Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Chemistry/Additional Science

Unit C2: Discovering Chemistry

Foundation Tier

Wednesday 14 June 2017 – 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P48580A

1/1/1/

P 4 8 5 8 0 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 ☒.

Chemical reactions

1 (a) Pieces of zinc react with dilute hydrochloric acid to produce zinc chloride and hydrogen gas.

(i) State what you would **see** when zinc is added to dilute hydrochloric acid.

(1)

.....

(ii) Write the word equation for this reaction.

(2)

.....

(iii) Describe a test to show that this reaction is exothermic.

(2)

.....

.....

.....

.....

(iv) State what can be done to the pieces of zinc to make the reaction with the dilute hydrochloric acid faster.

(1)

.....

.....

(b) State the effect of adding a catalyst on the rate of a reaction.

(1)

.....

.....

(Total for Question 1 = 7 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

Ions and precipitates

2 (a) Some metal ions can be detected using a flame test.

A flame test involves the following steps.
These steps are not in the correct order.

1 hold the flame test wire in a Bunsen flame
2 dip the flame test wire into the substance
3 clean the flame test wire

What is the correct order of steps for a flame test?

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

(1)

☒ **A** 1 – 3 – 2

☒ **B** 2 – 1 – 3

☒ **C** 2 – 3 – 1

☒ **D** 3 – 2 – 1

(b) Tests for two ions are described and the observations given.

Draw one straight line from each test to the ion it shows to be present.

(2)

description of test and observation	**ion shown**
Add dilute hydrochloric acid followed by barium chloride solution. A white precipitate forms.	carbonate ion, CO_3^{2-}
	chloride ion, Cl^-
Add dilute nitric acid followed by silver nitrate solution. A white precipitate forms.	nitrate ion, NO_3^-
	sulfate ion, SO_4^{2-}

(c) Potassium nitrate contains potassium ions, K^+, and nitrate ions, NO_3^-.

Give the formula of potassium nitrate.

(1)

.....

(d) Copper sulfate solution is added to sodium carbonate solution.

A green precipitate of copper carbonate is formed.

(i) Complete the word equation for this reaction.

(2)

copper ..... → copper ..... + ...

sulfate + ... carbonate +

(ii) Describe how to obtain a pure, dry sample of solid copper carbonate from the mixture.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 2 = 9 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Simple molecular, covalent compounds

3 Hydrogen chloride and water are simple molecular, covalent compounds.

(a) The formula of a molecule of water is H_2O.

Describe what this formula shows about a molecule of water.

(2)

(b) Covalent bonds join atoms together in a molecule of water.

Describe what is meant by a **covalent bond**.

(2)

(c) A chlorine atom has seven electrons in its outer shell.
A hydrogen atom has one electron only.

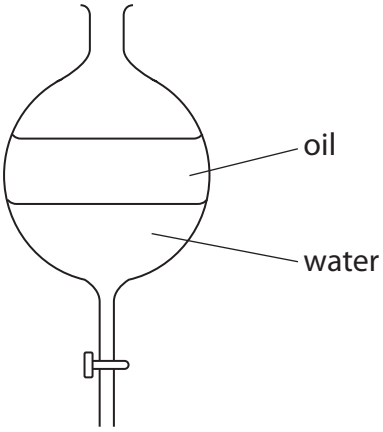
Draw a dot and cross diagram of a molecule of hydrogen chloride, HCl.

Show outer shell electrons only.

(2)

(d) Water and oil do not mix.

(i) The following apparatus can be used to separate a mixture of water and oil.



Give the name of this piece of apparatus.

(1)

.....

(ii) What term is used to describe two liquids that do not mix?

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

(1)

☒ **A** immiscible

☒ **B** inert

☒ **C** insoluble

☒ **D** ionic

(e) Water freezes to form ice.
Ice has a melting point of 0 °C.

Explain, in terms of its structure, why water has a low melting point.

(2)

.....

.....

.....

.....

(Total for Question 3 = 10 marks)

Compounds

4 Lead nitrate solution reacts with sodium iodide solution to form solid lead iodide and sodium nitrate solution.

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

(1)

This reaction is an example of

☒ **A** combustion

☒ **B** separation

☒ **C** neutralisation

☒ **D** precipitation

(ii) The balanced equation for this reaction is shown.

Complete the equation by filling in the state symbols for the products.

(2)

$$Pb(NO_3)_2(aq) + 2NaI(aq) \rightarrow PbI_2(\ldots\ldots) + 2NaNO_3(\ldots\ldots)$$

(iii) Calculate the relative formula mass of sodium nitrate, $NaNO_3$.

(relative atomic masses: Na = 23, N = 14, O = 16)

(1)

relative formula mass = ...

(iv) The formula of lead iodide is PbI_2.

Calculate, using this formula, the percentage by mass of lead in lead iodide.

(relative atomic masses: Pb = 207, I = 127;
relative formula mass of PbI_2 = 461)

(2)

percentage by mass = ...%

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) In an experiment, lead nitrate solution was reacted with sodium iodide solution to produce lead iodide.

(i) The yield of lead iodide from this experiment was 3.5 g.

The theoretical yield of lead iodide for this experiment was 5.0 g.

Calculate the percentage yield of lead iodide in this experiment.

(2)

.....

.....

.....

.....

percentage yield = ...%

(ii) State two reasons why the percentage yields of experiments are often less than 100%.

(2)

reason 1 .....

.....

reason 2 .....

.....

(Total for Question 4 = 10 marks)

Atoms and the periodic table

5 Mendeleev's original periodic table is different from the modern periodic table.

(a) Give one difference between Mendeleev's early periodic table and the modern periodic table.

(1)

.....

(b) An atom of argon contains 18 electrons, 22 neutrons and 18 protons.

(i) State the atomic number of argon.

(1)

.....

(ii) Argon is in group 0 of the periodic table.

Give the symbol of another element in the same group as argon.

(1)

.....

(iii) Which row of the table shows the correct relative charges of an electron, a neutron and a proton?

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

(1)

		relative charge of		
		electron	**neutron**	**proton**
☒	**A**	–1	+1	0
☒	**B**	+1	0	–1
☒	**C**	–1	0	+1
☒	**D**	0	–1	+1

(c) The electronic configuration of an aluminium atom is 2.8.3.

Explain, using this information, why aluminium is placed in group 3 of the periodic table.

(2)

.....

.....

.....

.....

*(d) Sodium fluoride is an ionic compound, containing sodium ions, Na^+, and fluoride ions, F^-.

Sodium and fluoride ions are formed from sodium and fluorine atoms.

Some information about sodium and fluorine atoms is given in the table.

	protons	neutrons	electron configuration
sodium	11	12	2.8.1
fluorine	9	10	2.7

Use the information in the table to describe the structure of sodium and fluorine atoms and how they combine to form sodium and fluoride ions in sodium fluoride.

You may use diagrams to help your answer.

(6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 5 = 12 marks)

Groups of the periodic table

6 (a) Chlorine, bromine and iodine are elements in group 7 in the periodic table.

(i) Chlorine is a toxic gas.

Which of the following hazard symbols would you expect to see on a container filled with chlorine?

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

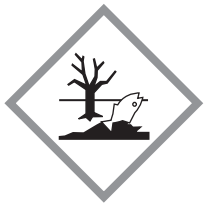
(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**



(ii) At room temperature, chlorine is a yellow-green gas and iodine is a grey solid.

Describe the appearance of bromine at room temperature.

(2)

.....

.....

(iii) Chlorine reacts with hydrogen to form hydrogen chloride.
Hydrogen chloride dissolves in water to form a solution.

Explain how this solution affects universal indicator.

(2)

.....

.....

.....

.....

(b) Which of the following statements is true for **all** the transition metals?

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

(1)

☒ **A** They have low melting points.

☒ **B** They float when placed in water.

☒ **C** They are good conductors of electricity.

☒ **D** They are magnetic.

*(c) Lithium, sodium, potassium, rubidium and caesium are all metals in group 1 of the periodic table.

group 1 of the periodic table

7 **Li** lithium 3
23 **Na** sodium 11
39 **K** potassium 19
85 **Rb** rubidium 37
133 **Cs** caesium 55

The reaction of rubidium and caesium with water can be predicted from the reactions of lithium, sodium and potassium with water.

Describe the similarities and differences in the reactions of these five metals with water.

You may use word equations or balanced equations to help your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

BLANK PAGE

BLANK PAGE

BLANK PAGE