



Rewarding Learning

**ADVANCED**  
General Certificate of Education  
2015

Centre Number

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Candidate Number

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# Chemistry

Assessment Unit A2 3

*assessing*

Module 3: Practical Examination

**Practical Booklet B**



**[AC234]**

**MONDAY 11 MAY, MORNING**

## TIME

1 hour 15 minutes, plus your additional time allowance.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Answer **all three** questions.

Write your answers in the spaces provided.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 50.

Question 1 is a practical exercise worth 17 marks.

Question 2 is a practical exercise worth 13 marks.

Question 3 is a planning exercise worth 20 marks.

Quality of written communication will be assessed in **Question 3**.

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.**

For Examiner's use only		
Question Number	Examiner Mark	Remark
1		
2		
3		
<b>Total Marks</b>		





## 2 Deductions exercise

(a) (i) Based on the following observations, make deductions for salt **A**.

Test	Observations	Deductions
1 Dissolve <b>A</b> in 20 cm <sup>3</sup> of water.	<i>Orange solution.</i>	
2 Add a few drops of concentrated ammonia solution to 2 cm <sup>3</sup> of the solution of <b>A</b> in a test tube.	<i>Rust precipitate forms immediately.</i>	[1]
3 Add 1 cm <sup>3</sup> of barium chloride solution to 2 cm <sup>3</sup> of the solution of <b>A</b> in a test tube. Allow the mixture to settle.	<i>White precipitate.</i>	[1]

(ii) Write down the formula of salt **A**.

\_\_\_\_\_ [1]

Examiner Mark	Remark

- (b) (i) Interpret the following data and identify the structural formula of the organic compound **B**, which has the *empirical* formula  $C_2H_4O$ .

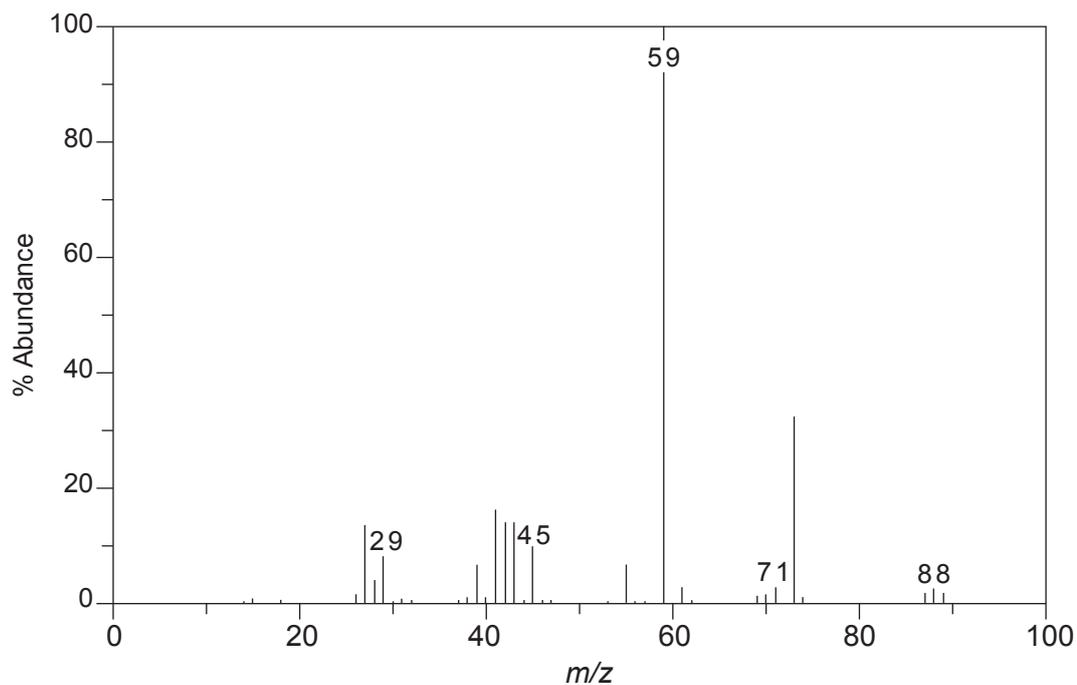
Test	Observations	Deductions
1 Describe the appearance of <b>B</b> .	<i>Colourless liquid.</i> <i>Pungent smell.</i>	
2 Add 2 cm <sup>3</sup> of deionised water to 2 cm <sup>3</sup> of <b>B</b> in a test tube.	<i>One layer forms.</i>	[1]
3 Add 10 drops of <b>B</b> to 2 cm <sup>3</sup> of acidified potassium dichromate solution in a test tube. Place the test tube in a hot water bath.	<i>Solution stays orange.</i>	[1]
4 Place 2 cm <sup>3</sup> of <b>B</b> into a test tube. In a fume cupboard, <b>cautiously</b> add a very small spatula measure of phosphorus(V) chloride to the test tube.	<i>Fizzing.</i> <i>Solid reacts.</i> <i>White fumes.</i>	[1]
5 Place 5 cm <sup>3</sup> of <b>B</b> in a boiling tube. Add 5 cm <sup>3</sup> of ethanol, and then 1 cm <sup>3</sup> of concentrated sulfuric acid. Heat the boiling tube in a water bath. <b>Cautiously</b> smell the contents of the boiling tube.	<i>Sweet smell.</i>	[1]
6 Add a spatula measure of sodium carbonate to 2 cm <sup>3</sup> of <b>B</b> in a test tube.	<i>Fizzing.</i> <i>Solid dissolves.</i>	[2]

- (ii) To what homologous series does **B** belong?

\_\_\_\_\_ [1]

Examiner Mark	Remark

The mass spectrum of **B** is shown below:



(iii) Draw a structure for **B** showing all the bonds present.

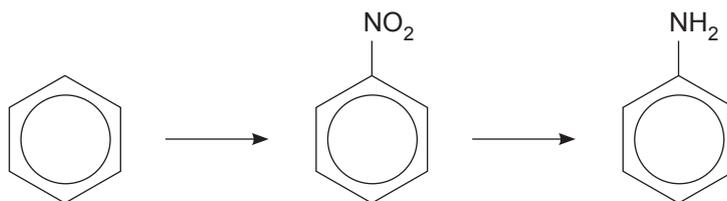
\_\_\_\_\_ [2]

(iv) Identify the species responsible for the base peak in the spectrum above.

\_\_\_\_\_ [1]

Examiner Mark	Remark

- 3 Benzene is used to prepare nitrobenzene (b pt. 211 °C), which is then used to make phenylamine (b pt. 184 °C).



Nitrobenzene is prepared from benzene as follows:

*Concentrated nitric acid, concentrated sulfuric acid and benzene (density  $0.88\text{ g cm}^{-3}$ ) are mixed slowly in a round-bottomed flask, ensuring the temperature does not rise above  $60^\circ\text{C}$ .*

*A reflux condenser is attached and the mixture is heated on a water bath for thirty minutes. The mixture is poured into  $100\text{ cm}^3$  of water and the acidic impurities are removed.*

*The organic layer is run off, dried with anhydrous sodium sulfate and placed into a round-bottomed flask.*

*The apparatus is rearranged for distillation and the contents of the round-bottomed flask are distilled using an air condenser (a condenser where no water flows through the outside jacket), collecting the fraction boiling between  $207\text{--}211^\circ\text{C}$ .*

- (a) Suggest why ammonia will **not** react with benzene.

\_\_\_\_\_ [1]

- (b) (i) Define the term **reflux**.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (ii) Draw a labelled diagram of the apparatus used for this distillation.

[4]

Examiner Mark	Remark

- (c) Calculate the volume of benzene required to synthesise 7 g of nitrobenzene assuming a 90% yield.

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[4]

- (d) Outline, giving practical details, how acidic impurities can be removed from the crude liquid prior to distillation.

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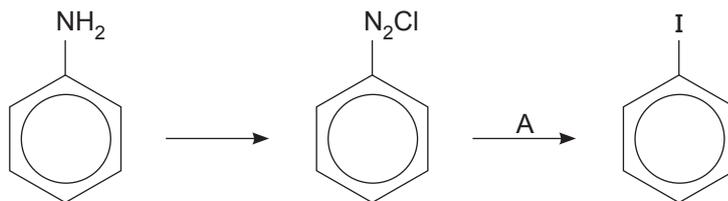
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[4]

Quality of written communication [2]

Examiner Mark	Remark

- (e) Phenylamine can be converted to iodobenzene, according to the following flow scheme:



- (i) Draw the structure of the benzenediazonium ion.

[2]

- (ii) Identify the reagents and conditions for stage A.

\_\_\_\_\_

\_\_\_\_\_ [2]

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**THIS IS THE END OF THE QUESTION PAPER**

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Examiner Mark	Remark





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