

Write your name here

Surname

Other names

Edexcel

International GCSE

Centre Number

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Candidate Number

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Chemistry

Unit: 4CH0

Paper: 2C

Friday 20 January 2012 – Morning

Time: 1 hour

Paper Reference

4CH0/2C

You must have:

Ruler

Calculator.

Total Marks

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 ►

P40127A

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P 4 0 1 2 7 A 0 1 1 6

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
40	Ca	Calcium	20
39	K	Potassium	19
38	Sr	Strontium	38
37	Rb	Rubidium	37
36	Kr	Krypton	36
35	Br	Bromine	35
34	Se	Selenium	34
33	As	Arsenic	33
32	Ge	Germanium	32
31	Ga	Gallium	31
30	Zn	Zinc	30
29	Cu	Copper	29
28	Ni	Nickel	28
27	Co	Cobalt	27
26	Fe	Iron	26
25	Mn	Manganese	25
24	Cr	Chromium	24
23	V	Vanadium	23
22	Ti	Titanium	22
21	Sc	Scandium	21
18	Ar	Argon	18
17	Cl	Chlorine	17
16	S	Sulfur	16
15	P	Phosphorus	15
14	N	Nitrogen	14
13	Al	Aluminium	13
12	Si	Silicon	12
11	B	Boron	11
86	Rn	Radon	86
85	At	Astatine	85
84	Po	Polonium	84
83	Bi	Bismuth	83
82	Pb	Lead	82
81	Tl	Thallium	81
80	Hg	Mercury	80
79	Au	Gold	79
78	Pt	Platinum	78
77	Ir	Iridium	77
76	Os	Osmium	76
75	Rh	Rhodium	75
74	Pd	Palladium	74
73	Ag	Silver	73
72	Cd	Cadmium	72
71	In	Indium	71
70	Sn	Tin	70
69	Sb	Antimony	69
68	Te	Tellurium	68
67	I	Iodine	67
66	Xe	Xenon	66
65	Ce	Cerium	65
64	Pr	Praseodymium	64
63	Nd	Niobium	63
62	Pm	Promethium	62
61	Sm	Samarium	61
60	Eu	Europium	60
59	Gd	Gadolinium	59
58	Tb	Terbium	58
57	Dy	Dysprosium	57
56	Ho	Holmium	56
55	Er	Erbium	55
54	Tm	Thulium	54
53	Yb	Ytterbium	53
52	Lu	Lutetium	52
51	Hf	Hafnium	51
50	Ta	Tantalum	50
49	W	Tungsten	49
48	Re	Rhenium	48
47	Os	Osmium	47
46	Ir	Iridium	46
45	Pt	Platinum	45
44	Au	Gold	44
43	Hg	Mercury	43
42	Tl	Thallium	42
41	Pb	Lead	41
40	Bi	Bismuth	40
39	Po	Polonium	39
38	At	Astatine	38
37	Rn	Radon	37
36	Fr	Francium	36
35	Ra	Radium	35
34	Ac	Actinium	34
33	La	Lanthanum	33
32	Ce	Cerium	32
31	Pr	Praseodymium	31
30	Nd	Niobium	30
29	Pm	Promethium	29
28	Sm	Samarium	28
27	Eu	Europium	27
26	Gd	Gadolinium	26
25	Tb	Terbium	25
24	Dy	Dysprosium	24
23	Ho	Holmium	23
22	Er	Erbium	22
21	Tm	Thulium	21
20	Yb	Ytterbium	20
19	Lu	Lutetium	19
18	Hf	Hafnium	18
17	Ta	Tantalum	17
16	W	Tungsten	16
15	Re	Rhenium	15
14	Os	Osmium	14
13	Ir	Iridium	13
12	Pt	Platinum	12
11	Au	Gold	11
10	Hg	Mercury	10
9	Tl	Thallium	9
8	Pb	Lead	8
7	Bi	Bismuth	7
6	Po	Polonium	6
5	At	Astatine	5
4	Rn	Radon	4
3	Fr	Francium	3
2	Ra	Radium	2
1	Ac	Actinium	1

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 (1)

A	B	C	D	E
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(ii) a noble gas (1)

A	B	C	D	E
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(iii) a Group 2 metal (1)

A	B	C	D	E
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(iv) a halogen (1)

A	B	C	D	E
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



(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).

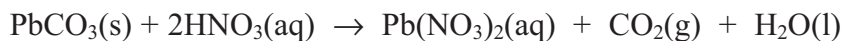
(2)

(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)



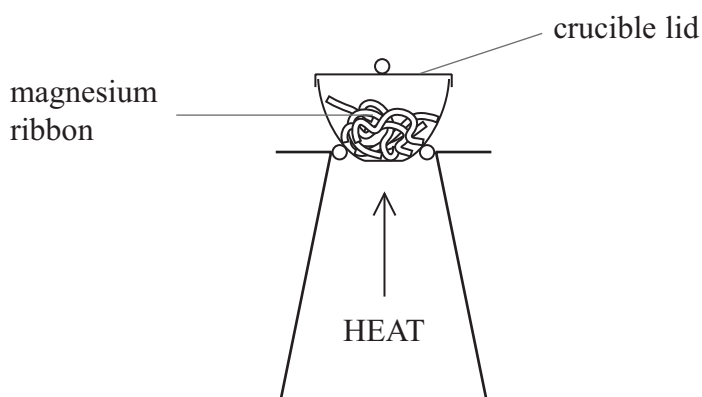
4 When magnesium is burned in air, it reacts with oxygen, O_2 , to form magnesium oxide, MgO

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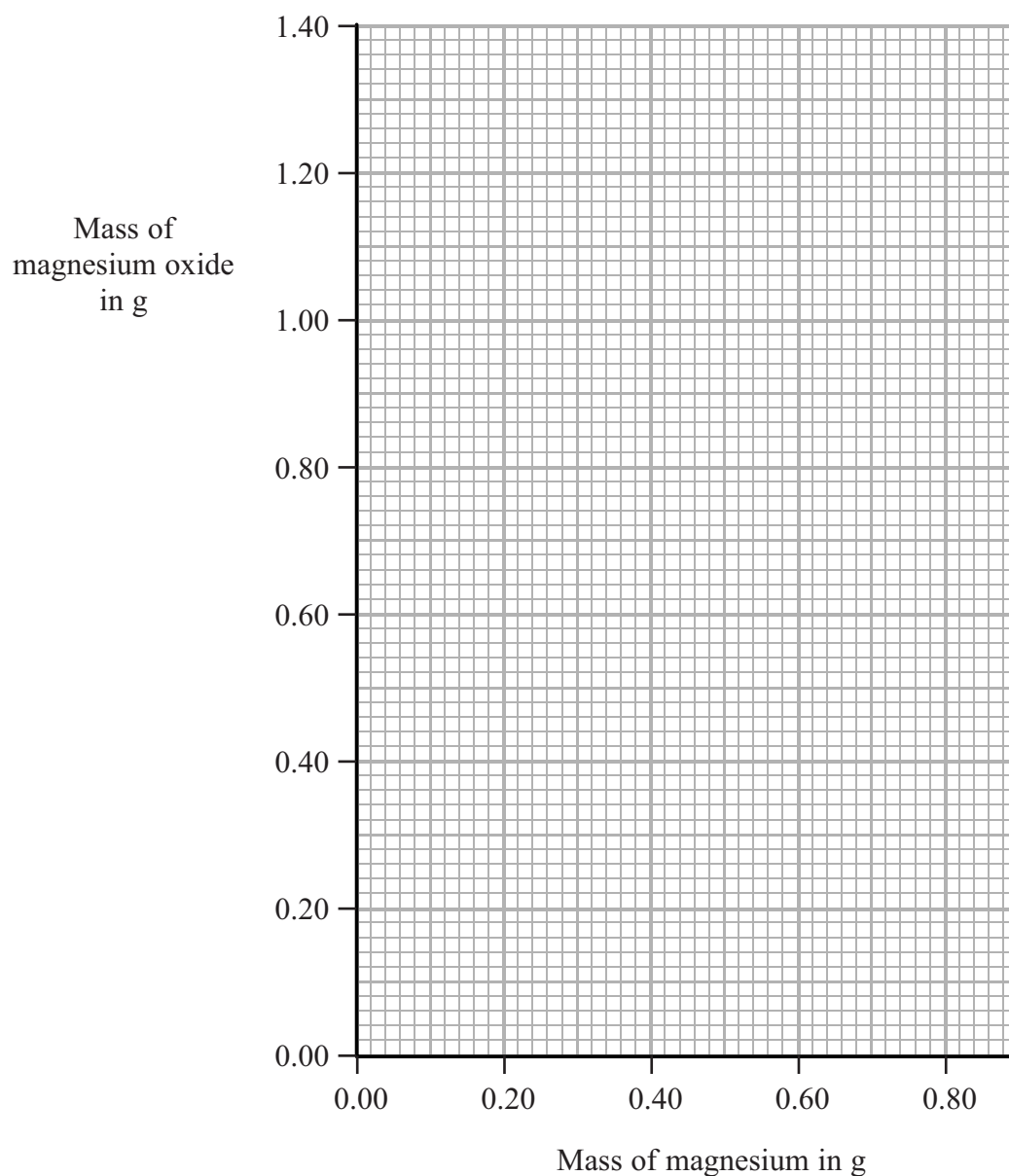
(c) The results of each experiment are given in the table.

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)

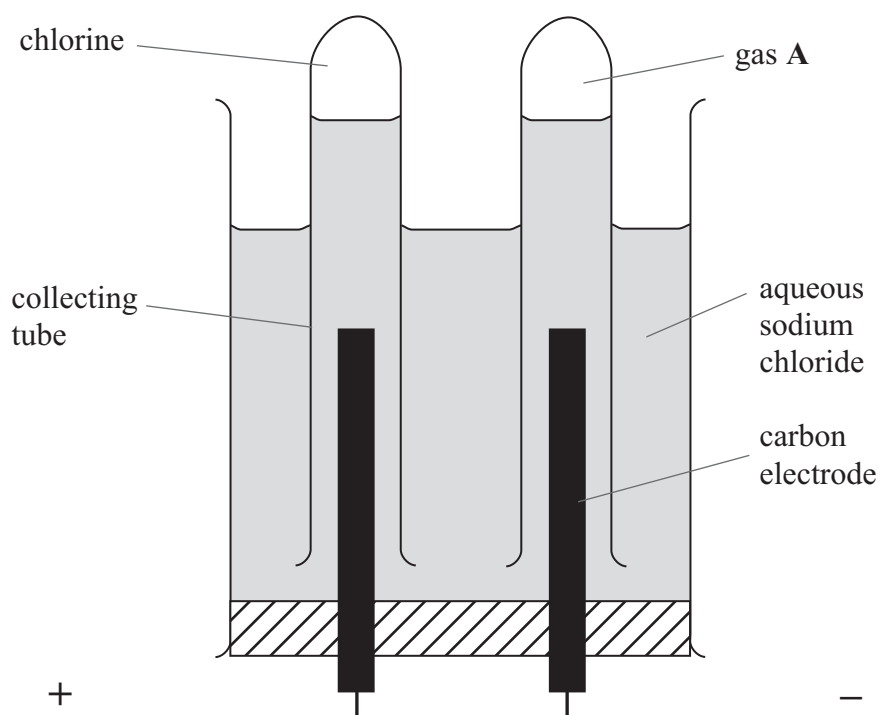
(iii) Use your graph to find the mass of magnesium oxide formed when 0.48 g of magnesium is burned.

(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)

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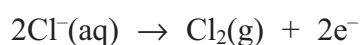


(b) Some of the solution formed after the electrolysis was tested with the indicator phenolphthalein. The indicator turned pink

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 dm³ 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)

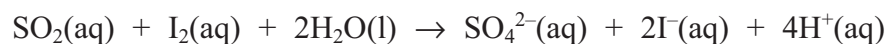
TURN OVER FOR QUESTION 8



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

