

Write your name here

Surname	Other names
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Edexcel Centre Number Candidate Number

International GCSE

Chemistry
Unit: 4CH0
Paper: 2C

Friday 20 January 2012 – Morning Time: 1 hour	Paper Reference 4CH0/2C
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You must have: Ruler Calculator.	Total Marks
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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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PEARSON

THE PERIODIC TABLE

0

7

6

5

4

3

Group

2

1

Period

4	He	Helium	2
---	----	--------	---

1	H	Hydrogen	1
---	---	----------	---

20	Ne	Neon	10
19	F	Fluorine	9
16	O	Oxygen	8
14	N	Nitrogen	7
12	C	Carbon	6
11	B	Boron	5
20	Ne	Neon	10
19	F	Fluorine	9
16	O	Oxygen	8
14	N	Nitrogen	7
12	C	Carbon	6
11	B	Boron	5
27	Al	Aluminium	13
28	Si	Silicon	14
31	P	Phosphorus	15
32	S	Sulfur	16
33	Cl	Chlorine	17
35.5	Ar	Argon	18
70	Ga	Gallium	31
73	Ge	Germanium	32
75	As	Arsenic	33
79	Se	Selenium	34
84	Br	Bromine	35
86	Kr	Krypton	36
115	In	Indium	49
119	Sn	Tin	50
122	Sb	Antimony	51
128	Te	Tellurium	52
127	I	Iodine	53
131	Xe	Xenon	54
204	Tl	Thallium	81
207	Pb	Lead	82
209	Bi	Bismuth	83
210	Po	Polonium	84
210	At	Astatine	85
222	Rn	Radon	86
65	Zn	Zinc	30
63.5	Cu	Copper	29
59	Ni	Nickel	28
59	Co	Cobalt	27
56	Fe	Iron	26
55	Mn	Manganese	25
52	Cr	Chromium	24
51	V	Vanadium	23
48	Ti	Titanium	22
45	Sc	Scandium	21
88	Sr	Strontium	38
86	Rb	Rubidium	37
89	Y	Yttrium	39
91	Zr	Zirconium	40
93	Nb	Niobium	41
96	Mo	Molybdenum	42
99	Tc	Technetium	43
101	Ru	Ruthenium	44
103	Rh	Rhodium	45
106	Pd	Palladium	46
112	Cd	Cadmium	48
112	Zn	Zinc	30
108	Ag	Silver	47
197	Au	Gold	79
195	Pt	Platinum	78
192	Ir	Iridium	77
190	Os	Osmium	76
186	Re	Rhenium	75
184	W	Tungsten	74
181	Ta	Tantalum	73
179	Hf	Hafnium	72
137	Ba	Barium	56
133	Cs	Caesium	55
139	La	Lanthanum	57
139	Y	Yttrium	39
89	Sc	Scandium	21
40	Ca	Calcium	20
40	Ca	Calcium	20
24	Mg	Magnesium	12
24	Mg	Magnesium	12
23	Na	Sodium	11
23	Na	Sodium	11
9	Be	Beryllium	4
9	Be	Beryllium	4
7	Li	Lithium	3
7	Li	Lithium	3
223	Fr	Francium	87
226	Ra	Radium	88
227	Ac	Actinium	89

Key

Relative atomic mass
Symbol
Name
Atomic number



Answer ALL questions.

- 1 (a) Complete the table to show the relative mass and relative charge of a proton, a neutron and an electron.

(4)

	Proton	Neutron	Electron
Relative mass			1/1840
Relative charge	+ 1		

- (b) The symbol for an atom of one isotope of hydrogen is ${}^3_1\text{H}$

- (i) State the number of protons, neutrons and electrons present in one atom of this isotope.

(2)

Number of protons

Number of neutrons

Number of electrons

- (ii) What is meant by the term **isotopes**?

(2)

.....

.....

.....

- (c) Bromine has two naturally-occurring isotopes with mass numbers 79 and 81.
A sample of bromine contained the two isotopes in the following proportions:

$$\text{bromine-79} = 50.7\% \quad \text{and} \quad \text{bromine-81} = 49.3\%$$

Use this information to calculate the relative atomic mass of bromine.
Give your answer to **two** decimal places.

(2)

(Total for Question 1 = 10 marks)



2 Use the Periodic Table on page 2 to help you answer this question.

(a) Part of the Periodic Table is shown.

																A	
	E												D				
B															C		

In each part of this question, place a cross (☒) in **one** box to identify the letter, **A** to **E**, that represents

(i) a metal that reacts violently with water

A **B** **C** **D** **E**

(1)

(ii) a noble gas

A **B** **C** **D** **E**

(1)

(iii) a Group 2 metal

A **B** **C** **D** **E**

(1)

(iv) a halogen

A **B** **C** **D** **E**

(1)



(b) Complete these sentences by placing a cross (☒) in **one** box next to the correct answer.

(i) The elements in the Periodic Table are arranged in order of increasing (1)

- number of neutrons
- atomic number
- relative atomic mass
- mass number

(ii) Elements in the same group in the Periodic Table have the same number of (1)

- electrons in the outer shell
- protons in the nucleus
- neutrons in the nucleus
- atoms

(Total for Question 2 = 6 marks)



3 Lead(II) sulfate, PbSO_4 , is an insoluble salt.

It can be made as a precipitate from a solution of lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$

(a) (i) Identify a substance that could be added to lead(II) nitrate solution to form a precipitate of lead(II) sulfate.

(1)

(ii) Write a chemical equation for the reaction between lead(II) nitrate and the substance you identified in (a)(i).

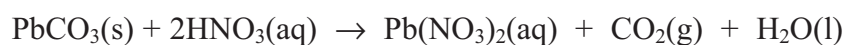
(2)

(iii) Outline how you would produce a pure, dry sample of lead(II) sulfate from the reaction mixture in (a)(ii).

(3)

(b) A solution of lead(II) nitrate can be made by reacting solid lead(II) carbonate with dilute nitric acid.

The equation for this reaction is:



State **two** observations you would make when dilute nitric acid is added to solid lead(II) carbonate.

(2)

1

2

(Total for Question 3 = 8 marks)



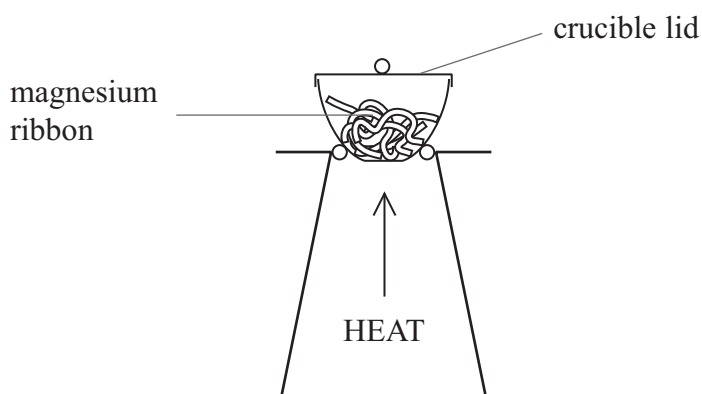
4 When magnesium is burned in air, it reacts with oxygen, O_2 , to form magnesium oxide, MgO

A class of students investigated the relationship between the mass of magnesium burned and the mass of magnesium oxide formed.

Each student was given a different mass of clean magnesium to heat.

The students used the following method.

- Weigh a crucible and lid
- Place the magnesium ribbon in the crucible, replace the lid, and reweigh
- Heat the crucible as shown in the diagram until the magnesium burns



- Lift the lid from time to time until there is no sign of further reaction
- Allow the crucible and lid to cool and reweigh
- Repeat the heating, cooling and reweighing until two consecutive masses are the same
- Calculate the mass of magnesium oxide formed

(a) (i) Why is it necessary to lift the lid from time to time while heating?

(1)

(ii) Why is it necessary to repeat the heating until two consecutive masses are the same?

(1)



(b) Show how the mass of magnesium oxide formed can be calculated from the readings obtained. (1)

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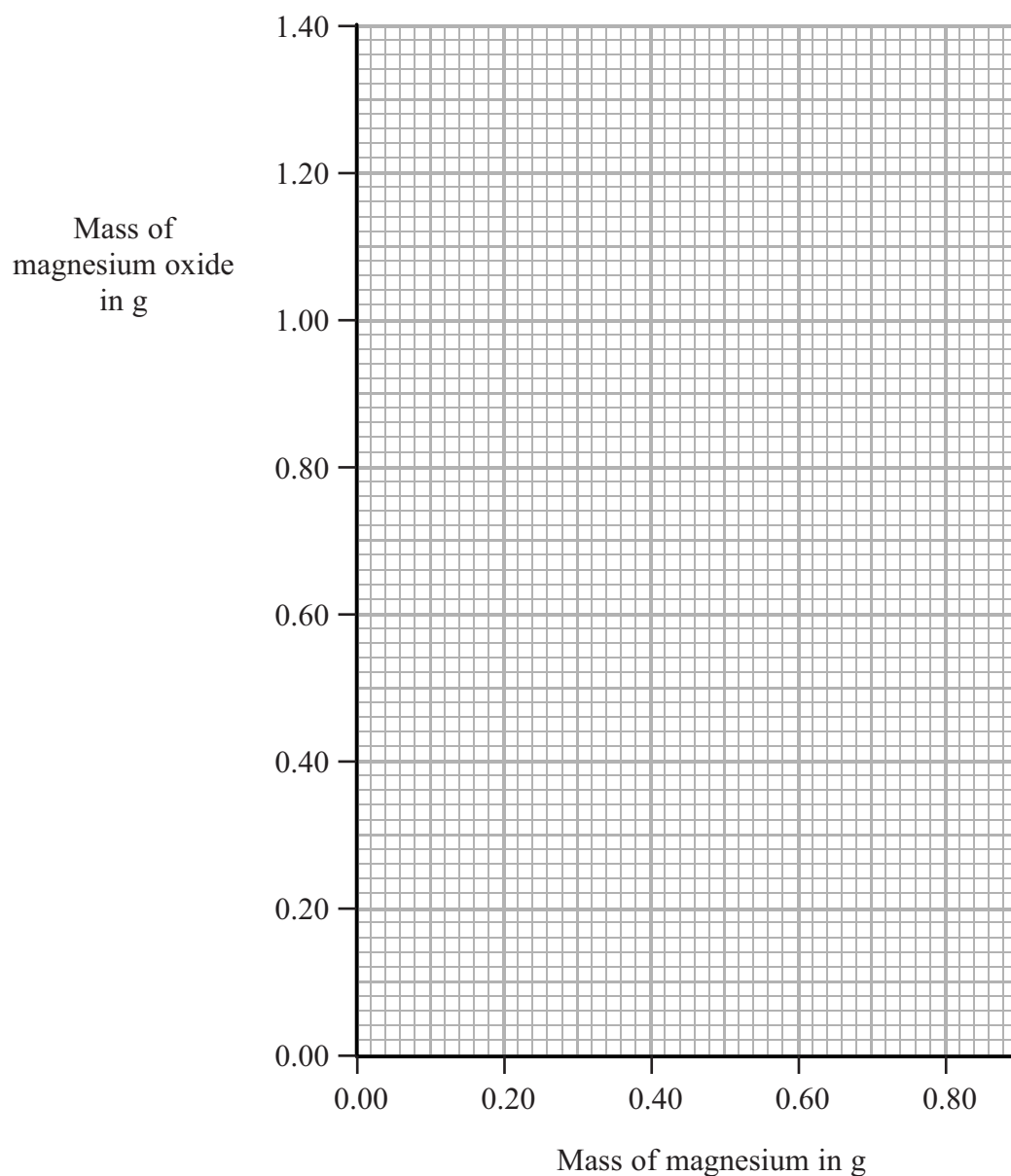
(c) The results of each experiment are given in the table.

Mass of magnesium in g	Mass of magnesium oxide in g
0.24	0.40
0.26	0.64
0.42	0.70
0.62	1.04
0.70	1.20
0.80	1.33



(i) Plot the results on the grid and draw a straight line of best fit.

(3)



(ii) Draw a circle around the anomalous result.

(1)

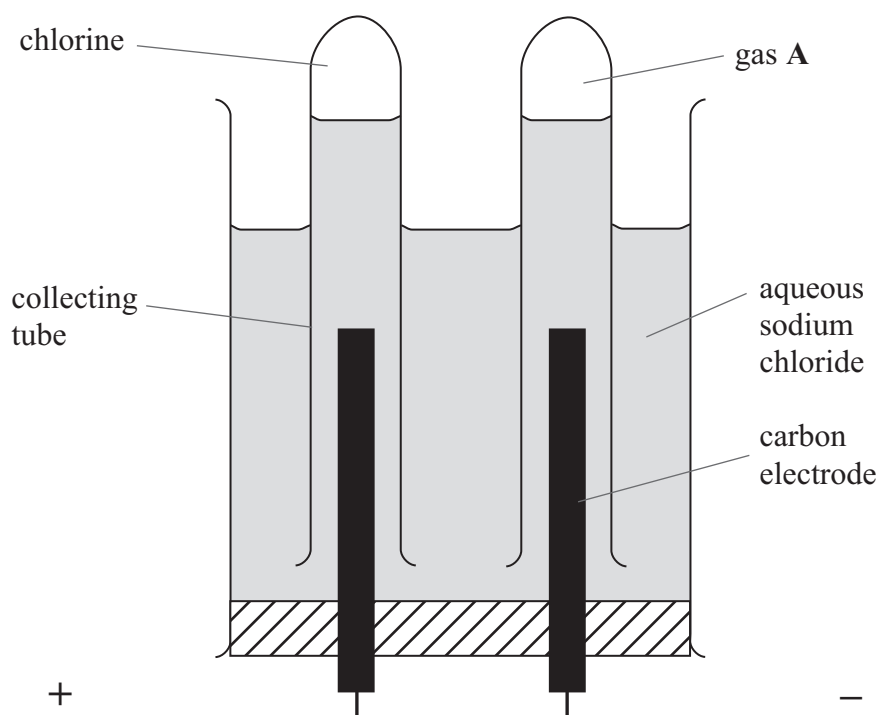
(iii) Use your graph to find the mass of magnesium oxide formed when 0.48 g of magnesium is burned.

(1)

(Total for Question 4 = 8 marks)



5 The apparatus shown can be used to electrolyse aqueous sodium chloride in the laboratory.



(a) Gases are evolved at both electrodes.

(i) Describe a chemical test to show that the gas evolved at the positive electrode is chlorine. (2)

.....

.....

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.....

(ii) Identify gas A. (1)

.....



(b) Some of the solution formed after the electrolysis was tested with the indicator phenolphthalein. The indicator turned pink

Explain this result.

(1)

(c) The equation for the reaction taking place at the positive electrode is:



Ten faradays (10 F) of electricity were passed through an aqueous solution of sodium chloride.

(i) Calculate the amount, in moles, of chlorine formed.

(1)

(ii) Calculate the volume of chlorine formed.

(One mole of a gas occupies 24 dm^3 at this temperature and pressure)

(2)

(Total for Question 5 = 7 marks)



6 Compound **X** is a blue, crystalline solid. It contains copper(II) ions (Cu^{2+}), sulfate ions (SO_4^{2-}) and water of crystallisation.

(a) A student dissolved some of compound **X** in water and then added aqueous sodium hydroxide solution. She obtained a blue precipitate.

Give the formula of the blue precipitate formed in the reaction.

(1)

(b) Another student tested a solution of compound **X** for sulfate ions using dilute hydrochloric acid, followed by a few drops of barium chloride solution. She obtained a white precipitate.

Why is the dilute hydrochloric acid necessary in this test?

(1)

(c) The empirical formula of compound **X** is $\text{CuSO}_9\text{H}_{10}$

Write the formula of compound **X** to show its water of crystallisation.

(1)

(d) Compound **X** gives a blue-green colour in a flame test.

Outline how you would carry out a flame test.

(2)

(Total for Question 6 = 5 marks)



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- 7 The table shows percentage by mass of the fractions obtained from a sample of crude oil and the percentage market demand for these fractions.

Fraction	Percentage by mass in crude oil	Market demand (%)
refinery gases	3	5
gasoline	12	28
kerosene	9	20
diesel	15	25
fuel oil	51	20
bitumen	10	2

- (a) Why is the market demand for the gasoline fraction greater than that for the fuel oil fraction? (1)

.....

.....

.....

- (b) Cracking is used to make long-chain hydrocarbon molecules into shorter-chain hydrocarbon molecules.

- (i) Complete the equation to show the other hydrocarbon molecule formed when $C_{20}H_{42}$ is cracked.

(1)



- (ii) Give the name of a catalyst used in industry to crack long-chain hydrocarbons and state a temperature at which cracking is carried out.

(2)

Catalyst

Temperature



(c) Ethene (C_2H_4) can be produced by cracking long-chain hydrocarbon molecules obtained from crude oil. The ethene produced can then be used to make ethanol.

Ethanol can also be made by the fermentation of sugars.

(i) Give **two** advantages of making ethanol from ethene, rather than by fermentation.

(2)

1

2

(ii) Suggest **two** reasons why ethanol is sometimes made by fermentation, rather than from ethene.

(2)

1

2

(Total for Question 7 = 8 marks)

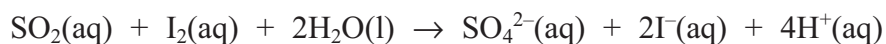
TURN OVER FOR QUESTION 8



8 Sulfur dioxide, SO_2 , is used as a preservative in wine.

The sulfur dioxide content of a wine can be found by titration. A chemist found that 25.0 cm^3 of a sample of wine reacted with exactly 15.00 cm^3 of 0.0010 mol/dm^3 aqueous iodine, $\text{I}_2(\text{aq})$.

The equation for the reaction is



(a) Calculate the amount, in moles, of iodine in 15.00 cm^3 of a 0.0010 mol/dm^3 solution.

(2)

(b) Deduce the amount, in moles, of sulfur dioxide in 25.0 cm^3 of the wine.

(1)

(c) Calculate the concentration, in mol/dm^3 , of sulfur dioxide in the wine.

(2)

(d) Calculate the concentration, in g/dm^3 , of sulfur dioxide in the wine.

(2)

(e) A concentration of sulfur dioxide that is greater than 0.16 g/dm^3 makes wine unpleasant to drink.

Use the value you have calculated in (d) to state whether the wine is drinkable.

(1)

(Total for Question 8 = 8 marks)

TOTAL FOR PAPER = 60 MARKS

