

Please write clearly in block capitals.

Centre number

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Candidate number

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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	



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



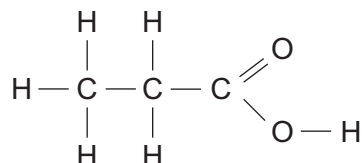
1 (e) Propanoic acid is a compound containing carbon atoms.

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

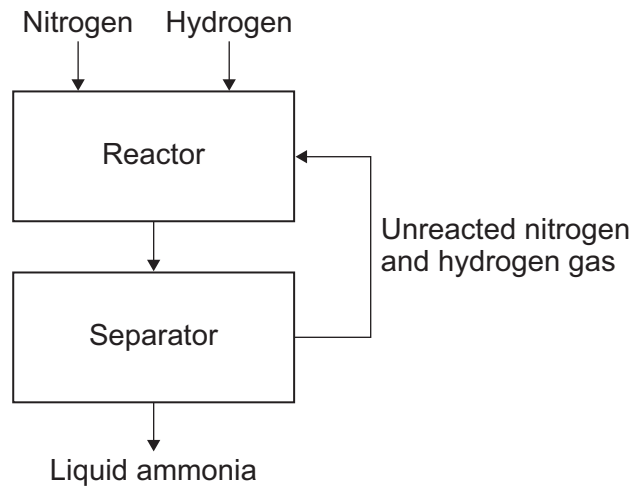
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3 This question is about the Haber process.

Figure 3 shows a flow diagram of the Haber process.

Figure 3



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

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

Figure 4

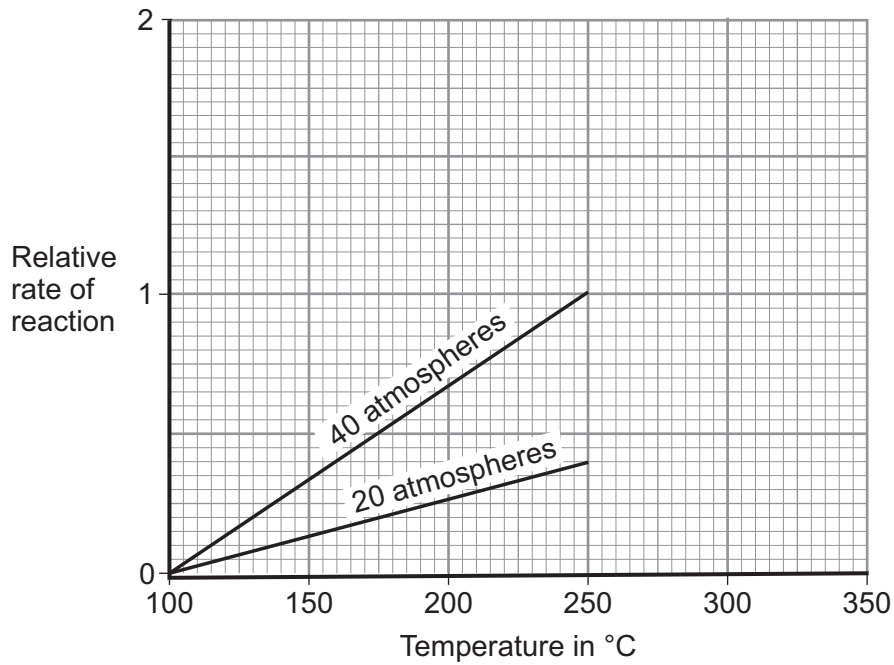


Table 1 shows the relative rate of reaction at 80 atmospheres at different temperatures.

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

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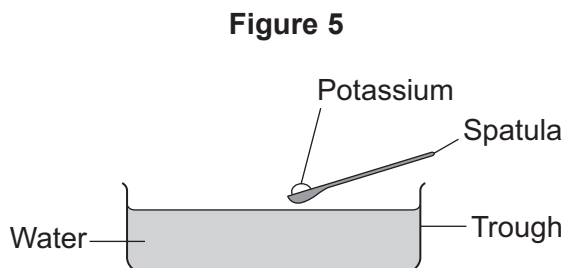
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4 This question is about potassium and its compounds.

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

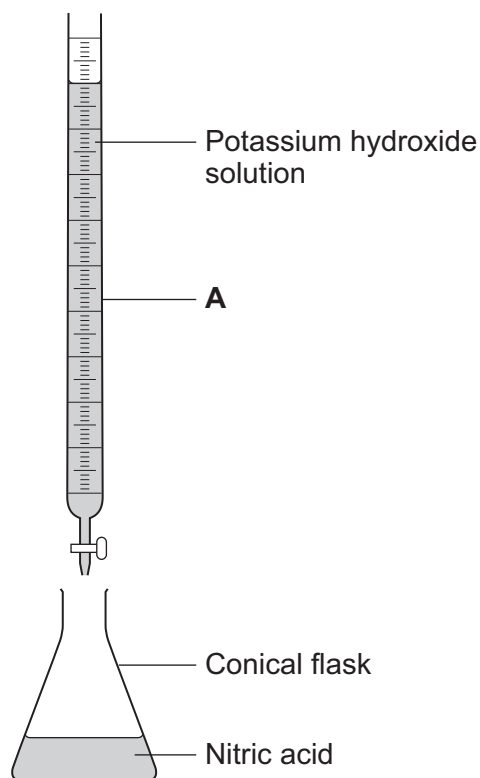
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4 (b) Potassium hydroxide solution is used in titrations.

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.

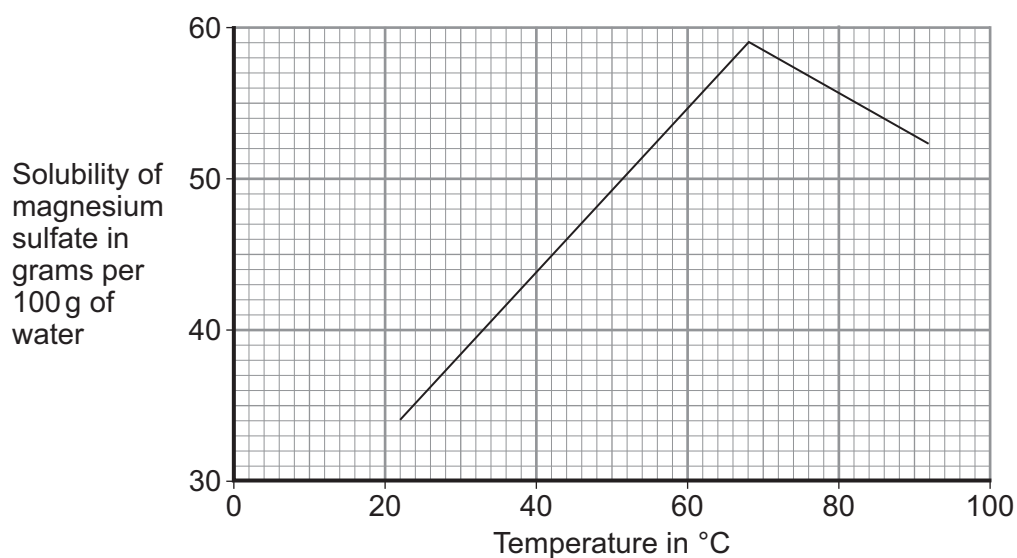
How is hard water formed from rainwater?

[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

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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

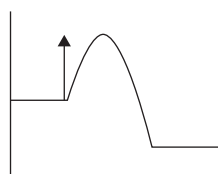
6 (b) **Figure 8** shows four energy level diagrams for the combustion of an alcohol.

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

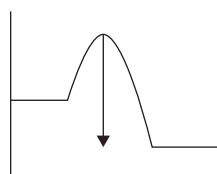
[1 mark]

Tick (✓) **one** box.

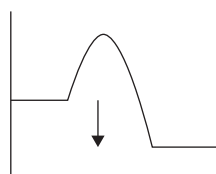
Figure 8



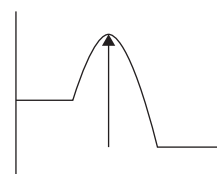
A



B



C



D

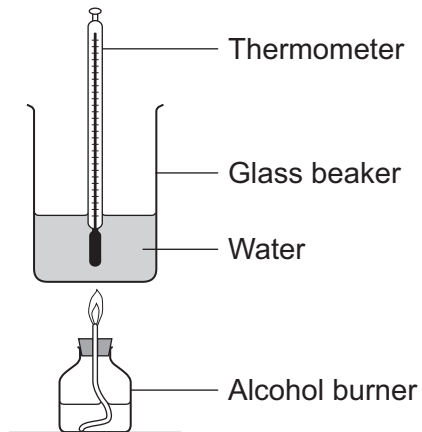
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- 6 (c) **Figure 9** shows apparatus used to measure the energy released when an alcohol is burned.

Figure 9



- 6 (c) (i) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe how a student could use the apparatus in **Figure 9** to compare the energy released when methanol and ethanol are burned.

You should include any measurements the student would need to make.

Do **not** describe how to do any calculations.

Do **not** describe any improvements to the apparatus.

[6 marks]



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]

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END OF QUESTIONS



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