



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2025

Centre Number

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Candidate Number

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Chemistry

Assessment Unit AS 3

assessing

Module 3: Practical Examination

Practical Booklet B (Theory)



[SCH32]

SCH32

THURSDAY 29 MAY, AFTERNOON

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 questions in black ink and use a dark HB pencil for drawings and graphs.

Do not write with a gel pen.

Answer all **five** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 55.

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.

14554



12SCH3201

1 A sample of hydrated manganese(II) chloride ($\text{MnCl}_2 \cdot x\text{H}_2\text{O}$) was heated to constant mass in an evaporating basin. The results were used to determine the formula of the hydrated manganese(II) chloride.

(a) Draw a labelled diagram of the assembled apparatus used to carry out this experiment.

[3]

(b) (i) State two masses which should be recorded before heating the sample.

1. _____

2. _____

_____ [2]

(ii) Describe how the sample is heated to constant mass.

_____ [2]



- (c) A sample of 4.00 g of hydrated manganese(II) chloride ($\text{MnCl}_2 \cdot x\text{H}_2\text{O}$) was heated to a constant mass of 2.55 g.
Determine the formula of the hydrated manganese(II) chloride.

Formula _____ [3]

- (d) Describe how a sample of solid hydrated manganese(II) chloride could be tested to fully confirm the presence of chloride ions.

[4]

[Turn over



- 2 (a) The polarity of some liquids was investigated by observing the deflection of a stream of each liquid from a burette using a charged rod.

One result from the experiment is shown in the table below.

Liquid	Deflection	Polar/Non-polar
cyclohexane	No	
water		
tetrachloromethane		

- (i) Complete the table. [3]

- (ii) Suggest a suitable material for the charged rod. [1]

- (b) The experiment was repeated using ethanol and the result of the experiment proved that ethanol is a polar liquid.

Draw the structural formula of ethanol, showing all bonds. Identify the **most** polar bond in the ethanol molecule using partial charges.

[2]





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(Questions continue overleaf)

14554

[Turn over



12SCH3205

3 (a) Chloroalkanes can be prepared by the reaction of phosphorus pentachloride with an alcohol.

(i) Write an equation for the reaction between butan-2-ol and phosphorus pentachloride.

_____ [1]

(ii) State one observation which indicates the production of hydrogen chloride gas in the reaction in (a)(i).

_____ [1]

(iii) Describe the test for hydrogen chloride gas and state the result for a positive test.

_____ [2]



(b) 1-chlorobutane reacts with ammonia. State two conditions for this reaction.

1. _____

2. _____ [2]

(c) 1-chlorobutane can be converted into butan-1-ol. Butan-1-ol reacts with acidified potassium dichromate(VI) solution producing two possible organic products depending on the method of preparation.

(i) Draw the skeletal formula of butan-1-ol.

[1]

(ii) Name the two possible organic products of the reaction between butan-1-ol and acidified potassium dichromate(VI) solution. State the method used to prepare each organic product.

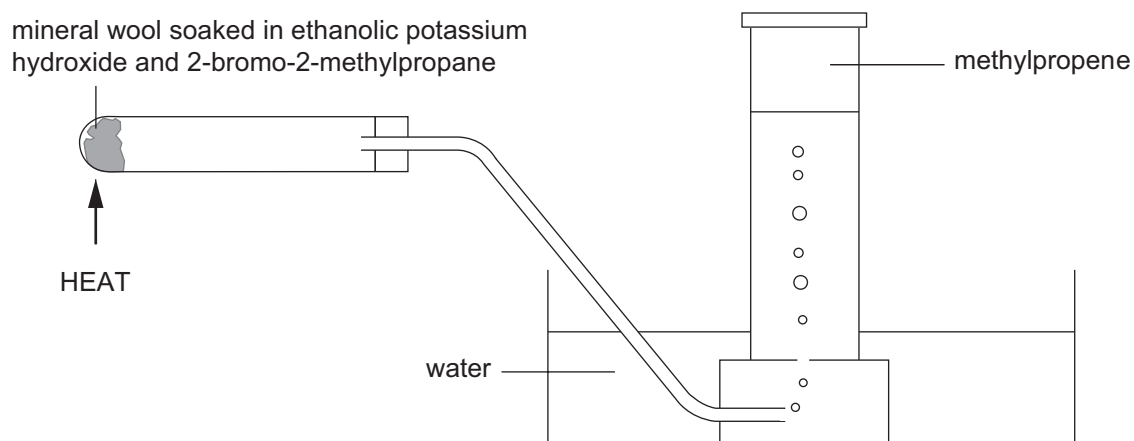
Name of product	Method of preparation

[4]

[Turn over



- 4 In an experiment to prepare methylpropene gas, some mineral wool was soaked in 2-bromo-2-methylpropane (density 1.22 g cm^{-3}) and ethanolic potassium hydroxide.



- (a) (i) Suggest the purpose of the mineral wool.

_____ [1]

- (ii) Why can methylpropene be collected over water?

_____ [1]

- (iii) Write an equation for the reaction of 2-bromo-2-methylpropane with ethanolic potassium hydroxide forming methylpropene.

_____ [1]



(b) Calculate the theoretical volume, in cm^3 , of methylpropene gas formed at 293 K and 1 atm, when 1.08 cm^3 of 2-bromo-2-methylpropane reacts with excess ethanolic potassium hydroxide. Give your answer to 3 significant figures.

Answer _____ cm^3 [3]

(c) If aqueous potassium hydroxide is used instead of ethanolic potassium hydroxide in the reaction with 2-bromo-2-methylpropane, the organic product is 2-methylpropan-2-ol.

(i) Describe how you would experimentally show that 2-methylpropan-2-ol is a tertiary alcohol.

_____ [1]

(ii) Write the equation for the reaction of 2-methylpropan-2-ol with sodium.

_____ [2]

(iii) State two observations for the reaction in (c)(ii).

1. _____
2. _____ [2]

[Turn over



- 5 (a) Complete the table below to give the colour of solid iodine and solid potassium iodide.

Substance	Colour
solid iodine	
solid potassium iodide	

[2]

- (b) A spatula measure of solid iodine is added to deionised water. State an observation which would be made.

_____ [1]

- (c) Starch solution is added to the resulting mixture from (b). State an observation which would be made.

_____ [1]

- (d) Describe how you would carry out a flame test on solid potassium iodide and state the result.

_____ [4]



- (e) 10 cm³ of 0.15 M potassium iodide solution were added to 10 cm³ of 0.10 M lead(II) nitrate solution. A precipitate of lead(II) iodide is formed. The equation for the reaction is:



- (i) Write an ionic equation for this reaction.

_____ [1]

- (ii) Calculate the mass of lead(II) iodide obtained. Give your answer, in mg, to 2 significant figures.

Answer _____ mg [4]

THIS IS THE END OF THE QUESTION PAPER



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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	

Total Marks	
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Examiner Number

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SCH32/4
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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} Js

Specific Heat Capacity of water = $4.2 \text{ J g}^{-1} \text{ K}^{-1}$

Speed of Light = $3 \times 10^8 \text{ ms}^{-1}$



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	–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.

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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



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

