Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Chemistry/Additional Science

Unit C2: Discovering Chemistry

Foundation Tier

Wednesday 7 November 2012 – Morning
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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P 4 1 7 4 9 A 0 1 2 0

PEARSON

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											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
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	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
[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						

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.

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 ☒.

Hand warmers

1 Some people use a hand warmer to warm their hands in winter.

(a) A chemical reaction takes place in the hand warmer.
This reaction gives out heat energy.

Give the name for reactions that give out heat energy.

(1)

.....

(b) In the hand warmer, iron reacts with oxygen.

Complete the word equation for this reaction.

(2)

iron + ... → .....

(c) Some hand warmers contain sodium chloride mixed with the reactants.
If sodium chloride is present, it is not used up but the chemical reaction is faster.

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

In this reaction the sodium chloride is acting as

(1)

☒ **A** a precipitate

☒ **B** a catalyst

☒ **C** an element

☒ **D** an alkali metal

(d) When ammonium nitrate crystals are dissolved in water, heat energy is taken in.

A student puts some water in a beaker.
He puts a thermometer in the water.
He adds some ammonium nitrate crystals and stirs the mixture.

Describe what the student would **see**.

(2)

.....

.....

.....

.....

.....

(e) In an experiment, the time taken for some potassium chloride crystals to dissolve in water has been measured.

A student is given the same mass of potassium chloride to dissolve in the same volume of water.

State **one** change that could be made to the potassium chloride crystals and **one** change that could be made to the water to make the dissolving faster.

(2)

change made to the potassium chloride crystals

.....

.....

change made to the water

.....

.....

(Total for Question 1 = 8 marks)

Salts

2 (a) Calcium chloride solution reacts with silver nitrate solution.
Solid silver chloride and calcium nitrate solution are formed.

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

The formula of a salt is $Ca(NO_3)_2$.

The name of this salt is

(1)

☒ **A** calcium nitride

☒ **B** calcium nitrate

☒ **C** calcium chloride

☒ **D** silver nitrate

(ii) The mixture produced in the reaction is filtered to obtain the silver chloride.
The solid silver chloride is washed with water and left to dry.
The yield of dry silver chloride was 3.0 g.

The theoretical yield of dry silver chloride in this experiment was 4.0 g.

1. Suggest why the yield was less than 4.0 g.

(2)

.....

.....

.....

.....

2. Calculate the percentage yield of this experiment.

(2)

.....

.....

.....

percentage yield = ... %

(b) (i) Calculate the relative formula mass of silver chloride, AgCl.
(relative atomic masses: Cl = 35.5, Ag = 108)

(1)

.....

relative formula mass = ...

(ii) Calculate the percentage by mass of silver, Ag, in silver chloride, AgCl.
(relative atomic masses: Cl = 35.5, Ag = 108)

(2)

.....

.....

.....

percentage of silver = ... %

(Total for Question 2 = 8 marks)

Groups in the periodic table

3 The elements lithium, sodium and potassium are all in the same group of the periodic table.

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

These elements are in

(1)

☒ **A** group 0

☒ **B** group 1

☒ **C** group 2

☒ **D** group 7

(b) Give the symbol of an atom of another element that is in the same group of the periodic table as lithium, sodium and potassium.

(1)

symbol .....

(c) The table shows the relative hardness and melting points of the three alkali metals, lithium, sodium and potassium, and the three transition metals, iron, copper and nickel.

metal	relative hardness	melting point / °C
lithium	0.6	181
sodium	0.4	98
potassium	0.5	63
iron	5.0	1535
copper	3.0	1083
nickel	4.0	1455

Alkali metals and transition metals have different typical properties.

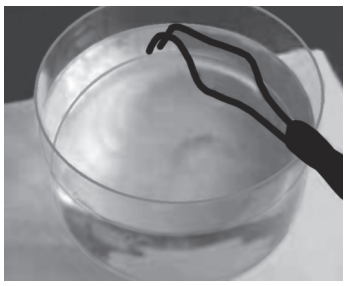
Draw **one** straight line from alkali metals and **one** from transition metals to their typical properties.

(2)

metals	**properties**
alkali metals	strong and have high melting points
	strong and have low melting points
	soft and have high melting points
transition metals	soft and have low melting points

(d) Potassium reacts with water.

In a class demonstration, a teacher drops a piece of potassium on to water.



(i) The teacher ties back her hair and wears a laboratory coat and goggles.

Suggest another safety precaution that the teacher should take.

(1)

.....

.....

(ii) The word equation for this reaction is given below.
Two of the state symbols have been given.

Write the other two state symbols in the spaces provided.

(2)

potassium(s) + water (l) → potassium hydroxide(.....) + hydrogen(.....)

(iii) Describe what you **see** when potassium is added to water.

(2)

.....

.....

.....

.....

(iv) Balance the equation for the reaction between potassium and water by putting numbers in the spaces provided.

(2)

.....K + $2H_2O$ → .....KOH + H_2

(Total for Question 3 = 11 marks)

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Atoms

4 Most atoms contain electrons, protons and neutrons.

(a) Describe the positions of these particles in atoms.

(3)

(b) A chlorine atom contains 17 electrons.

What is the electronic configuration of a chlorine atom?

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

(1)

☒ **A** 10.7

☒ **B** 8.8.1

☒ **C** 17

☒ **D** 2.8.7

(c) Chlorine and bromine are in the same group in the periodic table.

(i) Explain, in terms of electrons, why these elements are placed in the same group.

(2)

(ii) Describe the appearance of bromine at room temperature and pressure.

(2)

.....

.....

.....

.....

(d) An experiment was carried out to see how large a nucleus is compared to the overall size of an atom.

In the experiment a very large number of positively charged particles are fired at a thin sheet of gold.
When one of these positively charged particles comes close to the nucleus of a gold atom it is repelled.

Explain why only about 1 in every 20 000 positively charged particles are repelled.

(2)

.....

.....

.....

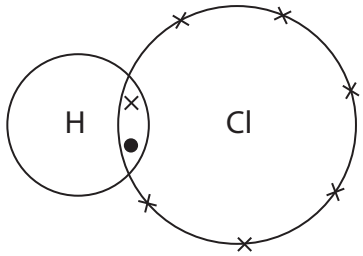
.....

(Total for Question 4 = 10 marks)

Gases

5 (a) Hydrogen chloride is a gas at room temperature.

The diagram shows the outer shell electrons in a molecule of hydrogen chloride.



(i) Give the name of the type of bond between the hydrogen and chlorine atoms in the molecule.

(1)

.....

(ii) Give the formula of a molecule of hydrogen chloride.

(1)

.....

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

A property of hydrogen chloride is that it

(1)

☒ **A** conducts electricity

☒ **B** has a high melting point

☒ **C** has a low boiling point

☒ **D** exists as a giant structure

(b) Hydrogen, H_2, reacts with fluorine, F_2, to form hydrogen fluoride, HF.

Write the balanced equation for the reaction.

(2)

.....

*(c) Methane is a gas at room temperature.
It exists as molecules, CH_4.
Methane has a low boiling point.
It does not conduct electricity.

Explain, in terms of the nature of its molecules and the forces between its molecules, why methane has a low boiling point and does not conduct electricity.

(6)

(Total for Question 5 = 11 marks)

Compounds

6 Magnesium flares provide a bright light in an emergency.

When the magnesium burns it reacts with oxygen to form magnesium oxide.

(a) Explain why magnesium oxide is a compound.

(2)

.....

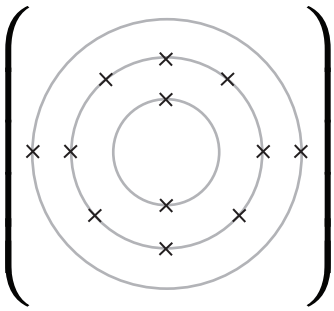
.....

.....

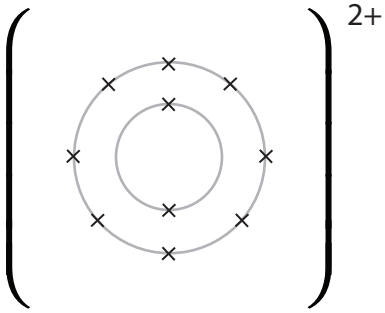
.....

(b) When magnesium reacts with oxygen, one magnesium atom and one oxygen atom form one magnesium ion and one oxide ion.

These diagrams show the arrangement of electrons in a magnesium atom and in a magnesium ion.



magnesium atom

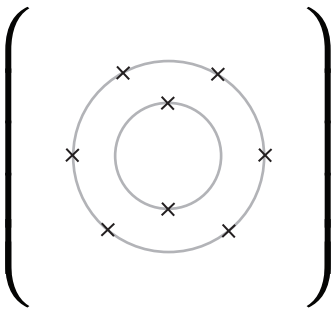


magnesium ion

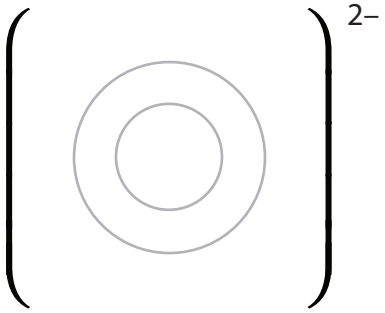
(i) In the diagram below the arrangement of electrons in an oxygen atom is given.

Draw the arrangement of electrons in the oxide ion.

(1)



oxygen atom



oxide ion

(ii) Explain, in terms of their electrons, how a magnesium atom, Mg, and an oxygen atom, O, react together to form a magnesium ion, Mg^{2+}, and an oxide ion, O^{2-}.

(2)

.....

.....

.....

.....

(iii) Magnesium oxide is an ionic compound.

Which of these is a property of solid magnesium oxide?

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

(1)

☒ **A** it has a high melting point

☒ **B** it has a low boiling point

☒ **C** it conducts electricity

☒ **D** it is malleable

*(c) You are given two solid sodium salts, which are unlabelled.

One of the solids is sodium chloride.
The other solid is sodium carbonate.

Describe how you could carry out a flame test to show that they are both sodium salts and describe another test to identify one of the salts completely.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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