

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 ►

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PEARSON

THE PERIODIC TABLE

0

7

6

5

4

3

Group

2

1

Period

1

1	H	1
	Hydrogen	

4	He	2
	Helium	

7	Li	3	9	Be	4
	Lithium			Beryllium	
23	Na	11	24	Mg	12
	Sodium			Magnesium	
39	K	19	40	Ca	20
	Potassium			Calcium	
86	Rb	37	88	Sr	38
	Rubidium			Strontium	
133	Cs	55	137	Ba	56
	Caesium			Barium	
223	Fr	87	226	Ra	88
	Francium			Radium	
				Ac	89
				Actinium	

11	B	5	12	C	6	14	N	7	16	O	8	19	F	9	20	Ne	10
	Boron			Carbon			Nitrogen			Oxygen			Fluorine			Neon	
27	Al	13	28	Si	14	31	P	15	32	S	16	35.5	Cl	17	40	Ar	18
	Aluminium			Silicon			Phosphorus			Sulfur			Chlorine			Argon	
70	Ga	31	73	Ge	32	75	As	33	79	Se	34	80	Br	35	84	Kr	36
	Gallium			Germanium			Arsenic			Selenium			Bromine			Krypton	
115	In	49	119	Sn	50	122	Sb	51	128	Te	52	127	I	53	131	Xe	54
	Indium			Tin			Antimony			Tellurium			Iodine			Xenon	
204	Tl	81	207	Pb	82	209	Bi	83	210	Po	84	210	At	85	222	Rn	86
	Thallium			Lead			Bismuth			Polonium			Astatine			Radon	

59	Co	27	56	Fe	26	55	Mn	25	52	Cr	24	51	V	23	48	Ti	22	45	Sc	21
	Cobalt			Iron			Manganese			Chromium			Vanadium			Titanium			Scandium	
59	Ni	28	59	Ni	28	59	Ni	28	59	Ni	28	59	Ni	28	59	Ni	28	59	Ni	28
	Nickel			Nickel			Nickel			Nickel			Nickel			Nickel			Nickel	
106	Pd	46	106	Pd	46	106	Pd	46	106	Pd	46	106	Pd	46	106	Pd	46	106	Pd	46
	Palladium			Palladium			Palladium			Palladium			Palladium			Palladium			Palladium	
103	Rh	45	103	Rh	45	103	Rh	45	103	Rh	45	103	Rh	45	103	Rh	45	103	Rh	45
	Rhodium			Rhodium			Rhodium			Rhodium			Rhodium			Rhodium			Rhodium	
190	Os	76	190	Os	76	190	Os	76	190	Os	76	190	Os	76	190	Os	76	190	Os	76
	Osmium			Osmium			Osmium			Osmium			Osmium			Osmium			Osmium	
186	Re	75	186	Re	75	186	Re	75	186	Re	75	186	Re	75	186	Re	75	186	Re	75
	Rhenium			Rhenium			Rhenium			Rhenium			Rhenium			Rhenium			Rhenium	
184	W	74	184	W	74	184	W	74	184	W	74	184	W	74	184	W	74	184	W	74
	Tungsten			Tungsten			Tungsten			Tungsten			Tungsten			Tungsten			Tungsten	
181	Ta	73	181	Ta	73	181	Ta	73	181	Ta	73	181	Ta	73	181	Ta	73	181	Ta	73
	Tantalum			Tantalum			Tantalum			Tantalum			Tantalum			Tantalum			Tantalum	
179	Hf	72	179	Hf	72	179	Hf	72	179	Hf	72	179	Hf	72	179	Hf	72	179	Hf	72
	Hafnium			Hafnium			Hafnium			Hafnium			Hafnium			Hafnium			Hafnium	
139	La	57	139	La	57	139	La	57	139	La	57	139	La	57	139	La	57	139	La	57
	Lanthanum			Lanthanum			Lanthanum			Lanthanum			Lanthanum			Lanthanum			Lanthanum	

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:

bromine-79 = 50.7% and 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.

[illegible]

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** ☐

(ii) a noble gas

(1)

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(iii) a Group 2 metal

(1)

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(iv) a halogen

(1)

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐



(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).

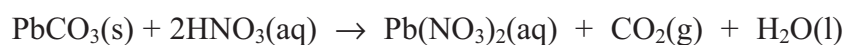
(2)

- (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)



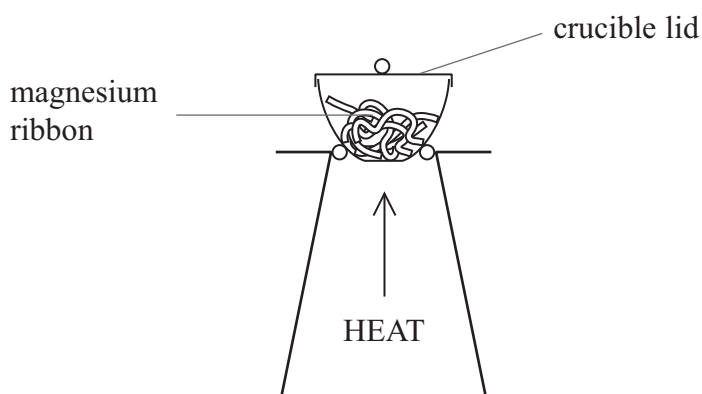
4 When magnesium is burned in air, it reacts with oxygen, O_2 , to form magnesium oxide, MgO

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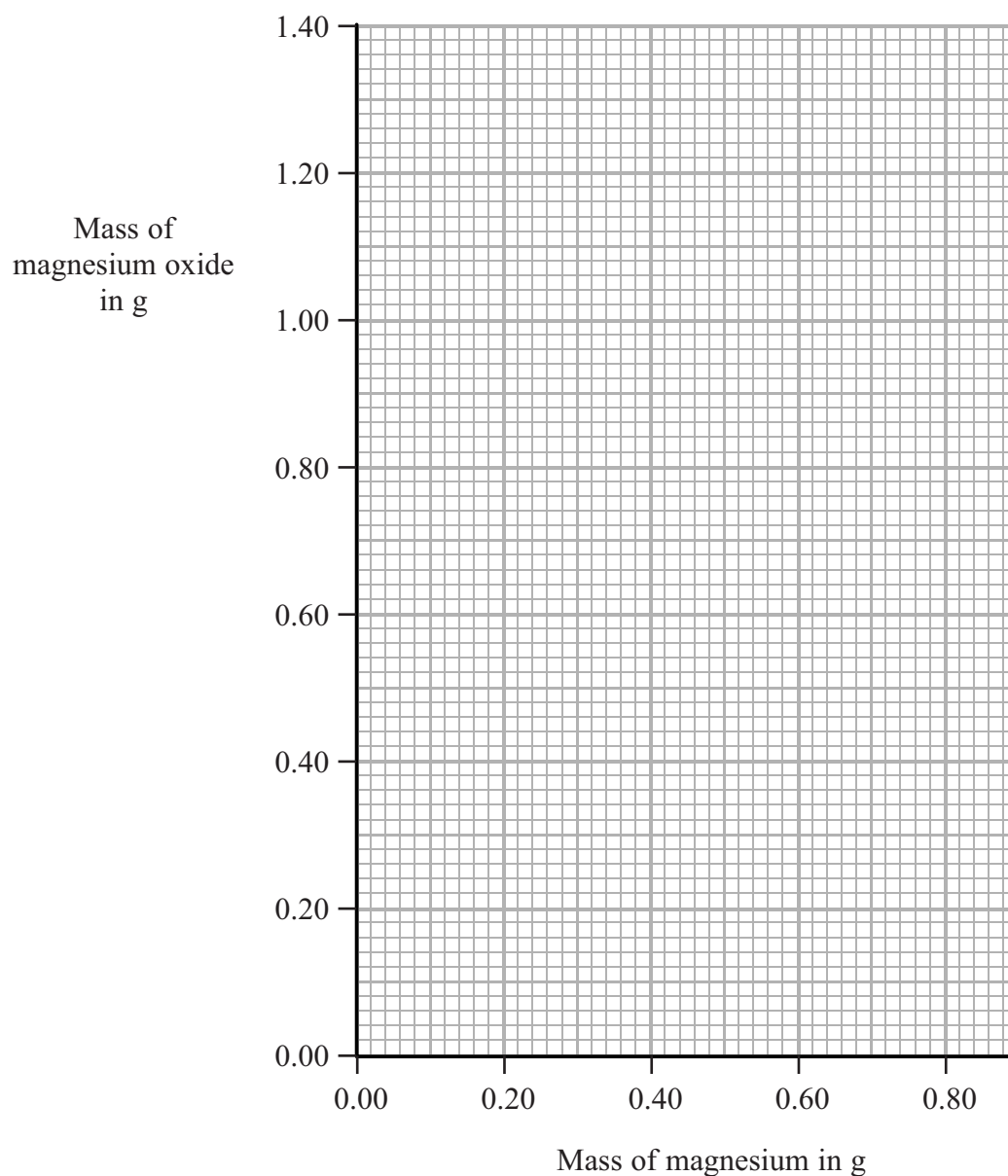
(c) The results of each experiment are given in the table.

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)

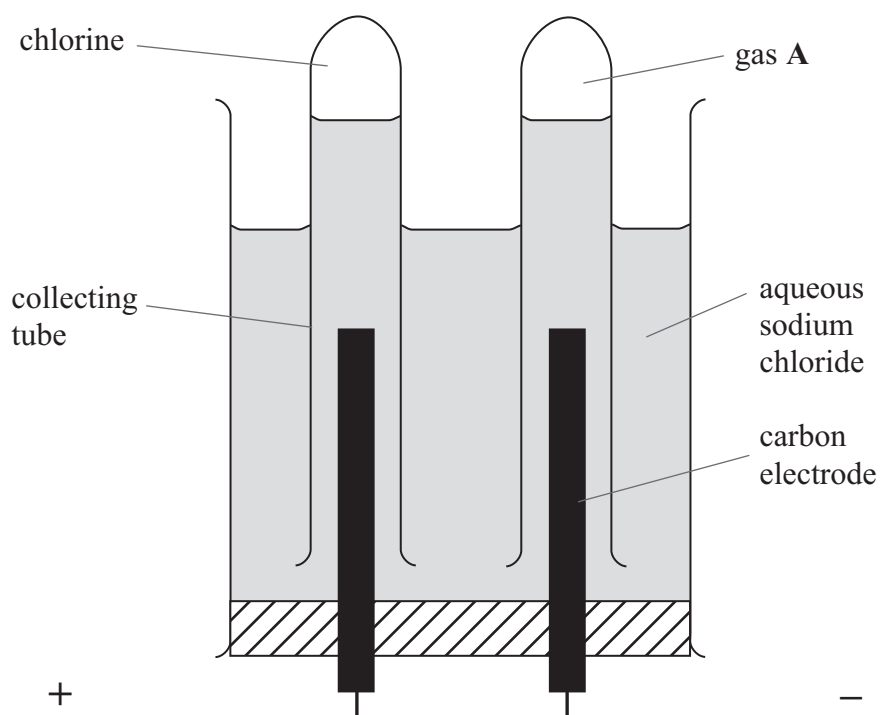
(iii) Use your graph to find the mass of magnesium oxide formed when 0.48 g of magnesium is burned.

(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)

.....

.....

.....

.....

(ii) Identify gas A. (1)

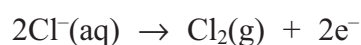
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- (b) Some of the solution formed after the electrolysis was tested with the indicator phenolphthalein. The indicator turned pink

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 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 $\text{CuSO}_4\text{H}_{10}$

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)

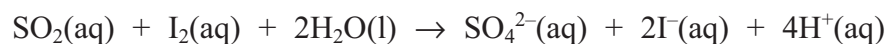
TURN OVER FOR QUESTION 8



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

