

Advanced GCE

CHEMISTRY A

Unit F326: Practical Skills in Chemistry 2:
Qualitative Task

Specimen Task

For use from September 2008 to June 2009.

F326 (1)

All items required by teachers and candidates for this task are included in this pack.

INFORMATION FOR CANDIDATES

- Qualitative Task: Hydrolysis of an ester.

INFORMATION FOR TEACHERS

- Mark scheme.
- Instructions for Teachers and Technicians.

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CHEMISTRY A

Unit F326: Practical Skills in Chemistry 2:
Qualitative Task

F326 (1)

Specimen Task

Candidates answer on this task sheet.

INSTRUCTIONS TO CANDIDATES

- Answer **all** parts of the task.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each part of the task.
- The total number of marks for this task is **10**.

ADVICE TO CANDIDATES

- Read each part carefully and make sure you know what you have to do before starting your answer.

FOR TEACHER'S USE		
Part	Max.	Mark
A1	5	
B1	5	
TOTAL	10	

Part	Max.	Mark
A1	5	
B1	5	
TOTAL	10	

This task consists of 4 printed pages.

Hydrolysis of an ester

Introduction

In this Practical Task, you will hydrolyse the ester methyl benzoate to prepare, and purify, benzoic acid, C_6H_5COOH . You will then leave your product to dry until your next lesson.

You will then measure the melting point of the benzoic acid, C_6H_5COOH .

Finally, you will carry out some reactions on the benzoic acid, C_6H_5COOH .

Five chemicals are supplied.

• Methyl benzoate, $C_6H_5COOCH_3$.	Harmful	
• 2 mol dm^{-3} sodium hydroxide, $NaOH(aq)$.	Corrosive	
• 2 mol dm^{-3} hydrochloric acid, $HCl(aq)$.	Irritant	
• Ethanol	Flammable	
• Methyl orange		

Part 1 Preparation of benzoic acid

- 1 Using a dropping pipette and small measuring cylinder, measure out 2.0 cm^3 of methyl benzoate.

Add the methyl benzoate to the pear-shaped or round-bottomed flask supplied.

Using a measuring cylinder, add 10 cm^3 of the 2.0 mol dm^{-3} $NaOH(aq)$, about 10 cm^3 of ethanol and a few anti-bumping granules.

- 2 Fit the water-cooled condenser and heat the flask gently for about 5 minutes.

Then boil gently under reflux for a further 15 minutes.

A1 [1]

Record any changes in the appearance of the contents of the flask that suggest a reaction is taking place.

.....

.....

..... B1 [1]

- 3 Cool the contents of the flask under cold tap water.

Remove the condenser and carefully pour the solution from the anti-bumping granules into a beaker.

- 4 Add ten drops of methyl orange indicator and acidify with 2.0 mol dm^{-3} $HCl(aq)$. You should need no more than 20 cm^3 of $HCl(aq)$. Solid benzoic acid, C_6H_5COOH , crystallises.

5 Filter the C_6H_5COOH under reduced pressure.

A1 [1]

6 Purify the C_6H_5COOH by recrystallisation from the **minimum** amount of boiling water.

A1 [1]

7 Filter the purified C_6H_5COOH under reduced pressure and partially dry the solid using the reduced pressure.

8 Label a dry Petri (or similar) dish with your name.

Weigh the Petri dish and record the mass in the space below.

Using a spatula, transfer your partially dry C_6H_5COOH onto the Petri dish and **leave it to dry until your next lesson**.

Part 2 Determination of melting point

1 Weigh the Petri dish with the dry C_6H_5COOH and record the mass in the space below.

Record the mass of C_6H_5COOH that you have prepared.

B1 [1]

2 Determine the melting point of the C_6H_5COOH (which is greater than $100\text{ }^\circ\text{C}$).

Record the melting point in the space below.

B1 [1]

Safety

Identify the most significant hazard in your procedure and any precautions taken to minimise the hazard.

.....
.....
.....A1 [1]

Weighings and melting point

[Turn over]

Part 3 Test-tube tests

- 1 Add about a 1 cm depth of water into a boiling tube.

Add a spatula measure of your benzoic acid product to the boiling tube.

Add an equal volume of 2 mol dm^{-3} sodium hydroxide, NaOH(aq), to the boiling tube.

Gently shake the boiling tube.

Record, and explain, the observation made, if any.

.....
.....
.....B1 [1]

- 2 Add about a 2 cm depth of 2 mol dm^{-3} hydrochloric acid.

Gently shake the boiling tube.

Record, and explain, the observation made, if any.

.....
.....
.....B1 [1]

- 3 Submit your product for inspection on the labelled Petri dish.

A1 [1]

A1: 5; B1: 5 [Total: 10]

END OF TASK

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The maximum mark for this task is **10**.

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Quality A1	Max Mark
carries out reflux competently filters solid under reduced pressure recrystallises to obtain white solid obtains a white dry solid with melting point in range 118–126 °C states that NaOH is corrosive, and gives a precaution	[1] [1] [1] [1] [1]
Quality B1	
observe, during reflux, two (immiscible) layers forming one (miscible) layer records correctly melting point, with units records mass results correctly, with units records, after addition of NaOH(aq), that benzoic acid dissolves/disappears and explains that a sodium salt/sodium benzoate has formed records, after addition of HCl(aq), that C ₆ H ₅ COOH precipitates/white solid forms and explains that a benzoic acid has formed	[1] [1] [1] [1] [1]
Total:	[10]

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This is a Qualitative Task. There is no time limit but it is expected that it can be completed within one hour.

Candidates may attempt more than one qualitative task with the best mark from this type of task being used to make up the overall mark for Unit F326.

Preparing for the assessment

It is expected that before candidates attempt Practical Skills in Chemistry 2 (Unit F326) they will have had some general preparation in their lessons. They will be assessed on a number of qualities such as demonstration of skilful and safe practical techniques using suitable qualitative methods, the ability to make and record valid observations, and the ability to organise results suitably. It is therefore essential that they should have some advance practice in these areas so that they can maximise their attainment.

Preparing candidates

At the start of the task the candidates should be given the task sheet.

Candidates must work on the task individually under controlled conditions with the completed task being submitted to the teacher at the end of the lesson. Completed tasks should be kept under secure conditions until results are issued by OCR.

Candidates should not be given the opportunity to redraft their work, as this is likely to require an input of specific advice. If a teacher feels that a candidate has under-performed, the candidate may be given an **alternative** task. In such cases it is essential that the candidate be given detailed feedback on the completed assessment before undertaking another Qualitative Task. Candidates are permitted to take each task **once** only.

Assessing the candidate's work

The mark scheme supplied with this pack should be used to determine a candidate's mark out of a total of 10 marks. The cover sheet for the task contains a grid for ease of recording marks. To aid moderators it is preferable that teachers mark work using red ink, including any appropriate annotations to support the award of marks.

Notes to assist teachers with this task

Teachers must trial the task before candidates are given it, to ensure that the apparatus, materials, chemicals etc provided by the centre are appropriate. The teacher carrying out the trial must complete a candidate's task sheet showing the results attained, and retain this, clearly labelled, so that it can be provided to the moderator when requested.

Health and Safety

Attention is drawn to Appendix G of the specification.

Apparatus list

Students must not be told any information about these materials apart from what is given on the assessment sheets.

Materials

Each student will require the following materials, labelled by the indicated name only and the hazard-warning symbol.

name		hazard	
methyl benzoate	About 5 cm ³ of methyl benzoate, C ₆ H ₅ COOCH ₃ , in a stoppered weighing bottle.	harmful	

Apparatus

Each student will require:

- safety spectacles
- 3 × 10 cm³ measuring cylinders
- 50 cm³ or 100 cm³ Quickfit pear-shaped or round-bottomed flask
- anti-bumping granules
- water filled quick-fit condenser and tubing
- Bunsen burner
- clamp stand, with boss and clamp (for supporting the Quickfit apparatus)
- gauze
- 250 cm³ beaker
- stirring rod
- spatula

Each student will also need access to the following:

- NaOH(aq) of concentration 2 mol dm^{-3} .
Each candidate will require about 10 cm^3 .
- HCl(aq) of concentration 2 mol dm^{-3} .
Each candidate will require about 30 cm^3 .
- a dropping bottle containing ethanol.
Each candidate will require about 10 cm^3 .
- a dropping bottle containing methyl orange.
- vacuum filtration apparatus
- boiling water
- melting point apparatus
- a top pan balance weighing to 0.01 g .



Note: The quantities of chemicals required are approximate and due allowance should be made for wastage.

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