

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCE

Chemistry

Advanced

Unit 6B: Chemistry Laboratory Skills II Alternative

Monday 16 January 2012 – Afternoon

Time: 1 hour 15 minutes

Paper Reference

6CH08/01

Candidates may use a calculator.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- A Periodic Table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL the questions. Write your answers in the spaces provided.

- 1 Three compounds **A**, **B** and **C** are subjected to a series of chemical tests. Some information about these compounds is given below.
- The three compounds are isomers with molecular formula C_3H_6O .
 - **A** and **B** contain only one functional group, but **C** contains two separate functional groups.
 - None of the three compounds contains a ring of atoms.
 - In each of the three compounds the oxygen atom is bonded to only one carbon atom.
- (a) (i) **A** and **B** are tested separately with 2,4-dinitrophenylhydrazine solution and both give an orange precipitate.

When **A** and **B** are heated separately with a mixture of potassium dichromate(VI) and dilute sulfuric acid, the solution containing **B** turns from orange to green. The solution containing **A** remains orange.

Use these results and the information at the start of the question to deduce displayed formulae for **A** and **B**.

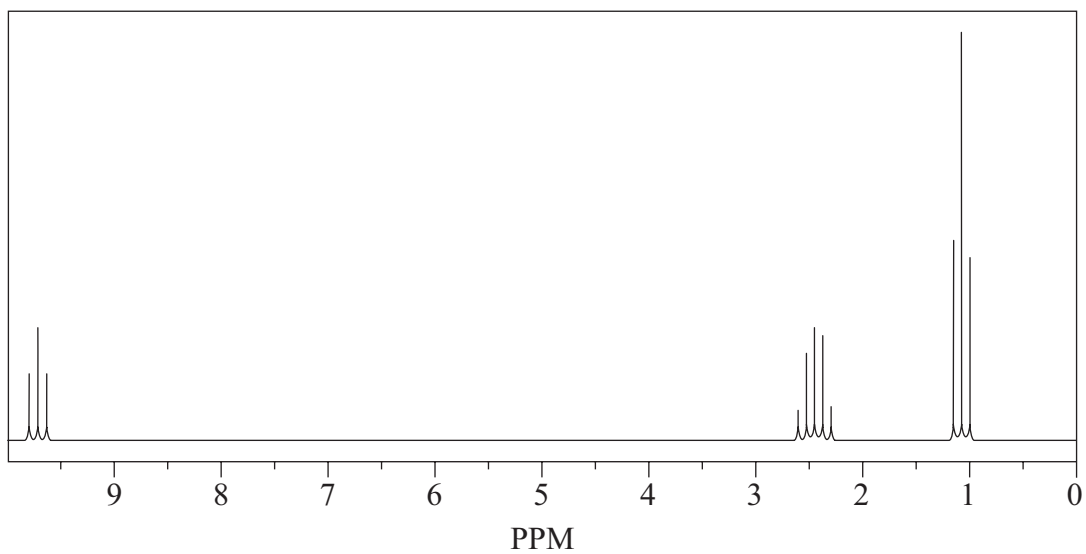
(2)

A

B



(ii)



State whether this is the nmr spectrum of **A** or **B**. Justify your answer.

Explain how the nmr spectrum of the other isomer will differ.

(2)

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(b) (i) **C** does **not** react with 2,4-dinitrophenylhydrazine.

When **C** is heated with acidified potassium dichromate(VI), the solution turns from orange to green.

When **C** is shaken with bromine water, the bromine water quickly turns colourless.

Name the **two** functional groups present in **C**.

(2)

(ii) State **two** observations you would expect to make when a small piece of sodium is added to **C**.

(2)

(iii) Draw **two** possible displayed formulae for **C** which are consistent with the above information.

(2)

(Total for Question 1 = 10 marks)



2 A green crystalline solid, **D**, dissolves in water to give a pale green solution.

(a) When dilute sodium hydroxide is added to the solution of **D**, a green precipitate, **E**, is observed.

When ammonia solution is added to the solution of **D**, the same green precipitate, **E**, forms which does **not** dissolve in excess ammonia solution.

Identify, by name or formula, substance **E**.

(1)

(b) When a solution of **D** is warmed with dilute sodium hydroxide, a gas, **F**, which turns moist red litmus paper blue, is given off.

Identify, by name or formula, the gas **F**.

(1)

(c) When a solution of barium chloride is added to a solution of **D**, a white precipitate, **G**, forms which is insoluble in dilute hydrochloric acid.

Identify, by name or formula, the precipitate **G**.

(1)

(d) Deduce the **formulae** of the **three** ions present in the salt, **D**.

(3)

(Total for Question 2 = 6 marks)



3 The equation for the reaction of iodine with propanone is



An experiment was carried out to find the order of reaction with respect to iodine.

50 cm³ of iodine solution, concentration 0.020 mol dm⁻³, was added to 25 cm³ of sulfuric acid, concentration 2.0 mol dm⁻³, in a conical flask.

25 cm³ of propanone solution, concentration 2.0 mol dm⁻³, was added to the mixture and a timer started.

A 10.0 cm³ sample was removed after one minute. Further 10.0 cm³ samples were removed every three minutes.

Immediately, each sample was added to 20 cm³ of sodium hydrogencarbonate solution (an excess). Each sample was then titrated with sodium thiosulfate solution, concentration 0.010 mol dm⁻³.

(a) (i) Show, by calculation of the number of moles, whether propanone or iodine was in excess.

(2)

(ii) What would be the most suitable piece of apparatus for removing a 10.0 cm³ sample from the mixture?

(1)

(iii) What would be the most suitable piece of apparatus for measuring 20 cm³ of the sodium hydrogencarbonate solution?

(1)



(iv) Suggest why each sample was added to sodium hydrogencarbonate solution.
Explain your answer.

(2)

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(b) (i) What colour change would you expect to see as the reaction takes place?

(2)

From to

(ii) To make the end-point of the titration easier to see, an indicator can be added.

Name the indicator and state the colour change you would expect to see.

(2)

Indicator

Colour change from to

(iii) At what stage in the titration should this indicator be added?

(1)

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(c) The following results were obtained in the experiment.

Time / min	Volume of sodium thiosulfate solution / cm ³
1	19.1
4	15.9
7	13.0
10	9.9
13	7.1
16	3.9
19	1.0

- (i) Explain why these results can be used to determine the order of the reaction directly, without calculating the corresponding concentrations of iodine in the solution.

(1)

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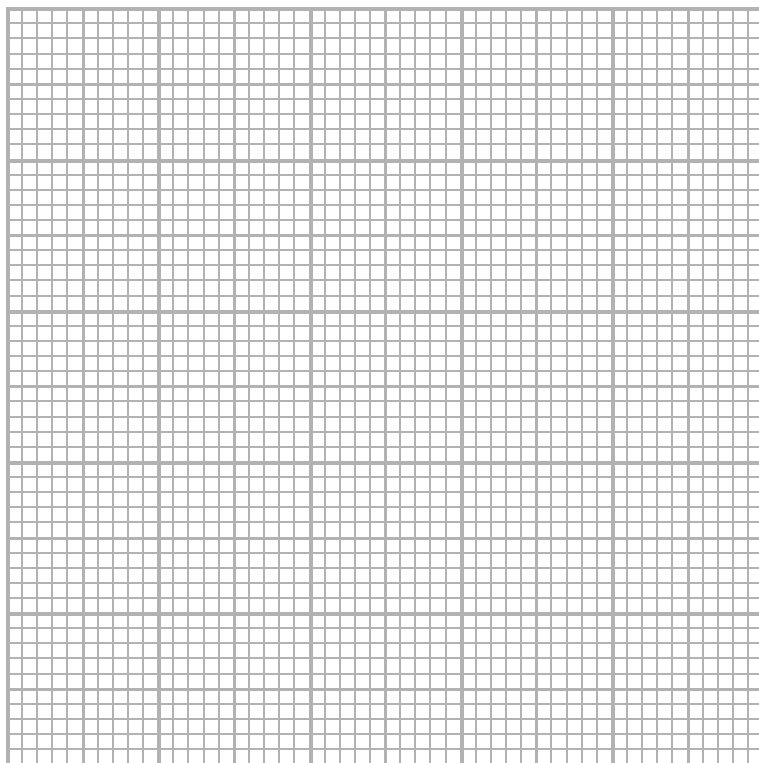
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(ii) Plot a graph of the volume of sodium thiosulfate solution on the vertical axis against time on the horizontal axis.

(2)



(iii) Use your graph to deduce the order of the reaction with respect to iodine.

Explain how you arrived at your answer.

(2)

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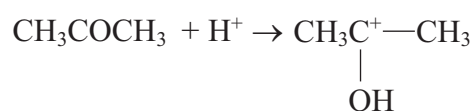
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(d) The following rate-determining step for the reaction between propanone and iodine is suggested.



Explain why your order of reaction with respect to iodine is consistent with this rate-determining step.

(1)

(Total for Question 3 = 17 marks)



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4 2-ethanoylaminobenzoic acid, $C_9H_9NO_3$, is a compound which emits flashes of light when its crystals are crushed or scraped. It is prepared under strictly supervised conditions.

The steps of the experimental procedure are as follows.

1. Place 3.5 g of 2-aminobenzoic acid, $C_7H_7NO_2$, in a dry 50 cm³ flask fitted with a reflux condenser.
 2. Add 7.0 cm³ of ethanoyl chloride (an excess) by pouring it carefully down the condenser.
 3. Heat slowly to boiling and reflux for 15 minutes.
 4. Allow to cool and then add 5 cm³ of water.
 5. Bring the solution back to boiling by heating slowly.
 6. Allow the solution to cool slowly at room temperature.
 7. Collect the crystals of 2-ethanoylaminobenzoic acid by suction filtration.
 8. Recrystallize the 2-ethanoylaminobenzoic acid from a 50% ethanoic acid/water mixture.
- (a) Explain how the process of heating under reflux works and why it is often necessary to heat under reflux, as in **step 3**.

(3)

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(d) (i) Draw a fully labelled diagram of the apparatus you would use to determine the melting temperature of the 2-ethanoylaminobenzoic acid crystals.

(2)

(ii) Give **two** aspects of the melting temperature determination that would indicate the crystals were pure.

(2)

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(e) In the equation for this reaction, the mole ratio of 2-aminobenzoic acid, $C_7H_7NO_2$, and 2-ethanoylaminobenzoic acid, $C_9H_9NO_3$, is 1:1.

In an experiment, 3.5 g of 2-aminobenzoic acid produced 2.35 g of recrystallized 2-ethanoylaminobenzoic acid.

Calculate the percentage yield of the product for this reaction.

(3)

(Total for Question 4 = 17 marks)

TOTAL FOR PAPER = 50 MARKS



