines, amides

Proton Chemical Shifts in Nuclear Magnetic Resonance Spectroscopy (relative to TMS)

Chemical Shift	Structure	
0.5–2.0	–C**H**	Saturated alkanes
0.5–5.5	–O**H**	Alcohols
1.0–3.0	–N**H**	Amines
2.0–3.0	–CO–C**H**	Ketones
	–N–C**H**	Amines
	C_6H_5–C**H**	Arene (aliphatic on ring)
2.0–4.0	X–C**H**	X = Cl or Br (3.0–4.0)
		X = I (2.0–3.0)
4.5–6.0	–C=C**H**	Alkenes
5.5–8.5	RCON**H**	Amides
6.0–8.0	–C_6**H**$_5$	Arenes (on ring)
9.0–10.0	–C**H**O	Aldehydes
10.0–12.0	–COO**H**	Carboxylic acids

These chemical shifts are concentration and temperature dependent and may be outside the ranges indicated above.

© CCEA 2017
COUNCIL FOR THE CURRICULUM, EXAMINATIONS AND ASSESSMENT
29 Clarendon Road, Clarendon Dock, Belfast BT1 3BG
Tel: +44 (0)28 9026 1200 Fax: +44 (0)28 9026 1234
Email: info@ccea.org.uk Web: www.ccea.org.uk

Rewarding Learning

11331.03

Rewarding Learning

Data Leaflet

Including the Periodic Table of the Elements

For the use of candidates taking
Advanced Subsidiary and
Advanced Level Examinations

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations

gce a/as examinations

chemistry

THE PERIODIC TABLE OF ELEMENTS

Group	I	II											III	IV	V	VI	VII	0
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1 **H** Hydrogen 1																	4 **He** Helium 2
	7 **Li** Lithium 3	9 **Be** Beryllium 4											11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
	23 **Na** Sodium 11	24 **Mg** Magnesium 12											27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
	39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30	70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
	85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	98 **Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48	115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
	133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La*** Lanthanum 57	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80	204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	210 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86
	223 **Fr** Francium 87	226 **Ra** Radium 88	227 **Ac**† Actinium 89	261 **Rf** Rutherfordium 104	262 **Db** Dubnium 105	266 **Sg** Seaborgium 106	264 **Bh** Bohrium 107	277 **Hs** Hassium 108	268 **Mt** Meitnerium 109	271 **Ds** Darmstadtium 110	272 **Rg** Roentgenium 111	285 **Cn** Copernicium 112						

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	145 **Pm** Promethium 61	150 **Sm** Samarium 62	152 **Eu** Europium 63	157 **Gd** Gadolinium 64	159 **Tb** Terbium 65	162 **Dy** Dysprosium 66	165 **Ho** Holmium 67	167 **Er** Erbium 68	169 **Tm** Thulium 69	173 **Yb** Ytterbium 70	175 **Lu** Lutetium 71
232 **Th** Thorium 90	231 **Pa** Protactinium 91	238 **U** Uranium 92	237 **Np** Neptunium 93	242 **Pu** Plutonium 94	243 **Am** Americium 95	247 **Cm** Curium 96	245 **Bk** Berkelium 97	251 **Cf** Californium 98	254 **Es** Einsteinium 99	253 **Fm** Fermium 100	256 **Md** Mendelevium 101	254 **No** Nobelium 102	257 **Lr** Lawrencium 103

* 58 – 71 Lanthanum series
† 90 – 103 Actinium series

$^{a}_{b}X$

a = relative atomic mass (approx)
x = atomic symbol
b = atomic number

11331.03

Rewarding Learning

ADVANCED
General Certificate of Education
2025

Chemistry

Assessment Unit A2 3

assessing

Further Practical Chemistry
Practical Booklet A

[ACH31]

THURSDAY 8 MAY, MORNING

APPARATUS AND MATERIALS LIST

To be accessed by Head of Department only

Advice for centres

- All chemicals used should be at least laboratory reagent specification and labelled with appropriate safety symbols, e.g. flammable.

- For centres running multiple sessions – candidates for the later session should be supplied with clean, dry glassware. If it is not feasible then glassware from the first session should be thoroughly washed, rinsed with deionised water and allowed to drain.

- Ensure all chemicals are in date, otherwise expected observations may not be seen.

- It is the responsibility of the centre to be cognisant of all health and safety issues and to carry out a thorough risk assessment **including checking hazard labelling advice**. Up to date information can be obtained at www.cleapss.org.uk.

- Provision of chemicals, their safe storage, use and subsequent disposal, are the responsibility of the centre.

- Each candidate must wear safety goggles or alternative eye protection for the duration of the practical examination.

Practical Examination

Each candidate must be supplied with safety goggles or glasses.

Question No. 1

Each candidate must be supplied with:

- 1 × boiling tube rack
- 3 × boiling tubes
- 1 × stopper to fit boiling tube
- 1 × white tile
- 1 × piece of universal indicator paper
- 1 × stopclock
- 1 × thermometer (–10 to 110°C with 1°C divisions)
- 2 × graduated disposable pipettes (graduated 3 cm^3)
- 1 × spatula
- approximately 30 cm^3 of 2 mol dm^{-3} ethanoic acid labelled **P** and with the hazard symbol for **health hazard** (exclamation mark symbol)
- access to a bottle of bromine water (less than 0.2 M) in a fume cupboard labelled **bromine water** and with the hazard symbol for **health hazard** (exclamation mark label) (approximately 2 cm^3 per candidate)
- 3 cm of magnesium ribbon in a sealed container labelled **magnesium ribbon** and with the hazard symbol for **flammable**
- approximately 1.0 g of anhydrous sodium carbonate in a sealed container labelled **sodium carbonate** and with the hazard symbol for **health hazard** (exclamation mark label)

Question No. 2

Each candidate must be supplied with:

- 1 × spatula
- 1 × stopclock
- 1 × wash bottle filled with deionised water
- 1 × boiling tube holder
- 1 × boiling tube rack
- 2 × boiling tubes
- 2 × 100 cm^3 beakers
- 1 × 250 cm^3 beaker for use as a water bath
- 1 × Bunsen burner
- 1 × heatproof mat
- 1 × glass stirring rod
- 1 × white tile
- 6 × graduated disposable pipettes (graduated 3 cm^3)
- kettle for access to hot water
- approximately 5 g of D (+) anhydrous glucose in a sealed container labelled **G**
- approximately 15 cm^3 of 1.0 mol dm^{-3} of sodium hydroxide solution labelled **sodium hydroxide solution** and with the hazard symbol for **corrosive**
- approximately 2 cm^3 of 0.02 mol dm^{-3} potassium manganate(VII) solution labelled **potassium manganate(VII) solution**
- approximately 5 cm^3 of 1.0 mol dm^{-3} copper sulfate solution labelled **copper sulfate solution** and with the hazard symbols for **health hazard** (exclamation mark label) and **corrosive**
- access to concentrated hydrochloric acid labelled **concentrated hydrochloric acid** and with the hazard symbols for **corrosive** and **health hazard** (exclamation mark label). This should be kept in a fume cupboard (approximately 5 cm^3 required per candidate) with a boiling tube rack.

Question No. 3

Each candidate must be supplied with:

- 1 × test tube rack
- 4 × test tubes
- 6 × graduated disposable pipettes (graduated 3 cm^3)
- 1 × wash bottle filled with deionised water
- 1 × spatula
- 1 × glass stirring rod
- 1 × 100 cm^3 beaker
- access to approximately 1 g of iron(III) chloride hexahydrate in a sealed container labelled **X** and with the hazard symbols for **corrosive** and **health hazard** (exclamation mark label)
- access to approximately 10 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution labelled **sodium hydroxide solution** and with the hazard symbol for **corrosive**
- access to approximately 5 cm^3 of 0.05 mol dm^{-3} potassium thiocyanate solution labelled **potassium thiocyanate solution**
- access to approximately 1 g of anhydrous sodium carbonate in a sealed container labelled **sodium carbonate** and with the hazard symbol for **health hazard** (exclamation mark label)
- access to approximately 5 cm^3 of 1.0 mol dm^{-3} nitric acid solution labelled **dilute nitric acid** and with the hazard symbol for **corrosive**
- access to approximately 5 cm^3 of 0.05 mol dm^{-3} silver nitrate solution labelled **silver nitrate solution**

Rewarding Learning

ADVANCED
General Certificate of Education
2025

Chemistry

Assessment Unit A2 3

Practical Assessment

Practical Booklet A

[ACH31]

THURSDAY 8 MAY, MORNING

Confidential Instructions to the Supervisor of the Practical Examination

INSTRUCTIONS TO THE SUPERVISOR OF THE PRACTICAL EXAMINATION

General

1. The instructions contained in this document are for the use of the Supervisor **and are strictly confidential**. Under no circumstances may information concerning apparatus or materials be given before the examination to a candidate or other unauthorised person.

2. In a centre with a large number of candidates it may be necessary for two or more examination sessions to be organised. **It is the responsibility of the schools to ensure that there should be no contact between candidates taking each session.**

3. A suitable laboratory must be reserved for the examination and kept locked throughout the period of preparation. Unauthorised persons not involved in the preparation for the examination must not be allowed to enter. Candidates must not be admitted until the specified time for commencement of the examination.

4. The Supervisor must ensure that the solutions provided for the candidates are of the nature and concentrations specified in the Apparatus and Materials List.

5. **The Supervisor is to be granted access to the Teacher's Copy of Practical Booklet A on Thursday 1 May 2025.** The Supervisor is asked to check, at the earliest opportunity, that the experiments and tests in the question paper may be completed satisfactorily using the apparatus, materials and solutions that have been assembled. **This question paper must then be returned to safe custody** at the earliest possible moment after the Supervisor has ensured that all is in order. **No access to the question paper should be allowed before Thursday 1 May 2025.**

6. Centres may need to carry out multiple sessions to accommodate all their candidates sitting Practical Booklet A in a laboratory. Supervision must take place from 30 minutes after the scheduled starting time of the examination, as set out in the timetable, until the time when the candidate(s) begin(s) their examination(s). This is in order to ensure that there is no contact with other candidates. The centre must appoint a member of staff from the centre to supervise the candidate(s) at all times while they are on the premises.

7. All apparatus should be checked before the examination, and there should be an adequate supply of spare apparatus in case of breakages. The Apparatus and Materials List should be regarded as a minimum and there is no objection to candidates being supplied with more than the minimum amount of apparatus and materials.

8. **Candidates may not use text books and laboratory notes for reference during the examination, and must be informed of this beforehand.**

9. Clear instructions must be given by the Supervisor to all candidates at the beginning of the examination concerning appropriate safety procedures and precautions. Supervisors are also advised to remind candidates that all substances in the examination must be treated with caution. **Only those tests specified in the question paper should be attempted. Candidates must not attempt any additional confirmatory tests**. Anything spilled on the skin should be washed off immediately with plenty of water. The use of appropriate eye protection is essential.

10. Supervisors are reminded that they may not assist candidates during the examination. However, if, in the opinion of the Supervisor, a candidate is about to do something which may endanger themselves or others, the Supervisor should intervene. A full written report must be sent to CCEA at once.

11. Upon request, a candidate may be given additional quantities of materials (answer paper, reagents and unknowns) without penalty. No notification needs to be sent to CCEA.

12. The examination room must be cleared of candidates immediately after the examination.

13. No materials will be supplied by CCEA.

14. All JCQ procedures for conducting examinations should be followed for this practical examination including displaying JCQ posters with examination information in the laboratory and removal of mobile phones. Posters should be available from your Examinations Officer.

Northern Ireland Council for the Curriculum, Examinations and Assessment

General Certificate of Education

Advanced

Chemistry

Practical Booklet A

[ACH31]

Thursday 8 May 2025

Centre Number
71

Candidate Number

This report must be completed by the Supervisor during the examination. The complete report should include all candidates taking this Practical Examination. This Supervisor's Report should be copied and attached to **Each Advice Note** bundle and returned to CCEA in the normal way.

Comments:

Supervisor's Signature . . . . . Date . . . . . .

Rewarding Learning

ADVANCED
General Certificate of Education
2025

Centre Number

Candidate Number

Chemistry

Assessment Unit A2 3
assessing
Further Practical Chemistry
Practical Booklet A

ACH31

[ACH31]

THURSDAY 8 MAY, MORNING

TEACHER'S COPY

For use with the

Confidential Instructions to the Supervisor of the Practical Examination

Please Note: This Teacher's Copy only shows the minimum information required to test the practical work in advance of the exam sitting. As information has been removed, the question numbering may not be consistent.

14557.04

BLANK PAGE

DO NOT WRITE ON THIS PAGE

1 You are provided with an organic compound labelled **P**.

All volumes of 5 cm^3 or less in this question may be measured approximately using a graduated disposable pipette.

Carry out the following tests.

Test
1. Place the piece of universal indicator paper on a white tile. Place one drop of **P** on the universal indicator paper.
2. Place 5 cm^3 of **P** into a boiling tube. Add the piece of magnesium ribbon.
3. Place 5 cm^3 of **P** into a boiling tube. In a fume cupboard, add 2 cm^3 of bromine water to the boiling tube. Return to your workstation, stopper the boiling tube and shake it vigorously. Allow the contents to settle.
4. Place 5 cm^3 of **P** into a boiling tube. Place a thermometer in the boiling tube Add one spatula measure of sodium carbonate. Stir with the thermometer.

2 You are provided with a solid labelled **G**.

All volumes of 5 cm^3 or less in this question may be measured approximately using a graduated disposable pipette.

(a) Place two spatula measures of solid **G** in a boiling tube. Heat gently for two minutes.

(b) **(i)** Add approximately 40 cm^3 of deionised water to a 100 cm^3 beaker. Add one spatula measure of solid **G** to the beaker and stir using a glass rod.

Keep the contents of the beaker for (b)(ii).

(ii) Add 5 cm^3 of sodium hydroxide solution to the beaker from **(b)(i)**. Place the beaker on a white tile. Add 1 cm^3 of potassium manganate(VII) solution to the beaker.

(c) Dissolve one spatula measure of solid **G** in approximately 20 cm^3 of deionised water in a 100 cm^3 beaker. Add 5 cm^3 of this solution into a boiling tube. Add 5 cm^3 of sodium hydroxide solution. Add 2 cm^3 of copper(II) sulfate solution dropwise. Gently shake the boiling tube.

Place the boiling tube into a beaker of freshly boiled water and leave for three minutes.

In a fume cupboard, add 3 cm^3 of concentrated hydrochloric acid to the boiling tube and shake **gently**. Leave your boiling tube in the fume cupboard.

3 You are provided with a solid labelled **X**.

All volumes of 5 cm^3 or less in this question may be measured approximately using a graduated disposable pipette.

(a) Using a 100 cm^3 beaker, dissolve all the sample of solid **X** in approximately 50 cm^3 of deionised water.

Keep this solution of X for parts (b) to (e).

(b) Add 2 cm^3 of the solution of **X** to a test tube. Add 1 cm^3 of sodium hydroxide solution dropwise and then add a further 2 cm^3 of sodium hydroxide solution.

(c) Add 2 cm^3 of the solution of **X** to a test tube. Add 5 drops of potassium thiocyanate solution dropwise to the test tube. Shake gently.

(d) Add 2 cm^3 of the solution of **X** to a test tube. Add 2 cm^3 of dilute nitric acid followed by 2 cm^3 of silver nitrate solution. Shake gently.

(e) Add 2 cm^3 of the solution of **X** to a test tube. Add one spatula measure of sodium carbonate to the test tube.

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
Total Marks	

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.