

Surname		Other Names	
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For Examiner's Use

General Certificate of Secondary Education
June 2008

CHEMISTRY
Unit Chemistry C3
Foundation Tier

CHY3F
F



Thursday 5 June 2008 9.00 am to 9.45 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> the Data Sheet (enclosed) a pencil and a ruler. <p>You may use a calculator.</p>

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. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- 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.

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Question	Mark	Question	Mark
1		6	
2		7	
3			
4			
5			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			



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

- 1 The picture shows an old Spanish coin. It is called a piece of eight.

Photograph of old Spanish coin is not reproduced here due to third party copyright constraints.

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shop.aqa.org.uk

- 1 (a) A genuine piece of eight has a mass of 27 g.

The masses of four pieces of eight were measured. The results are shown in the table.

Coin	Mass in grams
A	27.0
B	26.9
C	25.9
D	26.8

- 1 (a) (i) What is the range?

.....
(1 mark)

- 1 (a) (ii) Which coin, **A**, **B**, **C** or **D**, is most likely to be a forgery?

(1 mark)



- 1 (b) A genuine piece of eight is 90% silver.

Coins can be analysed to prove they are genuine.

- 1 (b) (i) Chemical analysis using acids and alkalis is **not** used on such rare and valuable coins.

This is because chemical analysis

.....
(1 mark)

- 1 (b) (ii) Rare and valuable coins are analysed by instrumental methods.

Suggest why.

.....

.....
(1 mark)

4

Turn over for the next question

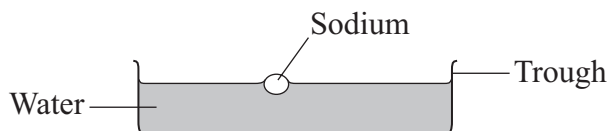
Turn over ►



- 2 (a) Read a student's report about the reaction between sodium and water.

The reaction between sodium and water

A small piece of sodium was added to some water in a trough.



The sodium floated and started to react.

The sodium moved along the surface of the water and melted to give a ball of molten metal.

The ball became smaller and smaller until it had all gone.

A gas was given off and a colourless solution was left.

The word equation for this reaction is:



Use the information from the student's report to answer these questions.

- 2 (a) (i) Which information shows that sodium has a low density?

.....
(1 mark)

- 2 (a) (ii) Which information shows that the reaction is exothermic?

.....
(1 mark)

- 2 (a) (iii) Name the gas given off.

.....
(1 mark)

- 2 (b) The periodic table on the Data Sheet may help you to answer these questions.

- 2 (b) (i) Sodium is in Group 1.

Name a Group 1 element that is more reactive than sodium.

.....
(1 mark)



- 2 (b) (ii) Here are some statements about Group 1 elements.
Only **two** of these statements are correct.
Put a tick (✓) next to the **two** correct statements.

Statement	(✓)
They are halogens	
They are metals	
They form covalent compounds	
They form ions with a +1 charge	

(2 marks)

- 2 (c) Dimitri Mendeleev put forward his periodic table in 1869.

Complete these sentences by drawing a ring around the correct answer.

- 2 (c) (i) Mendeleev arranged the elements in order of their

atomic weight

density

reactivity

(1 mark)

- 2 (c) (ii) The table is called a periodic table because elements with
properties occur at regular intervals.

identical

the same

similar

(1 mark)

- 2 (c) (iii) The vertical columns are known as

groups

periods

rows

(1 mark)


- 2 (d) How did Mendeleev overcome the problem of undiscovered elements when he designed his table?

.....
(1 mark)



- 3 The information in the box was on the internet.

Breathtaking Finish



Tim Henman used *smelling salts* to help revive his fortunes at Wimbledon yesterday.

The active chemical in *smelling salts* is ammonium carbonate, $(\text{NH}_4)_2\text{CO}_3$.

A student tested some *smelling salts* to prove that they contained ammonium ions and carbonate ions.

- 3 (a) Complete these sentences by choosing the correct substances from the box.
- 3 (a) (i) Test for carbonate ions.

ammonia	carbon dioxide	hydrochloric acid
limewater	water	

The student added to the smelling salts.

A gas called was given off.

This gas turned milky.

(3 marks)



3 (a) (ii) Test for ammonium ions.

ammonia	carbon dioxide	hydrochloric acid
litmus	sodium hydroxide	

The student added to the smelling salts.

A gas called was given off.

This gas turned paper blue.

(3 marks)

3 (b) Suggest why ammonium ions **cannot** be identified using a flame test.

.....
.....

(1 mark)

7

Turn over for the next question

Turn over ►



- 4 (a) The table shows the amount of energy produced by some food components.

Food component	Energy in kilocalories per gram
Carbohydrates	4
Dietary fibre	2
Ethanol	7
Fats	9
Sugar-free sweeteners	2.4

- 4 (a) (i) Which food component produces the most energy per gram?

.....
(1 mark)

- 4 (a) (ii) A packet of vegetable soup contains 25 g of carbohydrates.

Calculate the number of kilocalories produced by the carbohydrates in this packet of soup.

.....
Answer = kilocalories
(1 mark)

- 4 (a) (iii) Dietary information is usually given in kilocalories.

Which other energy unit is also used?

Draw a ring around your answer.

kilograms

kilojoules

kilometres

(1 mark)



4 (b) (i) Suggest why chips have more energy than the same mass of boiled potatoes.

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

(2 marks)

4 (b) (ii) Suggest why eating too many chips could be unhealthy.

.....
.....

(1 mark)

6

Turn over for the next question

Turn over ►



5 Good quality water is needed for a healthy life.

In the United Kingdom, obtaining safe water for drinking is as simple as turning on a tap. The water is made safe to drink by water companies.

However, in many parts of Africa and Asia, water used for drinking is contaminated and untreated. It is estimated that 2.2 million people die each year as a result of drinking contaminated water.



5 (a) Sea water is **not** used as drinking water.

Suggest why.

.....
.....
(1 mark)

5 (b) Explain why water for drinking is filtered and then treated with chlorine.

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

3



Turn over for the next question

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6 (a) Nicotinic acid is a weak acid. It has the formula C_5H_4NCOOH .

Hydrochloric acid is a strong acid. It has the formula HCl .

6 (a) (i) Give the name or formula of the ion that makes solutions acidic.

.....
(1 mark)

6 (a) (ii) Weak acids contain fewer of these ions than strong acids of the same concentration.

Describe and give the results of an experiment to show that nicotinic acid is a weaker acid than hydrochloric acid of the same concentration.

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

6 (b) Read the following information.

It's all in a name

Nicotinic acid is an important chemical. It is also known as niacin or vitamin B_3 . It is found in many foods including eggs, meat, poultry, fish, leafy vegetables, carrots and cereals. It is also in tea and coffee.

A lack of nicotinic acid in our diet causes the disease pellagra. The symptoms of pellagra include diarrhoea, dermatitis and dementia. People can die. Pellagra is a common disease of malnutrition in Africa.

Nicotinic acid can be made by oxidising nicotine.

Nicotine is found in tobacco, tomatoes and potatoes. Smoking tobacco is said to cause the death of millions of people each year from cancer.

DC/AC (Dedicated Citizens Against Chemicals) is a pressure group that wants the government to ban nicotine and chemicals made from nicotine. Many people oppose such a ban and there is to be a televised debate.



In the television programme, DC/AC and their opponents gave their reasons. You have to suggest what they were.

- 6 (b) (i) DC/AC said that nicotine and chemicals made from nicotine should be banned because

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

(2 marks)

- 6 (b) (ii) Their opponents said that nicotine and chemicals made from nicotine should **not** be banned because

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

(2 marks)

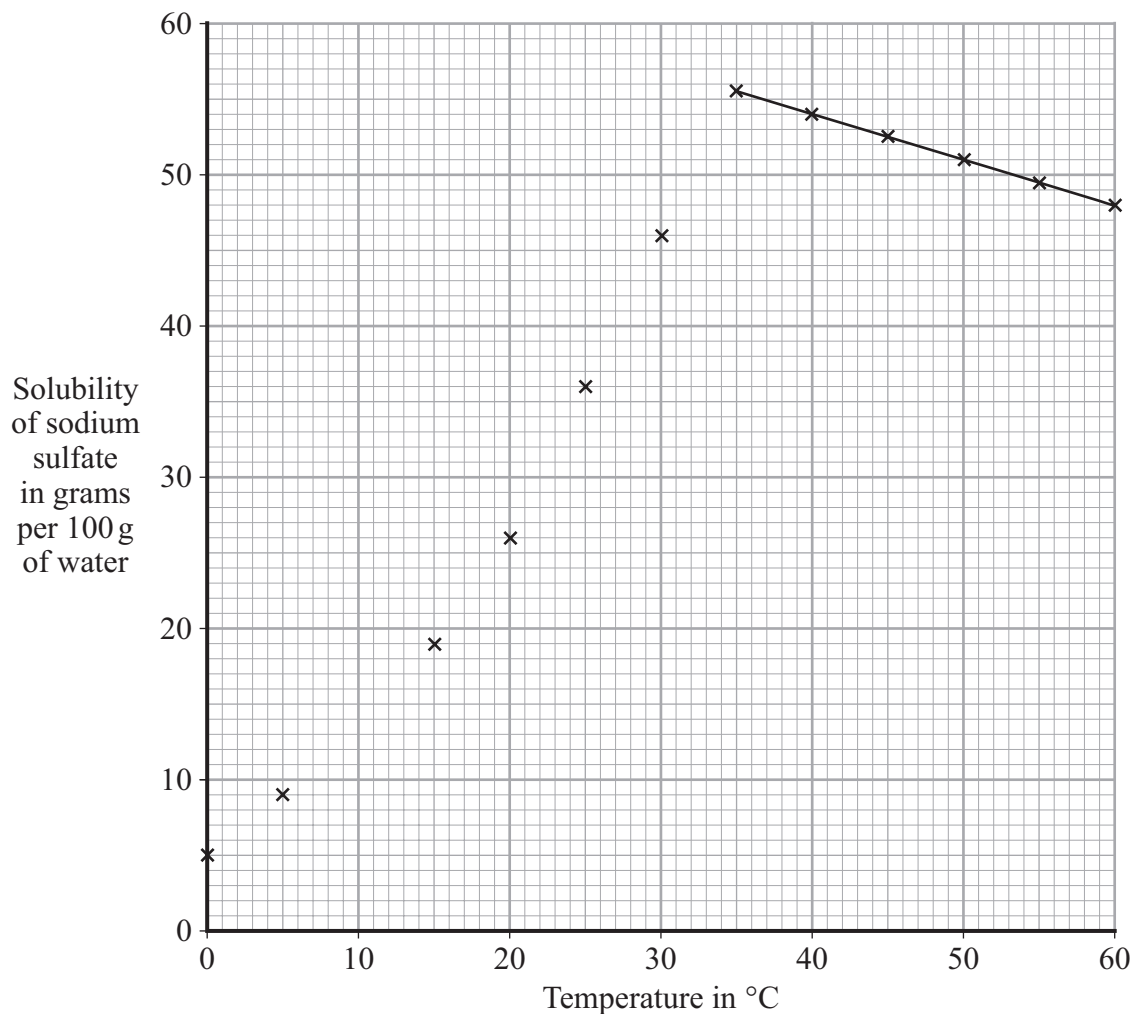
7

Turn over for the next question

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- 7 A student did experiments to find the maximum amount of sodium sulfate that dissolves in 100 g of water at different temperatures. Each experiment was repeated several times. The points on the graph show the student's average results.



Use the graph to answer the following questions.

- 7 (a) Complete the graph by drawing a smooth curve through the points. (1 mark)

- 7 (b) The student was surprised by the shape of this solubility graph.

Suggest why.

.....
(1 mark)

- 7 (c) Suggest why the student was sure that the results were reliable.

.....
(1 mark)



7 (d) At what temperature is the solubility of sodium sulfate greatest? °C
(1 mark)

7 (e) Use your graph to find the maximum mass of sodium sulfate that dissolves in 100 g of water at 10°C.

Mass = g
(1 mark)

7 (f) A *saturated solution* of sodium sulfate in 100 g of water is made at 30°C. It is then cooled to 15°C.

What mass of sodium sulfate crystallises from the solution?

.....
.....

Mass = g
(2 marks)

7 (g) At a given temperature what is meant by a *saturated solution*?

.....
.....

(1 mark)

8

END OF QUESTIONS



There are no questions printed on this page

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www.amurt.net/africa/ghana/2005

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Data Sheet

1. Reactivity Series of Metals

Potassium	most reactive
Sodium	
Calcium	↑
Magnesium	
Aluminium	
<i>Carbon</i>	
Zinc	
Iron	
Tin	
Lead	
<i>Hydrogen</i>	
Copper	
Silver	
Gold	
Platinum	↓
	least reactive

(elements in italics, though non-metals, have been included for comparison)

2. Formulae of Some Common Ions

Positive ions		Negative ions	
Name	Formula	Name	Formula
Hydrogen	H ⁺	Chloride	Cl ⁻
Sodium	Na ⁺	Bromide	Br ⁻
Silver	Ag ⁺	Fluoride	F ⁻
Potassium	K ⁺	Iodide	I ⁻
Lithium	Li ⁺	Hydroxide	OH ⁻
Ammonium	NH ₄ ⁺	Nitrate	NO ₃ ⁻
Barium	Ba ²⁺	Oxide	O ²⁻
Calcium	Ca ²⁺	Sulfide	S ²⁻
Copper(II)	Cu ²⁺	Sulfate	SO ₄ ²⁻
Magnesium	Mg ²⁺	Carbonate	CO ₃ ²⁻
Zinc	Zn ²⁺		
Lead	Pb ²⁺		
Iron(II)	Fe ²⁺		
Iron(III)	Fe ³⁺		
Aluminium	Al ³⁺		

Turn over ►

3. The Periodic Table of Elements

	1	2	3	4	5	6	7	0										
	1 H hydrogen 1							4 He helium 2										
		9 Be beryllium 4						20 Ne neon 10										
	23 Na sodium 11	24 Mg magnesium 12						40 Ar argon 18										
	39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
	85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
	133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[264] Bh bohrium 107	[266] Sg seaborgium 106	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112 – 116 have been reported but not fully authenticated								

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Cu and **Cl** have not been rounded to the nearest whole number.