

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

Surname

Forename(s)

Candidate signature

GCSE CHEMISTRY

F

Foundation Tier Unit Chemistry C3

Wednesday 14 June 2017

Morning

Time allowed: 1 hour

Materials

For this paper you must have:

- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 6(c)(i) should be answered in continuous prose. In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



Answer **all** questions in the spaces provided.

1 This question is about elements and compounds.

1 (a) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

densities	numbers	weights
-----------	---------	---------

The elements in the modern periodic table are arranged in order of their atomic _____.

1 (a) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

electrons	neutrons	protons
-----------	----------	---------

The outer shells of atoms of elements in the same group have the same number of _____.

1 (b) **Figure 1** shows the position of five elements in the modern periodic table.

Figure 1

Na																	Cl		
										Cu							Br		
																	I		

1 (b) (i) Which **one** of the elements in **Figure 1** is a gas at room temperature?

[1 mark]



1 (b) (ii) Which **one** of the elements in **Figure 1** is a transition metal?

[1 mark]

1 (b) (iii) Complete the sentence.

[1 mark]

In the modern periodic table, bromine (Br) is in Group _____ .

1 (c) Bromine reacts with sodium iodide to produce iodine.

The word equation for the reaction is:

bromine + sodium iodide \longrightarrow iodine + sodium bromide

1 (c) (i) What type of reaction is this?

[1 mark]

Tick (✓) **one** box.

Combustion

Displacement

Neutralisation

1 (c) (ii) Use the Chemistry Data Sheet to help you answer this question.

Which halogen would react with sodium chloride solution to produce chlorine?

[1 mark]

Tick (✓) **one** box.

Bromine

Fluorine

Iodine

Question 1 continues on the next page

Turn over ►



1 (d) Silver nitrate in the presence of dilute nitric acid is used to test for iodide ions.

What colour precipitate is produced?

[1 mark]

Tick (✓) **one** box.

Cream

White

Yellow



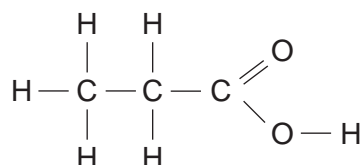
1 (e) Propanoic acid is a compound containing carbon atoms.

1 (e) (i) **Figure 2** shows the displayed structure of propanoic acid.

Draw a ring around the functional group of propanoic acid in **Figure 2**.

[1 mark]

Figure 2



1 (e) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

carbon dioxide	hydrogen	oxygen
----------------	----------	--------

Propanoic acid reacts with carbonates to produce _____ .

1 (e) (iii) Use the correct answer from the box to complete the sentence.

[1 mark]

alkalis	esters	fuels
---------	--------	-------

Propanoic acid reacts with alcohols to produce pleasant smelling compounds called _____ .

11

Turn over for the next question

Turn over ►



2 This question is about drinking water.

2 (a) Water in reservoirs is filtered and sterilised to make it suitable for drinking.

2 (a) (i) Draw **one** line from each treatment to the reason for the treatment.

[2 marks]

Treatment

Reason

Filter

To add dissolved salts

To kill microbes

Sterilise

To remove solids

To soften the water

2 (a) (ii) Which substance is used to sterilise the water?

[1 mark]

Tick (✓) **one** box.

Ammonia

Chlorine

Limewater

Sodium carbonate



2 (b) Pure water can be produced by distillation.

Why is distillation expensive?

[1 mark]

2 (c) Some water companies add fluoride to drinking water.

2 (c) (i) Give **one** benefit of adding fluoride to drinking water.

[1 mark]

2 (c) (ii) There is a lot of evidence to support the benefit of adding fluoride to drinking water.

Suggest why some people disagree with adding fluoride to drinking water.

[1 mark]

6

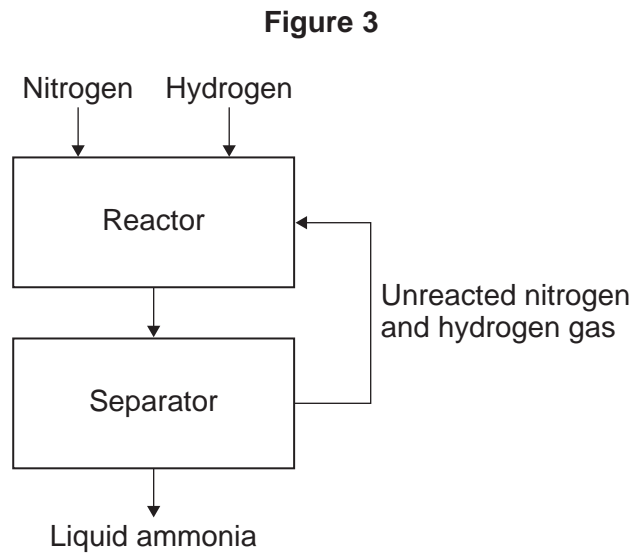
Turn over for the next question

Turn over ►



3 This question is about the Haber process.

Figure 3 shows a flow diagram of the Haber process.



3 (a) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

air	crude oil	natural gas	water
-----	-----------	-------------	-------

Nitrogen for the Haber process is obtained from _____ .



3 (a) (ii) Iron is used as a catalyst in the reactor.

How does a catalyst speed up a reaction?

[1 mark]

Tick (✓) **one** box.

Changes the pressure in the reactor

Lowers the activation energy

Makes the particles move faster

3 (a) (iii) Describe how the ammonia is separated from the other gases.

[2 marks]

3 (b) Complete the word equation for the reaction in the Haber process.

[1 mark]

nitrogen + _____ \rightleftharpoons _____

Question 3 continues on the next page

Turn over ►



- 3 (c) **Figure 4** shows how, in the Haber process, the rate of reaction changes as the temperature and pressure increase.

Figure 4

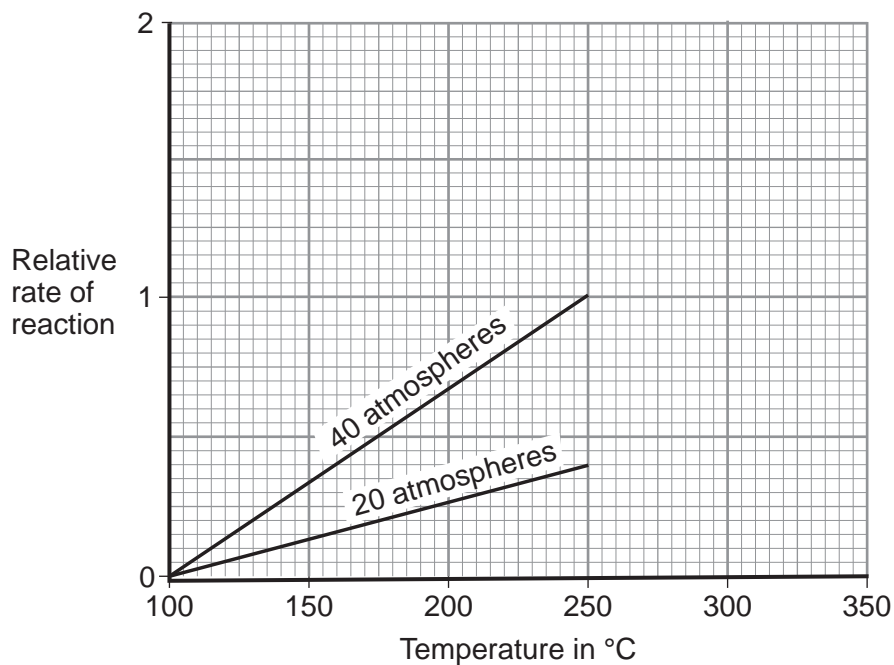


Table 1 shows the relative rate of reaction at 80 atmospheres at different temperatures.

Table 1

Temperature in °C	Relative rate of reaction
100	0.0
150	0.5
200	1.0
250	1.7
300	2.0



3 (c) (i) Plot the data in **Table 1** on the graph in **Figure 4**.

[2 marks]

3 (c) (ii) Draw a straight line of best fit for the points you have plotted.

[1 mark]

3 (c) (iii) What is the relative rate of reaction at 20 atmospheres and 300 °C?

Show your working on **Figure 4**.

[2 marks]

Relative rate of reaction = _____

3 (c) (iv) Describe how the rate of reaction changes as the pressure increases.

[1 mark]

11

Turn over for the next question

Turn over ►



There are no questions printed on this page

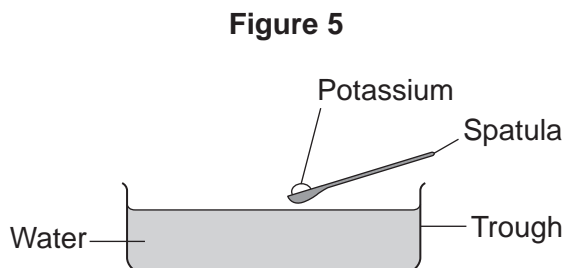
**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



4 This question is about potassium and its compounds.

4 (a) Potassium reacts with water.

Figure 5 shows potassium being added to water.



The word equation for the reaction is:



Give **two** observations that can be seen when potassium is added to water.

[2 marks]

Question 4 continues on the next page

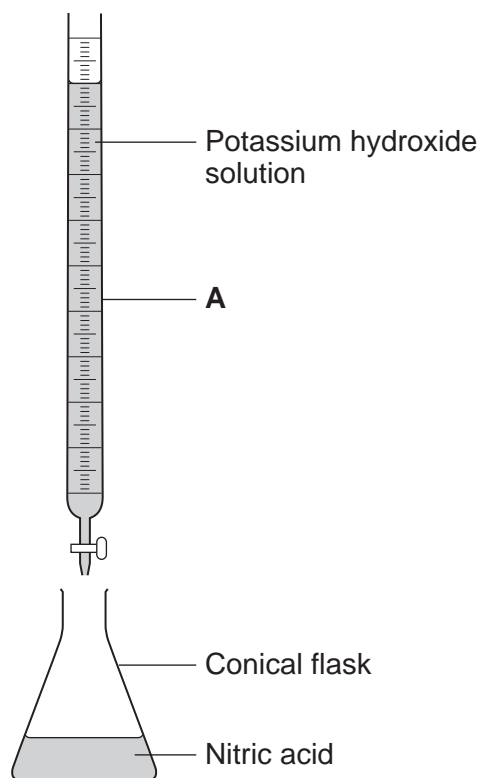
Turn over ►



4 (b) Potassium hydroxide solution is used in titrations.

A student used the apparatus in **Figure 6** to do a titration to find the concentration of some nitric acid.

Figure 6



4 (b) (i) Name the piece of apparatus labelled **A**.

[1 mark]

4 (b) (ii) What should the student add to the nitric acid before starting the titration?

[1 mark]



4 (b) (iii) Describe how the student could use the apparatus in **Figure 6** to complete the titration. **[3 marks]**

4 (b) (iv) The student did the titration four times.

Give **one** variable the student should keep the same for each titration.

[1 mark]

Question 4 continues on the next page

Turn over ►



4 (c) Table 2 shows the student's results.

Table 2

	Volume of potassium hydroxide solution used in cm ³
Titration 1	23.8
Titration 2	18.2
Titration 3	19.0
Titration 4	18.6
Mean value	

4 (c) (i) Calculate the mean volume of potassium hydroxide solution used.

Do not use any anomalous results in your calculation.

[2 marks]

Mean volume of potassium hydroxide solution used = _____ cm³



4 (c) (ii) A second student repeated the experiment and recorded the results in **Table 3**.

Table 3

	Volume of potassium hydroxide solution used in cm ³
Titration 1	24
Titration 2	18

Look at **Table 2** and **Table 3**.

Suggest **two** improvements the second student could make to obtain results that are more accurate.

[2 marks]

12

Turn over for the next question

Turn over ►



5 This question is about water.

5 (a) Rainwater is soft water.

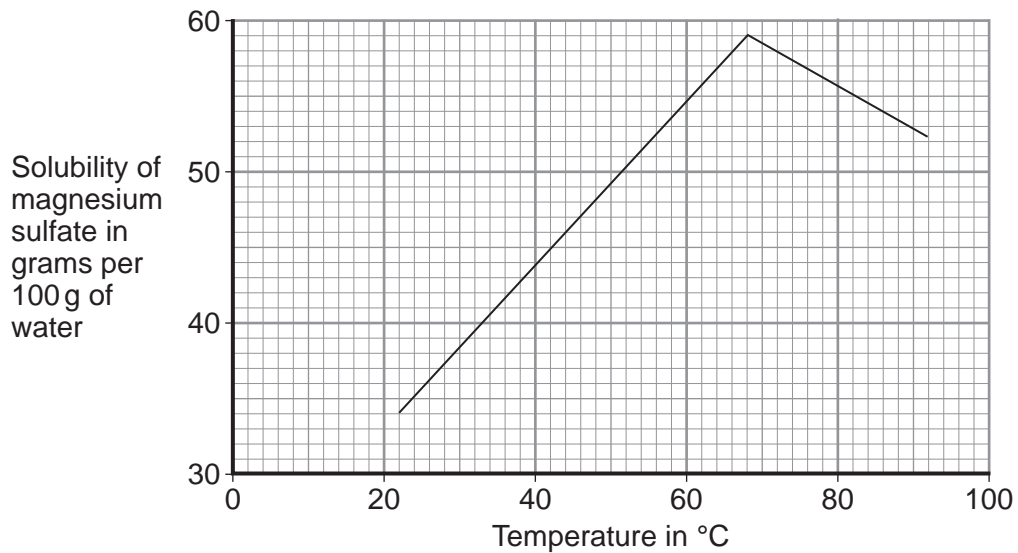
How is hard water formed from rainwater?

[2 marks]

5 (b) A sample of hard water contains magnesium sulfate.

Figure 7 shows the solubility of magnesium sulfate at different temperatures.

Figure 7



What conclusions can be made from Figure 7?

Use patterns and values from the graph in your answer.

[3 marks]



5 (c) Give **one** advantage and **one** disadvantage of hard water.

[2 marks]

Advantage _____

Disadvantage _____

5 (d) Describe and explain how hard water is softened using an ion exchange column.

[3 marks]

10

Turn over for the next question

Turn over ►



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



6 This question is about the combustion of alcohols.

6 (a) What is the structure of methanol?

[1 mark]

Tick (✓) **one** box.

CH₃OH

CH₃CH₂OH

CH₃CH₂CH₂OH

CH₃CH₂CH₂CH₂OH

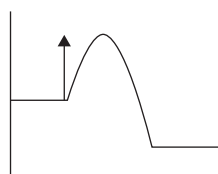
6 (b) **Figure 8** shows four energy level diagrams for the combustion of an alcohol.

Which diagram, **A**, **B**, **C**, or **D**, shows an arrow for the overall energy change?

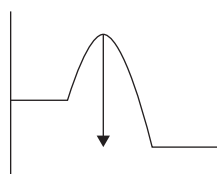
[1 mark]

Tick (✓) **one** box.

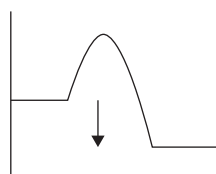
Figure 8



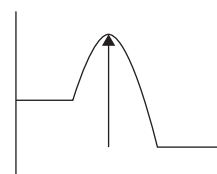
A



B



C



D

Question 6 continues on the next page

Turn over ►



Extra space

6 (c) (ii) The student calculated the energy released by the alcohols.

The calculated values were less than the values in a data book.

Explain how the apparatus in **Figure 9** could be improved to obtain more accurate results.

[2 marks]

10

END OF QUESTIONS



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Copyright information

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2017 AQA and its licensors. All rights reserved.

