

New
Specification

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Centre Number

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Candidate Number

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Chemistry

Assessment Unit AS 3

assessing

Module 3: Basic
Practical Chemistry

Practical Booklet A

[SCH31]

SCH31

WEDNESDAY 3 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 only. **Do not write with a gel pen.**

Answer **all three** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 25.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A Periodic Table of Elements (including some data) is provided.

You may not have access to notes, textbooks and other material to assist you.

Safety glasses should be worn at all times and care should be taken during this practical examination.



1 You are provided with four solutions labelled **A**, **B**, **C** and **D**.

(a) Describe the appearance of the solutions.

_____ [1]

(b) Give observations obtained when the procedures listed below are performed.

(i) Mix 2 cm^3 of **A** with 2 cm^3 of **B** in a test tube.

_____ [1]

(ii) Mix 2 cm^3 of **A** with 2 cm^3 of **C** in a test tube.

_____ [2]

(iii) Mix 2 cm^3 of **A** with 2 cm^3 of **D** in a test tube.

_____ [1]

(iv) Mix 2 cm^3 of **B** with 2 cm^3 of **C** in a test tube.

_____ [2]



(v) Mix 2 cm³ of **B** with 2 cm³ of **D** in a test tube.

[1]

(vi) Mix 2 cm³ of **C** with 2 cm³ of **D** in a test tube.

[2]

[Turn over

10924



08SCH3103

- 2 (a) You are required to react hydrochloric acid of unknown concentration with standard 2.0 mol dm^{-3} sodium hydroxide solution.

You are provided with:

hydrochloric acid of unknown concentration
 2.0 mol dm^{-3} sodium hydroxide solution
a thermometer

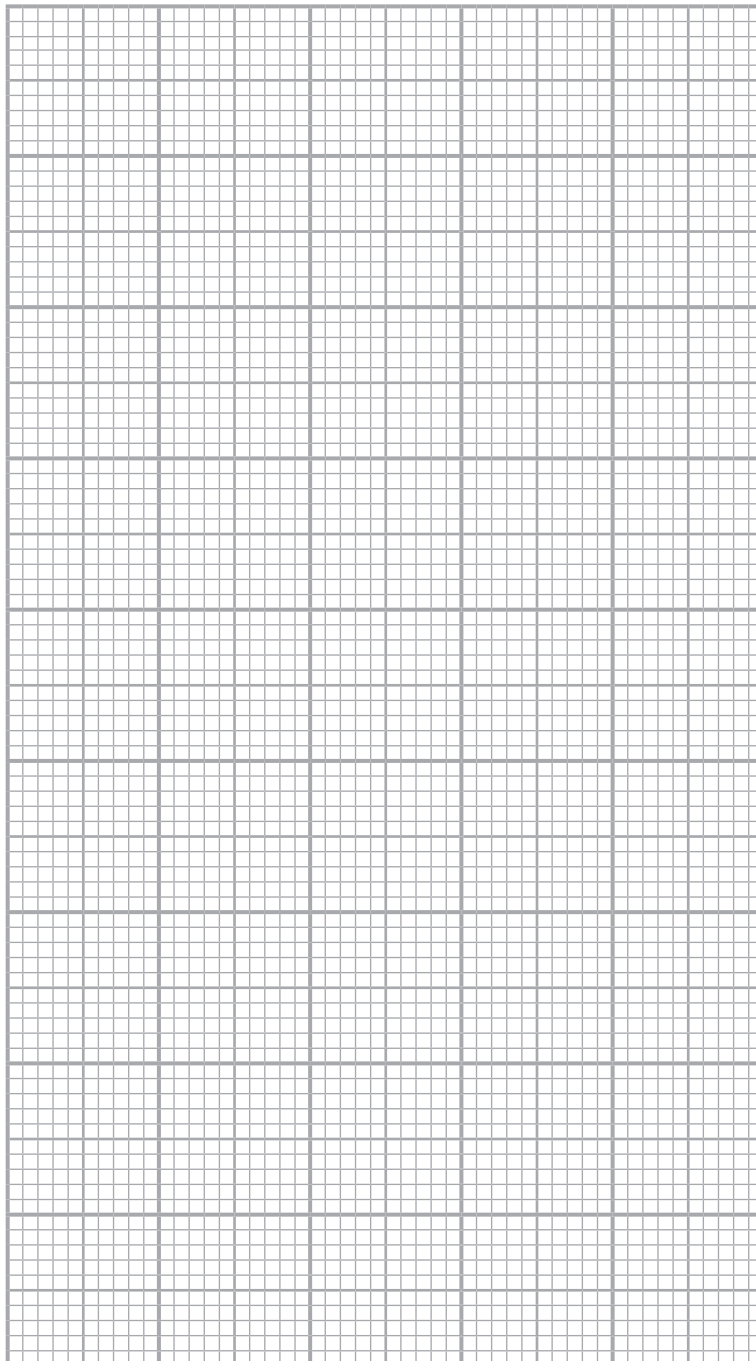
- Rinse out a burette with the hydrochloric acid.
- Fill the burette with the hydrochloric acid.
- Rinse out a pipette with the sodium hydroxide solution.
- Using the pipette and a pipette filler, place 25.0 cm^3 of the sodium hydroxide solution in a polystyrene cup in a beaker.
- Measure and record the temperature of the sodium hydroxide solution.
- Add 5.0 cm^3 of hydrochloric acid from the burette to the sodium hydroxide solution, stir and record the temperature in a suitable table.
- Continue adding 5.0 cm^3 portions and recording the temperature, until 40.0 cm^3 of hydrochloric acid solution has been added.
- Repeat the complete experiment to obtain a mean temperature.
- Present your results in a suitable table in the space below.

[4]



(b) (i) Label the axes on the graph, including the units. [1]

(ii) Plot a graph of mean temperature against volume of hydrochloric acid added. [2]



[Turn over



3 You are provided with three unknown liquids labelled **E**, **F** and **G**. Without using any other reagents, give observations for each of the following procedures.

(a) Describe the smell of each of the liquids.

(i) **E** _____
_____ [1]

(ii) **F** _____
_____ [1]

(iii) **G** _____
_____ [1]

(b) (i) Mix 2 cm^3 of **E** with 2 cm^3 of **F** in a test tube.

(ii) Mix 2 cm^3 of **E** with 2 cm^3 of **G** in a test tube.

(iii) Mix 2 cm^3 of **F** with 2 cm^3 of **G** in a test tube.

_____ [3]



(c) Place 2 drops of **F** and **G** on different watch glasses and ignite using a burning splint.

(i) **F** _____ [1]

(ii) **G** _____ [1]

THIS IS THE END OF THE QUESTION PAPER



DO NOT WRITE ON THIS PAGE

Question Number	Marks	
	Examiner Mark	Remark
1		
2		
3		
Total Marks		

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08SCH3108



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 dm³

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	Compound
0.5–2.0	–CH	Saturated alkanes
0.5–5.5	–OH	Alcohols
1.0–3.0	–NH	Amines
2.0–3.0	–CO–CH	Ketones
	–N–CH	Amines
	C ₆ H ₅ –CH	Arene (aliphatic on ring)
2.0–4.0	X–CH	X = Cl or Br (3.0–4.0) X = I (2.0–3.0)
4.5–6.0	–C=CH	Alkenes
5.5–8.5	RCONH	Amides
6.0–8.0	–C ₆ H ₅	Arenes (on ring)
9.0–10.0	–CHO	Aldehydes
10.0–12.0	–COOH	Carboxylic acids

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

New
Specification

GCE

CHEMISTRY DATA SHEET GCE A/AS EXAMINATIONS CHEMISTRY

Including the Periodic Table of the Elements

For the use of candidates taking
Advanced Subsidiary and Advanced Level
Chemistry 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.**

For first teaching from September 2016
For first award of AS Level in Summer 2017
For first award of A Level in Summer 2018
Subject Code: 1110

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						

* 58–71 Lanthanum series

† 90–103 Actinium series

a	x
b	

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

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



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WEDNESDAY 3 MAY, MORNING

APPARATUS AND MATERIALS LIST

Advice for centres

- All chemicals used should be at least laboratory reagent specification and labelled with appropriate safety symbols, e.g. irritant.
- 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. Up to date information can be obtained at www.cleapss.org.uk

Practical Examination

Each candidate must be supplied with safety goggles or glasses.

Please note no other reagents or means of identifying solutions should be provided to students other than those provided in this list. Items such as pH paper are not permitted.

Each candidate must be supplied with:

- 15 cm³ of 0.1 mol dm⁻³ potassium carbonate solution labelled **A**
- 15 cm³ of 2 mol dm⁻³ hydrochloric acid labelled **B**
- 15 cm³ of 0.1 mol dm⁻³ silver nitrate solution labelled **C**, this should be stored in a dark bottle and dispensed as close to the examination as possible
- 15 cm³ of 0.1 mol dm⁻³ potassium iodide solution labelled **D**, this should be prepared as close to the examination as possible, not more than one day before
- 6 test tubes
- Test tube rack
- Test tube holder
- At least 6 dropping pipettes
- 10 cm³ measuring cylinder
- 250 cm³ beaker
- Two 100 cm³ beakers
- Thermometer graduated in 1°C intervals
- 100 cm³ of 2.0 mol dm⁻³ sodium hydroxide solution, labelled **sodium hydroxide solution 2.0 mol dm⁻³** and **corrosive**
- 100 cm³ of 2.0 mol dm⁻³ hydrochloric acid, labelled **hydrochloric acid** and **corrosive**
- One 50 cm³ burette of at least class B quality
- A funnel for filling the burette
- A retort stand and clamp
- One beaker for waste solution
- Three polystyrene cups
- One 25 cm³ pipette of at least class B quality
- A wash bottle containing deionised water

- Safety pipette filler
- 10 cm³ of deionised water labelled **E**
- 10 cm³ ethanol (industrial alcohol) labelled **F**
- 10 cm³ cyclohexane labelled **G** in a sealed container
- Beaker placed in fume cupboard labelled **waste residues containing G**
- Three watch glasses
- Three wooden splints
- Bunsen burner

Supervisor should direct candidates to place residues containing G into a beaker in the fume cupboard immediately after use