Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
June 2013

Chemistry

CH3FP

Unit Chemistry C3

F

Written Paper

Monday 20 May 2013 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

Time allowed
- 1 hour

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.

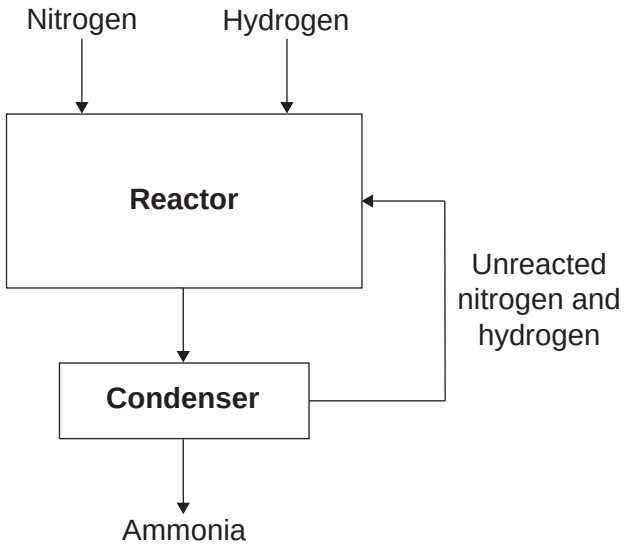
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 9 should be answered in continuous prose.
  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.

Do not write outside the box

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

1 The flow diagram shows the Haber process. In the Haber process ammonia is produced from nitrogen and hydrogen.



1 (a) The word equation for the production of ammonia is:

nitrogen + hydrogen $\rightleftharpoons$ ammonia

Draw a ring around the correct answer to complete the sentence.

The symbol $\rightleftharpoons$ in the word equation shows the reaction is

exothermic.

reversible.

slow.

(1 mark)

Do not write outside the box

1 (b) The reactor contains iron.

Complete the sentence.

The iron speeds up the reaction because it is a ..... .

(1 mark)

1 (c) What happens to the unreacted nitrogen and hydrogen?

.....

.....

(1 mark)

1 (d) The sentences describe how ammonia is produced in the Haber process.

The sentences are in the wrong order.

P Ammonia is separated as a liquid.

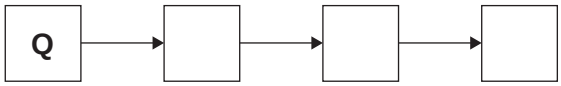
Q Nitrogen and hydrogen are mixed together.

R A mixture of gases enters the condenser.

S Nitrogen and hydrogen react to produce ammonia.

Complete the boxes below to show the correct order of the sentences.

The first box has been done for you.



(2 marks)

5

Turn over for the next question

Do not write outside the box

2 Low sodium salt is used on food. This label is from a packet of low sodium salt.

Low Sodium Salt

Ingredients:

Sodium chloride
Potassium chloride
Drying agent: magnesium carbonate

A chemist tests the low sodium salt for the substances on the label.

2 (a) The chemist tests for sodium ions and potassium ions using a flame test.

Draw a ring around the correct answer to complete each sentence.

2 (a) (i) In a flame test, sodium ions produce a (lilac / red / yellow) colour.

(1 mark)

2 (a) (ii) In a flame test, potassium ions produce a (lilac / red / yellow) colour.

(1 mark)

Do not write outside the box

2 (b) The chemist added hydrochloric acid to low sodium salt. Carbon dioxide gas was produced.

Describe the test for carbon dioxide and give the result of the test.

.....

.....

.....

.....

(2 marks)

2 (c) The chemist made a solution of low sodium salt.

2 (c) (i) Tick (✓) **one** box to show the chemical used to test for chloride ions.

	Tick (✓)
Barium chloride solution	
Silver nitrate solution	
Sodium sulfate solution	

(1 mark)

2 (c) (ii) Sodium hydroxide solution is used to test for magnesium ions.

Draw a ring around the colour of precipitate produced by this test.

brown **green** **white**

(1 mark)

6

Turn to page 7 for the next question

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ANSWER IN THE SPACES PROVIDED

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3 This question is about the periodic table.

Use the Chemistry Data Sheet to help you answer these questions.

3 (a) Complete the sentences.

Elements in the periodic table are arranged in order of atomic ..... .

The elements in Group ..... are called the noble gases.

(2 marks)

3 (b) Calcium (Ca) is in Group 2.

Name **one** other element in Group 2.

.....

(1 mark)

3 (c) Draw a ring around the correct answer to complete each sentence.

3 (c) (i) Sodium (Na) is

an alkali metal.

a non-metal.

a transition metal.

(1 mark)

3 (c) (ii) Nickel (Ni) is

an alkali metal.

a non-metal.

a transition metal.

(1 mark)

3 (d) In 1869 Mendeleev produced his periodic table.

Why did Mendeleev leave gaps in his periodic table?

.....

.....

(1 mark)

6

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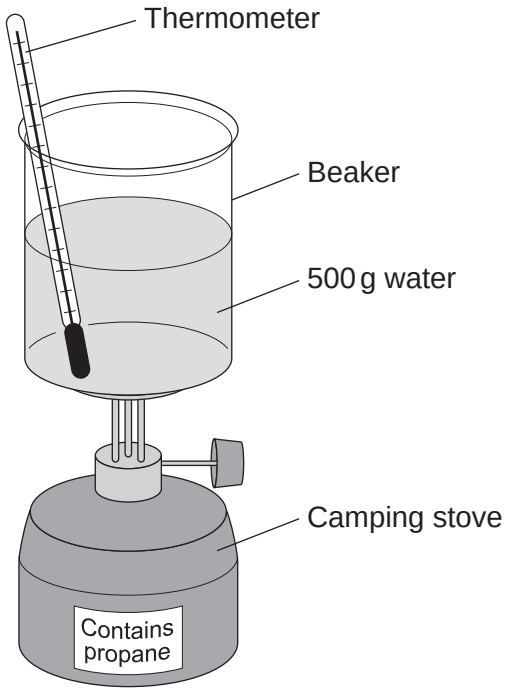
4 A camping stove uses propane gas.



4 (a) A student did an experiment to find the energy released when propane is burned.

The student:

- put 500 g water into a beaker
- measured the temperature of the water
- heated the water by burning propane for 1 minute
- measured the temperature of the water again.

The student found the temperature change was 20 °C.

The student can calculate the energy released, in joules (J), using the equation:

energy released (J) = mass of water (g) × 4.2 × temperature change (°C)

4 (a) (i) Use the student's result to calculate the energy released in joules (J).

.....

.....

Energy released = ... J

(2 marks)

Do not write outside the box

4 (a) (ii) State **two** safety precautions that the student should take during the experiment.

1 .....

.....

2 .....

.....

(2 marks)

4 (a) (iii) Tick (✓) **two** boxes which describe how the student could make his result more accurate.

	Tick (✓)
Stir the water before measuring the temperature.	
Heat the water until it boils.	
Place a lid on the beaker.	
Use a larger beaker for the water.	

(2 marks)

Question 4 continues on the next page

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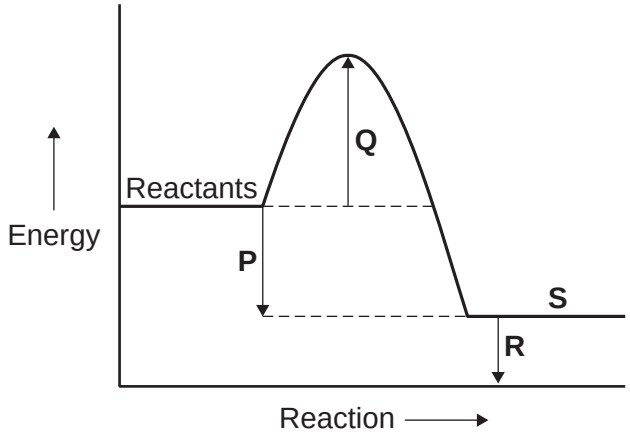
4 (b) The change in energy when propane is burned can be shown in an energy level diagram.



Draw **one** line from each description to the correct letter.

Description	Letter
products	P
activation energy	Q
energy released by the reaction	R
	S

(3 marks)

Do not write outside the box

4 (c) Propane and hydrogen are both used as fuels.

Some information about propane and hydrogen is given in the table.

Fuel	Resource	Products formed when fuel burned
propane	crude oil	carbon dioxide and water
hydrogen	water	water

Use the information in the table to suggest **two** disadvantages that propane has as a fuel compared to hydrogen.

1 .....

.....

2 .....

.....

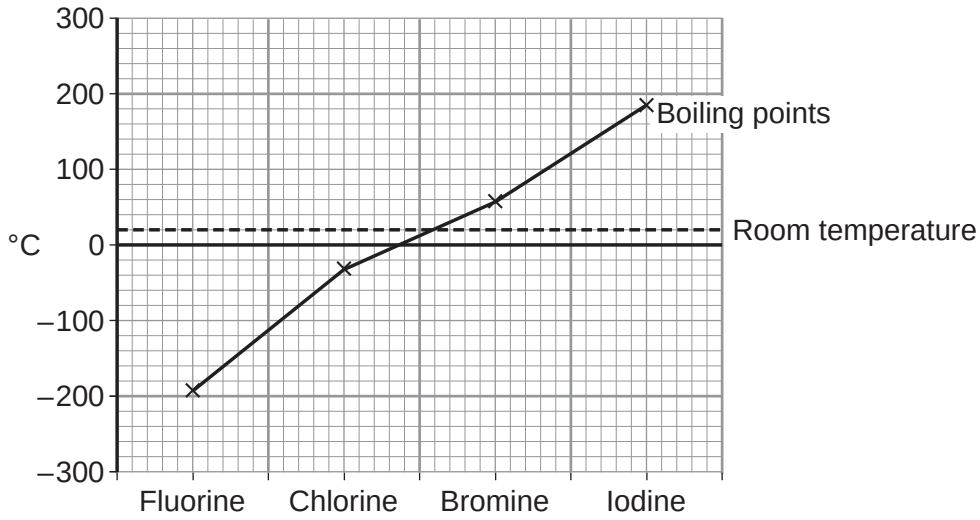
(2 marks)

11

Turn over for the next question

Do not write outside the box

5 The graph shows the boiling points of the halogens.



5 (a) Use the graph to help you answer these questions.

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

gas	liquid	solid

At room temperature chlorine is a ..... .

(1 mark)

5 (a) (ii) Describe the trend in boiling point from fluorine to iodine.

.....

.....

(1 mark)

5 (b) Chlorine reacts with metals to produce metal chlorides.

5 (b) (i) When a chlorine atom forms a chloride ion it gains one electron.

What is the charge on a chloride ion?

.....

(1 mark)

5 (b) (ii) Write a word equation for the reaction between sodium and chlorine.

.....

(1 mark)

Do not write outside the box

5 (c) In the UK water companies add chlorine to tap water.

Why is chlorine added to tap water?

.....

(1 mark)

5 (d) Water companies add fluoride to tap water in some parts of the UK.
Fluoride is added to improve dental health.

Suggest **one** reason why some people are against adding fluoride to tap water.

.....

.....

.....

(1 mark)

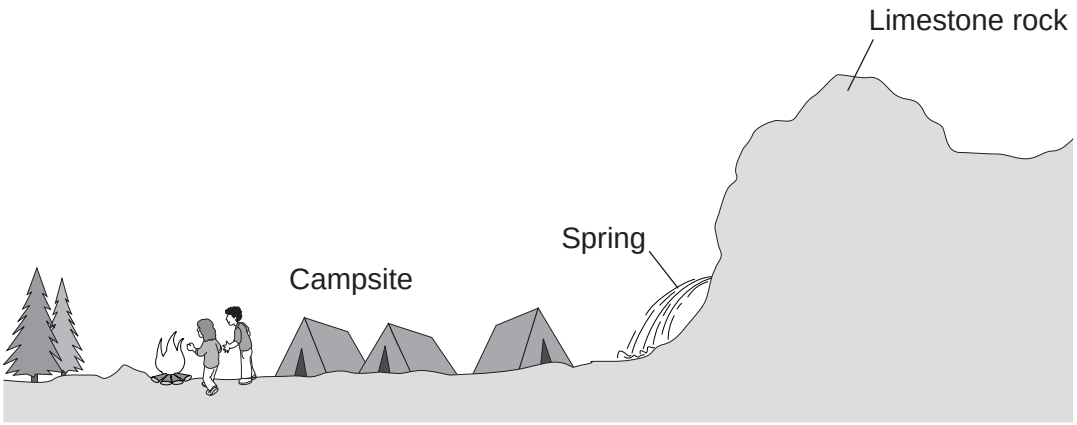
6

Turn over for the next question

Do not write outside the box

6 This question is about hard water.

6 (a) A campsite has a spring, where water flows out of limestone rock.



6 (a) (i) The water from the spring is hard because it contains calcium ions.

How do the calcium ions get into the spring water?

.....

.....

(1 mark)

6 (a) (ii) A student at the campsite boils some of the spring water in a pan. The inside of the pan becomes coated with a white solid.

What is the white solid?

.....

(1 mark)

6 (a) (iii) When the student uses soap to wash in the spring water, scum forms.
Scum is **not** formed if the spring water has been boiled and allowed to cool.

Draw a ring around the correct answer to complete the sentence.

The hardness in the spring water is

acidic.
permanent.
temporary.

(1 mark)

Do not write outside the box

6 (b) In a laboratory, a student compared the hardness of three different samples of water.

The student measured 20 cm^3 of water into a boiling tube.
The student then:

- added a drop of soap solution
- shook the boiling tube for 10 seconds
- looked to see if a permanent lather had formed.

The student repeated the procedure until a permanent lather formed.

The results are shown in the table.

Water sample	Number of drops of soap solution needed to form a permanent lather			
	Test 1	Test 2	Test 3	Mean
Spring water	13	11	6	
Tap water	7	5	6	6
Distilled water	1	1	1	1

6 (b) (i) Calculate the correct mean for spring water.

.....

Mean = ... drops
(2 marks)

6 (b) (ii) Which of the three sources of water was hardest?

Draw a ring round the correct answer.

distilled water **spring water** **tap water**

Use the results in the table to give a reason for your answer.

.....

.....

.....
(2 marks)

Question 6 continues on the next page

Turn over ▶

Do not write outside the box

6 (c) Ion exchange columns are used to soften hard water.

6 (c) (i) Draw a ring around the correct answer to complete each sentence.

The ion exchange column softens water by [dissolving / evaporating / removing] calcium ions.

Calcium ions in the water exchange with [chloride / magnesium / sodium] ions in the column.

(2 marks)

6 (c) (ii) After a few weeks sodium chloride solution needs to be passed through the ion exchange column.

Suggest why.

.....

.....

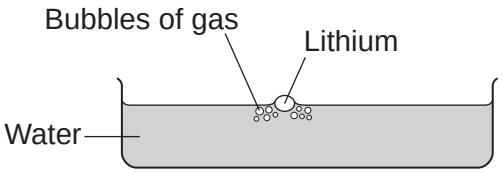
(1 mark)

10

Do not write outside the box

7 Lithium is in Group 1 of the periodic table.

Lithium reacts with water to produce a gas and an alkaline solution.



7 (a) (i) Name the gas produced.

.....

(1 mark)

7 (a) (ii) Which ion causes the solution to be alkaline?

.....

(1 mark)

7 (b) Potassium is also in Group 1 of the periodic table.
Potassium reacts with water in a similar way to lithium.

Write down **two** differences you would see between the reactions of potassium and lithium with water.

1 .....

.....

2 .....

.....

(2 marks)

4

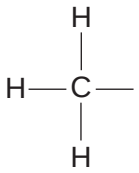
Turn over for the next question

Do not write outside the box

8 This question is about organic compounds.

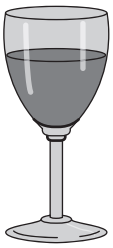
8 (a) Wine contains ethanol (CH_3CH_2OH).

8 (a) (i) Complete the displayed structure of ethanol.



(1 mark)

8 (a) (ii) Wine left in a glass for several days turns sour.
The sour taste is caused by ethanoic acid.



Complete the sentences.

The ethanoic acid is produced from a reaction between ethanol

and ..... .

This type of reaction is ..... .

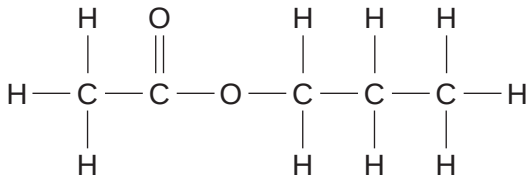
(2 marks)

Do not write outside the box

8 (b) Propyl ethanoate, a fragrance, can be produced by reacting ethanoic acid with an alcohol.

Propyl ethanoate is a member of a series of organic compounds. The members of the series all have the same functional group.

The displayed structure of propyl ethanoate is:



8 (b) (i) Draw a ring around the functional group for this series on the displayed structure of propyl ethanoate.

(1 mark)

8 (b) (ii) Name the series of organic compounds with this functional group.

.....

(1 mark)

8 (b) (iii) The alcohol used to make propyl ethanoate has the formula $CH_3CH_2CH_2OH$

Name this alcohol.

.....

(1 mark)

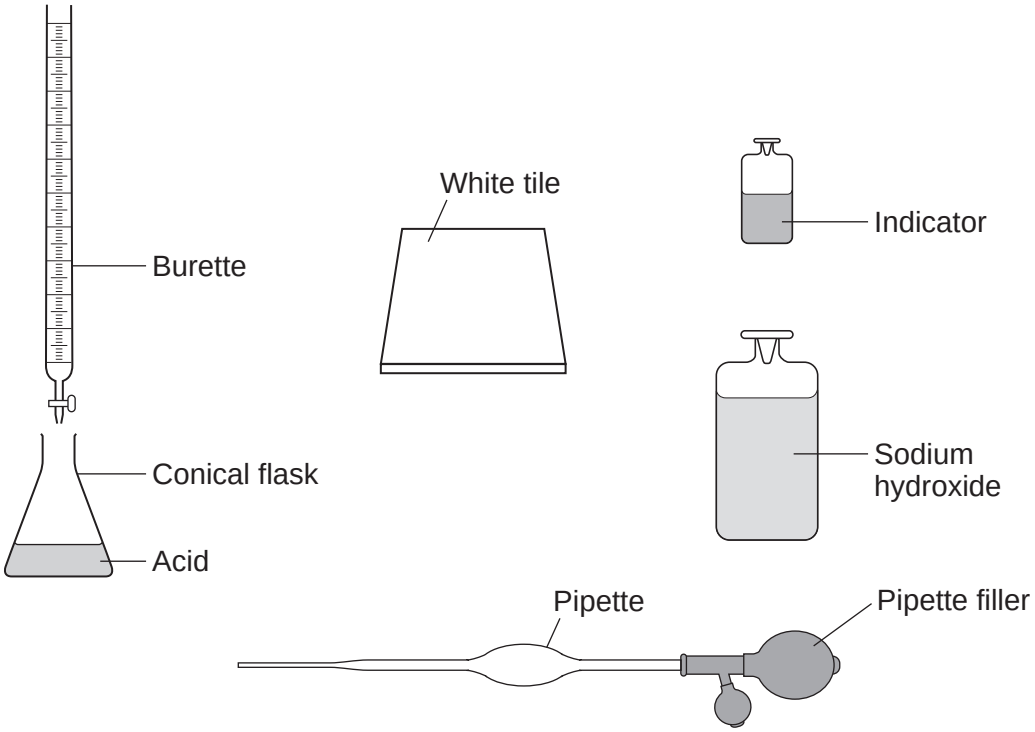
6

Turn over for the next question

Do not write outside the box

9 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

A student used the equipment shown to do a titration.



Describe how the student should use this equipment to find the volume of sodium hydroxide solution that reacts with a known volume of acid.
Include any measurements the student should make.

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

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(6 marks)

6

END OF QUESTIONS

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