

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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



General Certificate of Secondary Education
Foundation Tier
June 2010

Chemistry

CHY3F

Unit Chemistry C3

F

Wednesday 26 May 2010 9.00 am to 9.45 am

For this paper you must have:

- a pencil
 - a ruler
 - the Data Sheet (enclosed).
- You may use a calculator.

Time allowed

- 45 minutes

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 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice

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



J U N 1 0 C H Y 3 F 0 1

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

1 The table shows some information about acids and alkalis.

Name of acid or alkali	Type	Ions produced in solution		pH	Effect on Universal Indicator
Hydrochloric acid	Strong acid	H ⁺	Cl ⁻	1	Goes red
Sodium hydroxide	Strong alkali	Na ⁺	OH ⁻	13	Goes purple

Use the information in the table to help you answer parts **(a)** and **(b)**.

1 **(a)** Draw a ring around the correct answer to complete each sentence.

1 **(a) (i)** Hydrochloric acid is acidic.

This is because it contains

Cl⁻

H⁺

OH⁻

ions.

(1 mark)

1 **(a) (ii)** Sodium hydroxide solution is alkaline.

This is because it contains

H⁺

Na⁺

OH⁻

ions.

(1 mark)

1 **(a) (iii)** The pH of acids is

higher than

lower than

the same as

the pH of alkalis.

(1 mark)



1 (b) Ethanoic acid is a weak acid.

Universal Indicator can be used to show that hydrochloric acid is a stronger acid than ethanoic acid of the same concentration.

Explain how.

.....

.....

.....

.....

(2 marks)

1 (c) Draw a ring around the correct answer to complete this sentence.

Strong acids and strong alkalis are

completely

not

partially

ionised in water.

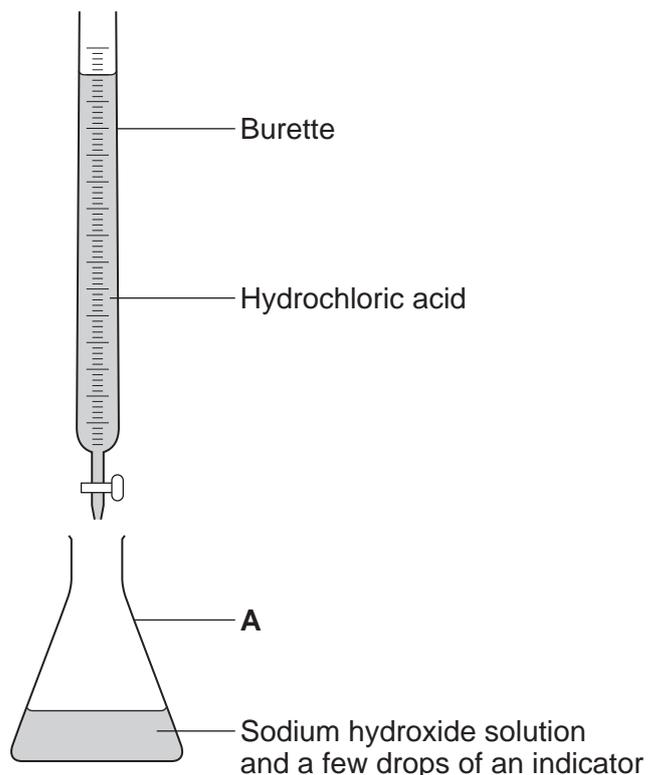
(1 mark)

Question 1 continues on the next page

Turn over ►



- 1 (d) The diagram shows the apparatus used to find the volume of hydrochloric acid that reacts with 25.0 cm^3 of sodium hydroxide solution.



- 1 (d) (i) Which **one** of the following is the correct name for **A**?

Draw a ring around your answer.

beaker

conical flask

pipette

(1 mark)

- 1 (d) (ii) Use the correct word from the box to complete the sentence.

distillation

filtration

titration

The method used to find the volume of acid that reacts with a known volume of alkali is

(1 mark)

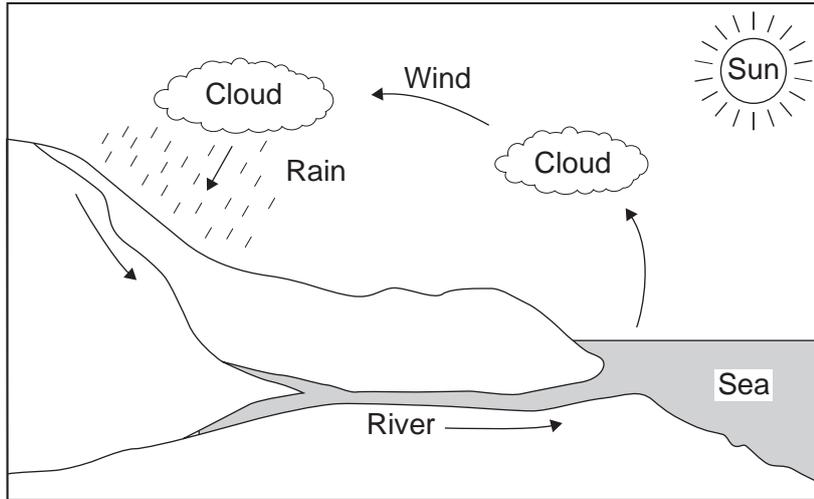
- 1 (d) (iii) Suggest **one** way to make the results more reliable.

.....

(1 mark)



2 The diagram shows part of the *Water Cycle*.



2 (a) Draw a ring around the correct answer to complete each sentence about the *Water Cycle*.

Heat from the Sun causes water in the sea to

- boil.
- condense.
- evaporate.

This forms water vapour that rises in the atmosphere. As it rises the water vapour cools.

This forms clouds because the water vapour

- boils.
- condenses.
- evaporates.

(2 marks)

2 (b) Suggest why sea water is **not** suitable as drinking water.

.....

.....

(1 mark)

3

Turn over ►



- 3 (b)** The table shows the melting points of the Group 1 metals arranged in alphabetical order.

Group 1 metal		
Name	Symbol	Melting point in °C
Caesium	Cs	29
Francium	Fr	27
Lithium	Li	180
Potassium	K	64
Rubidium	Rb	39
Sodium	Na	98

- 3 (b) (i)** Arrange these metals in order of increasing melting point. Three have been done for you.

Fr Cs Li

Lowest \longrightarrow Highest (1 mark)

- 3 (b) (ii)** Use the periodic table on the Data Sheet **and** your answer in part (b)(i) above to complete this sentence about how the melting points change.

Going down Group 1, the melting points.....
(1 mark)

- 3 (c)** The transition metals are a block of elements between Groups 2 and 3 of the periodic table. Transition metals have different properties to Group 1 metals.

Put ticks (✓) next to the **three** correct statements about transition metals in the table below.

Statement	(✓)
They are harder than Group 1 metals	
They have lower densities than Group 1 metals	
They have higher melting points than Group 1 metals	
They are more reactive with water than Group 1 metals	
They often form coloured compounds but Group 1 compounds are usually white	

(3 marks)

10

Turn over ►



4 Chemical tests can be used to detect and identify elements and compounds.

A jar of a chemical from 1870 is shown.



Copperas was a name used for iron(II) sulfate, FeSO_4 . It does not contain any copper!

4 (a) A student tested solutions of copperas to show which ions it contained.

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

4 (a) (i) The student tested for iron(II) ions, Fe^{2+}

The student added a solution of

barium chloride.
silver nitrate.
sodium hydroxide.

The colour of the precipitate formed was

green.
red.
white.

The precipitate was a

liquid.
gas.
solid.

(3 marks)



4 (a) (ii) The student tested for sulfate ions, SO_4^{2-}

The student added dilute hydrochloric acid and

barium chloride

silver nitrate

solution.

sodium hydroxide

The colour of the precipitate formed was

green.

red.

white.

Sulfuric acid (H_2SO_4) should **not** be used instead of hydrochloric acid (HCl) when

testing for sulfate ions. This is because sulfuric acid contains

chloride ions, Cl^-

nitrate ions, NO_3^-

sulfate ions, SO_4^{2-}

(3 marks)

4 (b) A flame test can be used to identify the metal ions in a compound.

How do you carry out a flame test?

.....
.....

(1 mark)

4 (c) The elements in a compound can also be detected and identified using instrumental methods of analysis.

State **one** advantage of using instrumental methods compared with chemical tests.

.....
.....

(1 mark)



- 5 The table gives some information about the composition of three samples of water from wells in the Canary Islands, Crete and Cyprus.

Ions	Mineral content of water in mg per litre		
	Canary Islands	Crete	Cyprus
Calcium, Ca ²⁺	28	82	18
Magnesium, Mg ²⁺	14	41	13
Sodium, Na ⁺	53	7	22
Chloride, Cl ⁻	7	143	39
Hydrogencarbonate, HCO ₃ ⁻	281	5	93
Sulfate, SO ₄ ²⁻	2	14	16

- 5 (a) Describe and explain how ions get into these samples of water.

.....

.....

.....

.....

(2 marks)

- 5 (b) The sample of water from Crete is harder than the other two.

Use the information in the table to explain why.

.....

.....

(1 mark)



5 (c) People who use hard water can expect higher costs than people who use soft water.

Explain why.

.....
.....
.....
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(2 marks)

5 (d) Hard water can be made soft by removing the ions that cause hardness.

State **one** way these ions can be removed.

.....
.....

(1 mark)

6

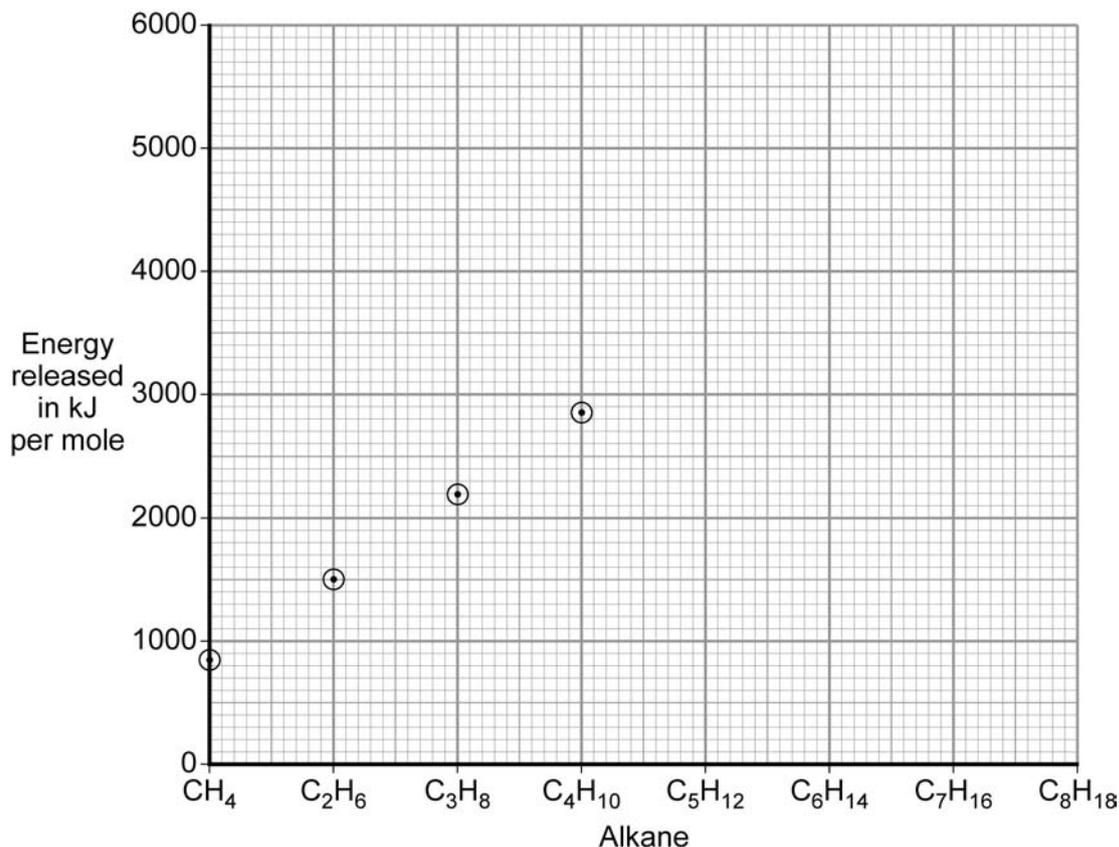
Turn over for the next question

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6 (a) Alkanes are important hydrocarbon fuels. They have the general formula C_nH_{2n+2}

The points on the graph show the amount of energy released when 1 mole of methane (CH_4), ethane (C_2H_6), propane (C_3H_8) and butane (C_4H_{10}) are burned separately.



6 (a) (i) Draw a line through the points and extend your line to the right-hand edge of the graph. (1 mark)

6 (a) (ii) Use the graph to estimate the amount of energy released when 1 mole of octane (C_8H_{18}) is burned.

Energy released = kJ
(1 mark)



6 (a) (iii) Suggest why we can make a good estimate for the energy released by 1 mole of pentane (C_5H_{12}).

.....
.....

(1 mark)

6 (a) (iv) A student noticed that octane (C_8H_{18}) has twice as many carbon atoms as butane (C_4H_{10}), and made the following prediction:

“When burned, 1 mole of octane releases twice as much energy as 1 mole of butane.”

Use the graph to decide if the student’s prediction is correct. You **must** show your working to gain credit.

.....
.....
.....
.....

(2 marks)

Question 6 continues on the next page

Turn over ►



6 (b) Some information about four fuels is given in the table.

Fuel	Type	Heat released in kJ per g	Combustion products			Type of flame
			CO ₂	SO ₂	H ₂ O	
Bio-ethanol	Renewable	29	✓		✓	Not smoky
Coal	Non-renewable	31	✓	✓	✓	Smoky
Hydrogen	Renewable	142			✓	Not smoky
Natural gas	Non-renewable	56	✓		✓	Not smoky

From this information a student made two conclusions.

For each conclusion, state if it is correct **and** explain your answer.

6 (b) (i) “Renewable fuels release more heat per gram than non-renewable fuels.”

.....

.....

.....

.....

(2 marks)

6 (b) (ii) “Non-renewable fuels are better for the environment than renewable fuels.”

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.....

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.....

.....

(2 marks)

END OF QUESTIONS



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