

Write your name here

Surname

Other names

Pearson
Edexcel GCSE

Centre Number

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Candidate Number

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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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PEARSON

The Periodic Table of the Elements

	1	2	3	4	5	6	7	0										
	7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 P phosphorus 15	16 O oxygen 8	17 Cl chlorine 17	18 Ar argon 18								
	19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36
	37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54
	55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 Rn radon 86
	[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[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						

1	H	1
	hydrogen	

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)

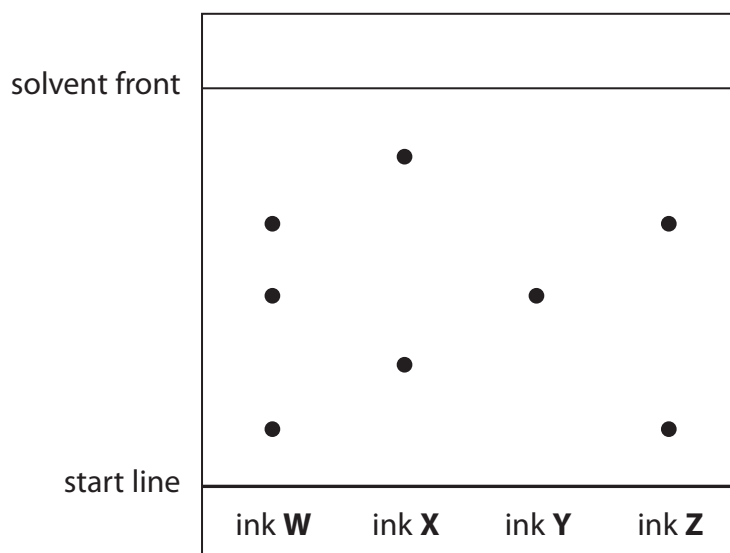


Mixtures and compounds

- 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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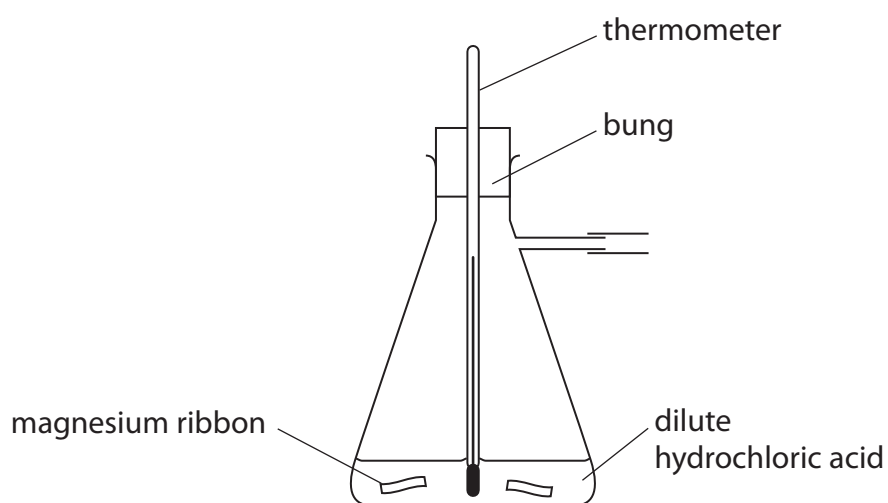
relative formula mass =

(Total for Question 3 = 11 marks)

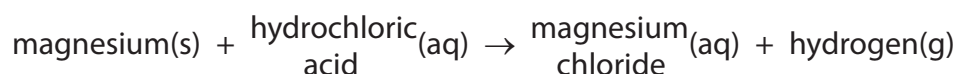


Chemical reactions

- 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)

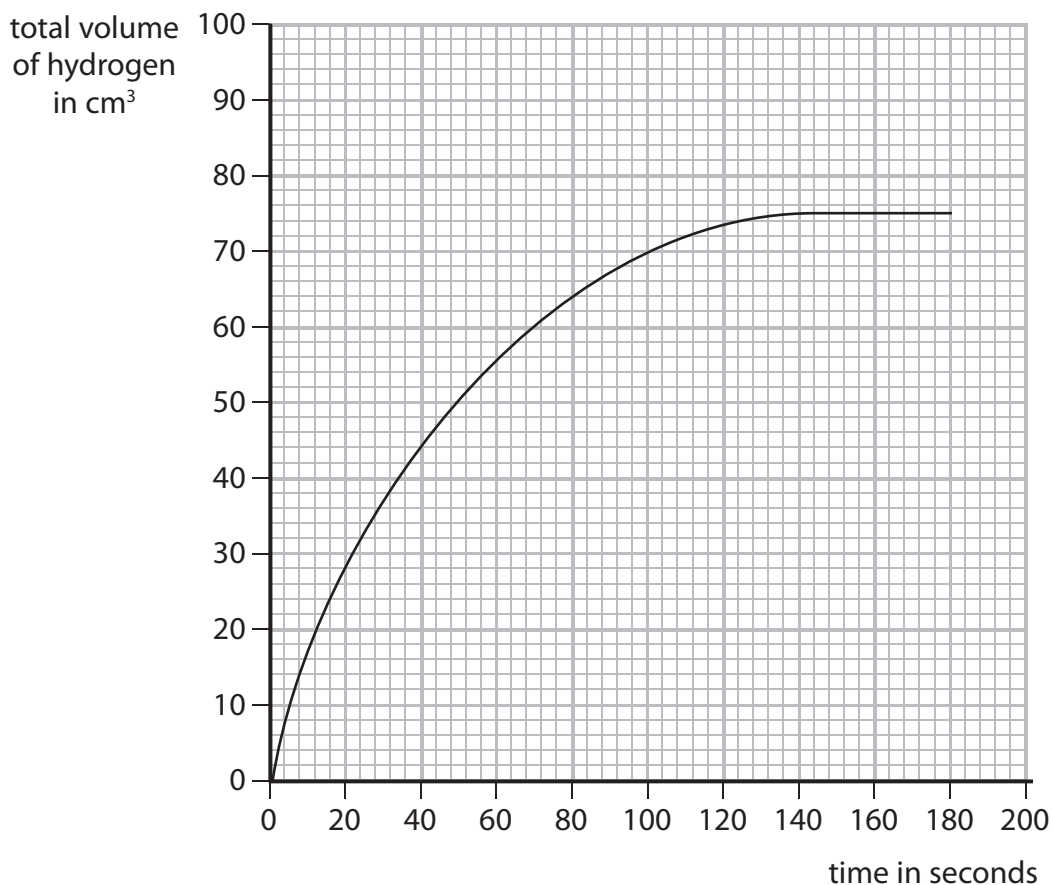


(c) Every 20 seconds, the student recorded the total volume of hydrogen produced in the reaction.

(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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.....



*(d) Here is some information about the periodic table.

In the periodic table elements are arranged in rows and columns.
The position of an element in the periodic table depends on its atomic structure.
Elements with similar chemical properties are found in the same parts of the periodic table.

Identify different parts of the periodic table and explain how the position of an element in the periodic table is linked to its chemical properties and atomic structure.

(You are provided with an outline of the periodic table below and you may use this to help your answer.)

The image shows an outline of the periodic table with a grid structure. The grid is approximately 4 rows high and 18 columns wide. The first two columns on the left are shaded black. The first column on the right is shaded black. The second, third, and fourth columns from the right are shaded black. There is a single shaded cell in the top row, centered horizontally. There is another single shaded cell in the top row, positioned at the far right end of the grid.

(6)

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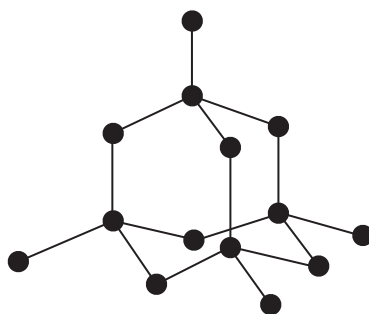
Handwriting practice area with 25 horizontal dotted lines.

(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?

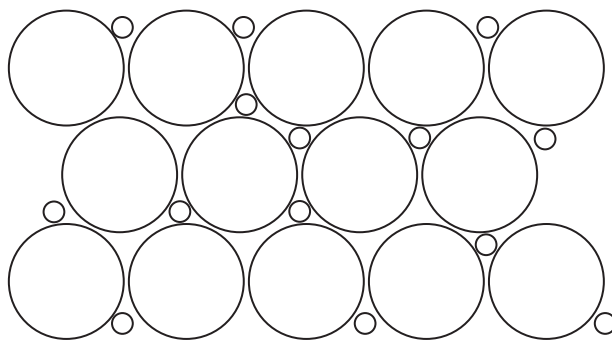
Put a cross (☒) in the box next to your answer.

(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



*(c) The diagram shows the structure of a metal.



Use the diagram to describe the structure of a metal and to explain why metals are malleable and conduct electricity.

(6)

A series of horizontal dotted lines provided for writing the student's answer to the question.



Blank writing area with horizontal dotted lines.

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS



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