

Write your name here	
Surname	Other names
Pearson Edexcel GCSE	Centre Number
	Candidate Number
Chemistry/Additional Science	
Unit C2: Discovering Chemistry	
Foundation Tier	
Tuesday 9 June 2015 – Afternoon Time: 1 hour	Paper Reference 5CH2F/01
You must have: Calculator, ruler	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.*

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.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

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

Turn over ►

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0																																										
7 Li lithium 3	9 Be beryllium 4	23 Na sodium 11	24 Mg magnesium 12	39 K potassium 19	40 Ca calcium 20	85 Rb rubidium 37	88 Sr strontium 38	133 Cs caesium 55	137 Ba barium 56	223 Fr francium 87	226 Ra radium 88	103 La* lanthanum 57	104 Ac* actinium 89	105 Db dubnium 105	106 Sg seaborgium 106	107 Bh bohrium 107	108 Hs hassium 108	109 Mt meitnerium 109	110 Ds darmstadtium 110	111 Rg roentgenium 111	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																						
11 B boron 5	12 C carbon 6	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18	27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	127 I iodine 53	131 Xe xenon 54	197 Au gold 79	195 Pt platinum 78	192 Ir iridium 77	186 Re rhenium 75	184 W tungsten 74	181 Ta tantalum 73	178 Hf hafnium 72	139 La* lanthanum 57	137 Ba barium 56	103 La* lanthanum 57	104 Ac* actinium 89	105 Db dubnium 105	106 Sg seaborgium 106	107 Bh bohrium 107	108 Hs hassium 108	109 Mt meitnerium 109	110 Ds darmstadtium 110	111 Rg roentgenium 111	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
1 H hydrogen 1	4 He helium 2	19 F fluorine 9	16 O oxygen 8	14 N nitrogen 7	12 C carbon 6	11 B boron 5	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	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	112 Cd cadmium 48	112 Cd cadmium 48	197 Au gold 79	195 Pt platinum 78	192 Ir iridium 77	186 Re rhenium 75	184 W tungsten 74	181 Ta tantalum 73	178 Hf hafnium 72	139 La* lanthanum 57	137 Ba barium 56	103 La* lanthanum 57	104 Ac* actinium 89	105 Db dubnium 105	106 Sg seaborgium 106	107 Bh bohrium 107	108 Hs hassium 108	109 Mt meitnerium 109	110 Ds darmstadtium 110	111 Rg roentgenium 111	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
Elements with atomic numbers 112-116 have been reported but not fully authenticated																																																	

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.



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Questions begin on next page.



Answer ALL questions

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Halogens

- 1 The table gives information about the colours and physical states at room temperature of the halogens, chlorine, bromine and iodine.

(a) Complete the table.

(3)

name	colour at room temperature	physical state at room temperature
chlorine		gas
bromine		liquid
iodine	grey	

(b) These two hazard symbols are attached to a container of liquid bromine.



A chemist uses bromine in an experiment.

Use the hazard symbols to suggest safety precautions the chemist should take when using the bromine.

(2)

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(c) Magnesium reacts with bromine to form magnesium bromide.

Write the word equation for this reaction.

(2)

(d) Sodium reacts with chlorine to form sodium chloride.

Which of these is the formula for sodium chloride?

Put a cross (X) in the box next to your answer.

(1)

- A SCI
- B NaOCl
- C NaCl
- D SOCl

(Total for Question 1 = 8 marks)

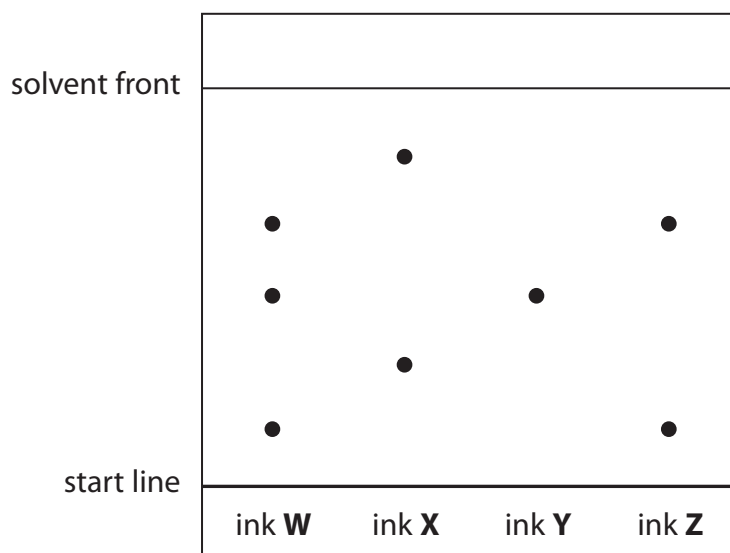


Mixtures and compounds

- 2 (a) Paper chromatography can be used to separate the coloured dyes in inks.

A student carried out a chromatography experiment on four inks, **W**, **X**, **Y** and **Z**.

The diagram shows the result.



- (i) State the letter of the ink that contained only one coloured dye.

(1)

- (ii) Ink **W** has been made by mixing two of the other inks together.

State the two inks that could have been mixed to make ink **W**.

(1)

and

- (b) Complete the sentence by putting a cross (☒) in the box next to your answer.

Oil and water are immiscible liquids.

A mixture of oil and water is best separated by using

(1)

- A** distillation
- B** evaporation
- C** a filter funnel
- D** a separating funnel



- (c) Which row of the table correctly shows the boiling point and ability to conduct electricity of a simple molecular, covalent liquid?

Put a cross (☒) in the box next to your answer.

(1)

	boiling point	ability to conduct electricity
<input checked="" type="checkbox"/> A	low	good
<input checked="" type="checkbox"/> B	high	poor
<input checked="" type="checkbox"/> C	low	poor
<input checked="" type="checkbox"/> D	high	good

- (d) Hydrogen chloride, HCl, can be formed by the reaction of hydrogen, H₂, with chlorine, Cl₂.

Write the balanced equation for this reaction.

(2)

- (e) The electronic configuration of hydrogen is 1.
The electronic configuration of chlorine is 2.8.7.

Draw a dot and cross diagram to show the arrangement of electrons in a molecule of hydrogen chloride, HCl.

Show outer electrons only.

(2)

(Total for Question 2 = 8 marks)



Ions and analysis

3 (a) Which of the following is the formula of a cation?

Put a cross (☒) in the box next to your answer.

(1)

- A** Mg
- B** Na⁺
- C** H₂O
- D** F⁻

(b) (i) The formula of a potassium ion is K⁺ and of a carbonate ion is CO₃²⁻.

Which of the following is the formula of potassium carbonate?

Put a cross (☒) in the box next to your answer.

(1)

- A** KCO₃
- B** K(CO)₃
- C** K₂CO₃
- D** K(CO₃)₂

(ii) When dilute hydrochloric acid is added to potassium carbonate, a gas is evolved.

Describe the test for this gas.

(2)

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.....

.....



- (c) Barium nitrate solution is added to potassium sulfate solution in a beaker.
A white precipitate of barium sulfate forms in a mixture with potassium nitrate solution.

Describe how you would obtain a pure, dry sample of barium sulfate from the mixture in the beaker.

(3)

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- (d) Magnesium oxide is an ionic compound.

The electronic configuration of magnesium is 2.8.2.

The electronic configuration of oxygen is 2.6.

Describe, in terms of electrons, how a magnesium atom and an oxygen atom form ions in magnesium oxide, MgO.

(3)

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- (e) Calculate the relative formula mass of magnesium oxide, MgO.
(relative atomic masses: O = 16; Mg = 24)

(1)

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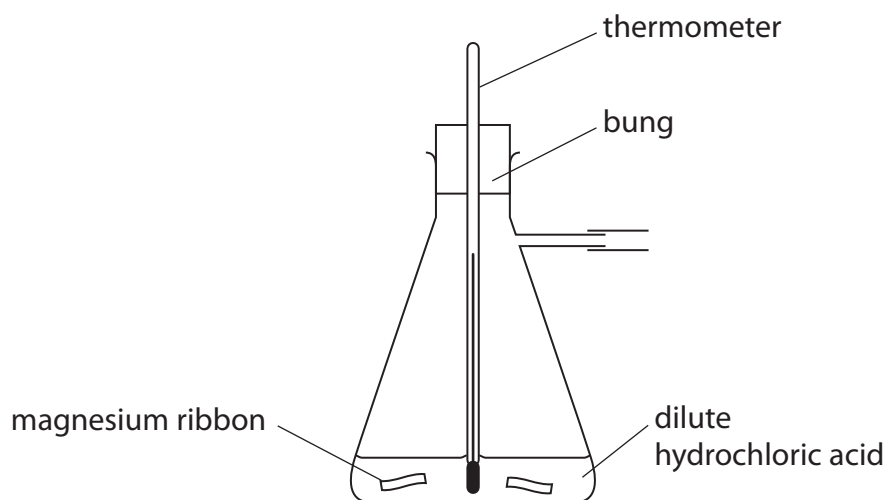
relative formula mass =

(Total for Question 3 = 11 marks)

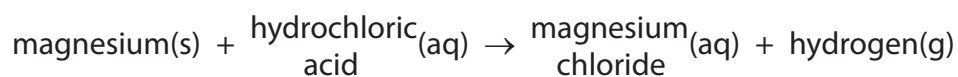


Chemical reactions

- 4 The apparatus shown was used by a student to investigate the reaction between strips of magnesium ribbon and **excess** dilute hydrochloric acid.



The word equation for the reaction is



- (a) States of substances in reactions can be shown by state symbols.

Explain the difference between magnesium chloride(aq) and magnesium chloride(l).

(2)

- (b) Describe what you would **see** when magnesium ribbon reacts with dilute hydrochloric acid.

(1)

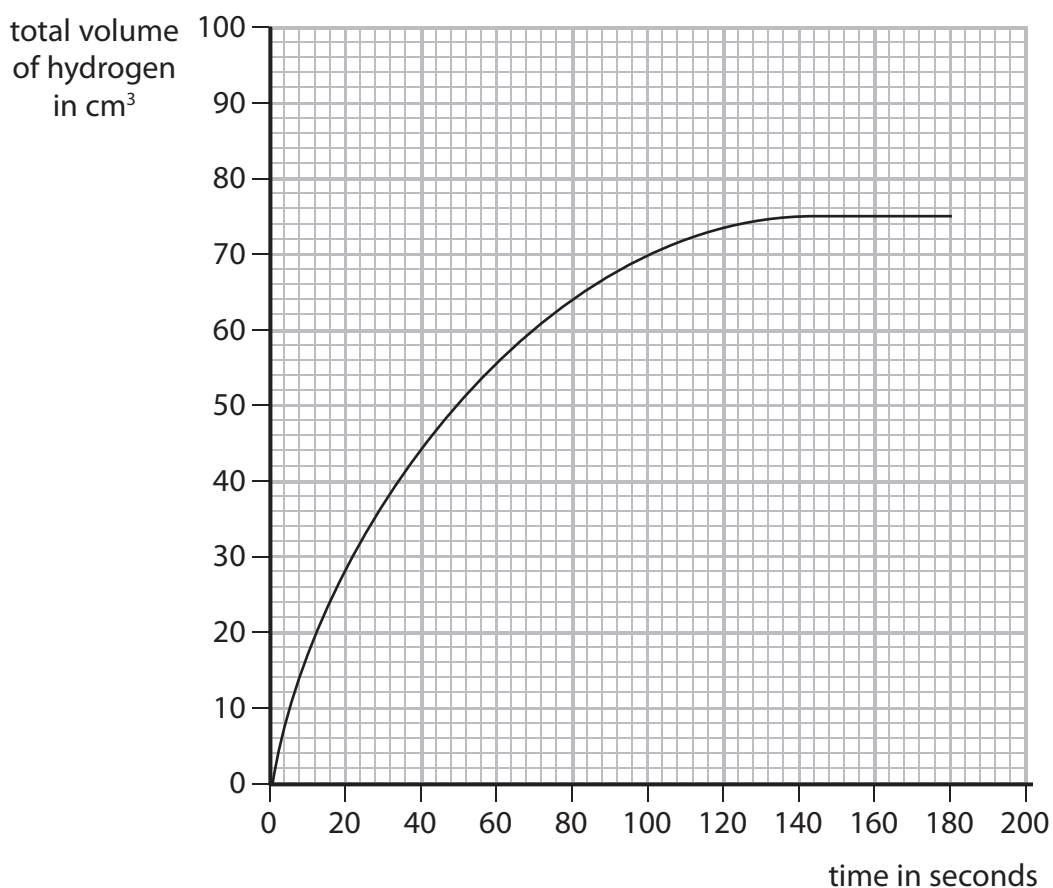


(c) Every 20 seconds, the student recorded the total volume of hydrogen produced in the reaction.

- (i) Name a piece of apparatus the student should use to measure the volume of hydrogen produced.

(1)

The results are shown on the graph.



- (ii) After how many seconds had all the magnesium reacted?

(1)

..... seconds

- (iii) The experiment is repeated using the same volume of a more concentrated hydrochloric acid solution. All other conditions were kept the same.

On the graph draw a curve to show how the volume of hydrogen changes with time during this experiment.

(2)



- (d) A student repeated the original experiment using the same mass of magnesium as a powder instead of as ribbon.

All other conditions were the same as in the first experiment.

Explain the effect on the rate of reaction of using magnesium powder instead of magnesium ribbon.

(2)

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- (e) When magnesium reacts with dilute hydrochloric acid there is a change in temperature.

In an experiment the results were

temperature at start = 21°C

temperature at end = 62°C

Explain what conclusion can be made about the type of reaction, from these results.

(2)

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(Total for Question 4 = 11 marks)



Atoms and the periodic table

5 (a) Complete the table to show the relative mass of a neutron and of an electron.

(2)

particle	relative mass
proton	1
neutron	
electron	

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

An atom has no overall charge because it contains

(1)

- A** more protons than electrons
- B** the same number of electrons and protons
- C** the same number of electrons and neutrons
- D** more neutrons than electrons

(c) The atomic number of lithium is 3.

The mass number of an atom of lithium is 7.

State the name and number of each of the particles in the nucleus of this atom.

(2)

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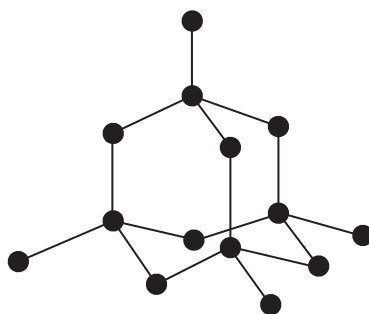
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(Total for Question 5 = 11 marks)



Elements

- 6 (a) The arrangement of carbon atoms in diamond is shown.



diamond

Explain why diamond has a very high melting point.

(2)

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(b) (i) Calculate the percentage by mass of calcium in calcium chloride, CaCl_2 .

(relative atomic masses $\text{Cl} = 35.5$; $\text{Ca} = 40$;
relative formula mass $\text{CaCl}_2 = 111$)

(2)

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.....

percentage by mass = %

(ii) Which row of the table correctly shows the solubility of calcium chloride and barium sulfate in water?

Put a cross (☒) in the box next to your answer.

(1)

	calcium chloride	barium sulfate
<input type="checkbox"/> A	soluble	soluble
<input type="checkbox"/> B	insoluble	insoluble
<input type="checkbox"/> C	insoluble	soluble
<input type="checkbox"/> D	soluble	insoluble



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(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS



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