Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Chemistry/Additional Science

Unit C2: Discovering Chemistry

Foundation Tier

Thursday 13 June 2013 – 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.
- You should use a calculator in this examination.

Turn over ▶

P41938A

1/1/1/1/

P 4 1 9 3 8 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 ☒.

Groups in the periodic table

1 The periodic table is very useful to chemists.

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

The periodic table is a table of

(1)

- ☒ **A** mixtures
- ☒ **B** elements
- ☒ **C** compounds
- ☒ **D** solutions

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

Group 1 in the periodic table contains

(1)

- ☒ **A** transition metals
- ☒ **B** noble gases
- ☒ **C** halogens
- ☒ **D** alkali metals

(c) The table shows some of the gases in group 0 and some of their properties.
The gases are shown in the order in which they appear in group 0.

(i) Fill in the three spaces in the table.

(3)

gas	atomic symbol	density / g dm^{-3}	reaction with metals
helium	He	0.12	no reaction
neon	Ne	1.44	no reaction
argon	Ar		no reaction
krypton		3.00	no reaction
xenon	Xe	3.56	

(ii) Some light bulbs contain a metal filament.

These light bulbs are filled with argon.

Explain why argon, instead of air, is used inside these light bulbs.

(2)

.....

.....

.....

.....

.....

(d) The table shows some solids and some properties of solids.

Draw **one** straight line from each solid to properties of that solid.

(2)

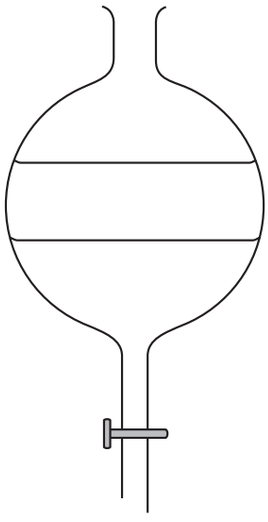
solid	**properties of solid**
iodine	a soft metal that reacts vigorously with water
potassium	a grey solid that forms a purple vapour when heated
copper	a yellow solid that does not conduct electricity
	a red-brown solid that reacts to form blue compounds

(Total for Question 1 = 9 marks)

BLANK PAGE

Water

2 (a) A separating funnel is shown.



The separating funnel can be used to separate two immiscible liquids, such as oil and water.

Describe how you would use a separating funnel to separate two immiscible liquids.

(2)

.....

.....

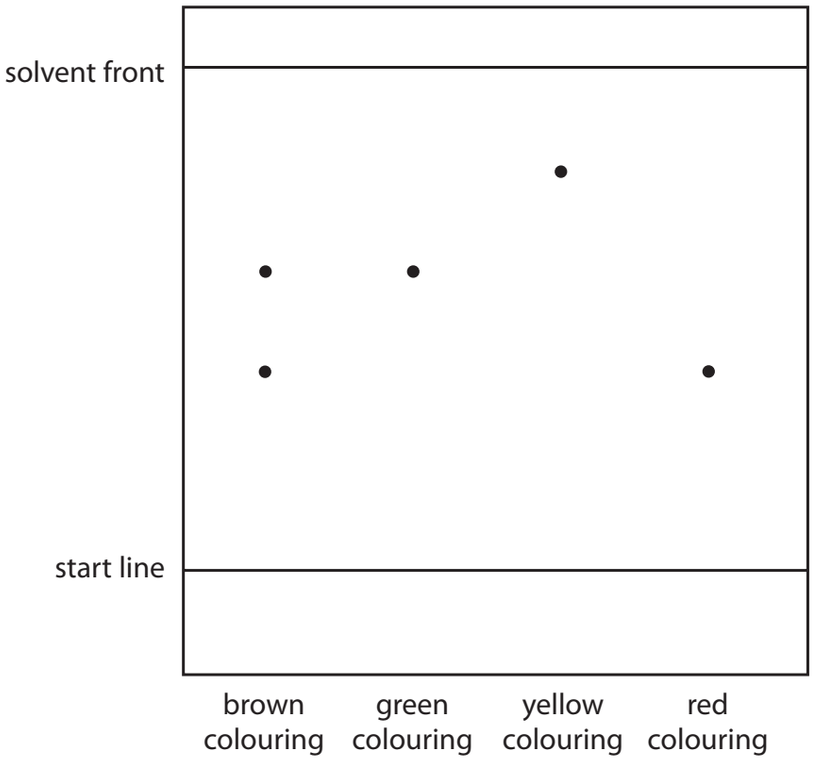
.....

.....

(b) Paper chromatography can be used to separate coloured substances.

A student carried out a chromatography experiment on four food colourings.
The four food colourings were brown, green, yellow and red.

The diagram shows the results.



Use the results of the chromatography experiment to describe the colours present in the brown food colouring.

(2)

.....

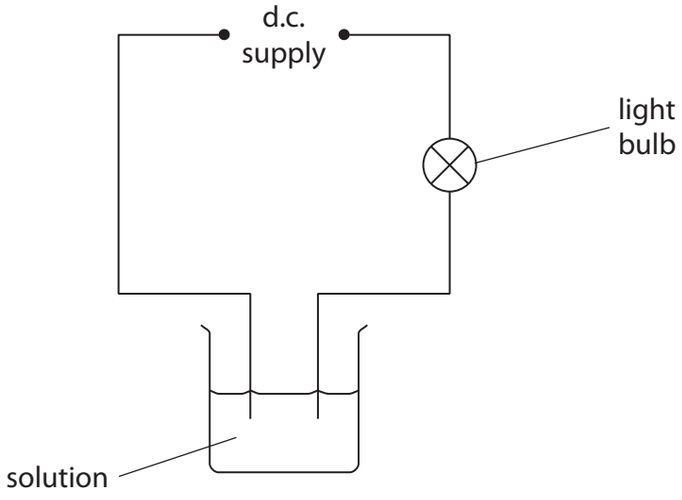
.....

.....

.....

(c) An experiment is carried out on two solutions to see if they conduct electricity.

The apparatus used is shown.



The two solutions used are sodium chloride solution and sucrose solution.
Sodium chloride is an ionic compound.
Sucrose is a simple molecular, covalent compound.

Explain what happens when each solution is tested in the circuit shown.

(3)

.....

.....

.....

.....

.....

(d) Calculate the relative formula mass of water, H_2O.

(Relative atomic masses: H = 1.0, O = 16)

(1)

.....

.....

relative formula mass = ...

(Total for Question 2 = 8 marks)

Atomic structure and the periodic table

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

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(b) The atomic number of oxygen is 8.

The mass number of an atom of oxygen is 17.

Describe the number and type of particles in the nucleus of this atom.

(2)

.....

.....

.....

.....

(c) Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

(d) An atom of phosphorus contains 15 electrons.

Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

.....

.....

.....

.....

(e) Phosphorus oxide is a compound that contains covalent bonds.

(i) Describe what is meant by a **covalent bond**.

(2)

.....

.....

.....

.....

(ii) The formula of a molecule of phosphorus oxide is P_4O_{10}.

Give the empirical formula of this oxide.

(1)

.....

(Total for Question 3 = 10 marks)

Calcium carbonate

4 (a) Calcium nitrate solution reacts with sodium carbonate solution.
The products are calcium carbonate and another salt.

Write the word equation for this reaction.

(2)

.....

.....

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

The colour produced in a flame test by calcium ions is

(1)

☒ **A** green

☒ **B** lilac

☒ **C** orange-red

☒ **D** yellow

(ii) Describe how a flame test is carried out on a solid.

(2)

.....

.....

.....

.....

(c) If calcium carbonate is heated strongly, it decomposes.

$$CaCO_3 \rightarrow CaO + CO_2$$

If 100 g of calcium carbonate is heated a calculation shows that 44 g carbon dioxide should be formed.

(i) In an experiment 100 g of calcium carbonate was heated and only 40 g carbon dioxide was formed.

Calculate the percentage yield of carbon dioxide in this reaction.

(2)

.....

.....

percentage yield of carbon dioxide = ... %

(ii) Suggest a reason why only 40 g of carbon dioxide was formed in the experiment.

(1)

.....

.....

.....

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

Ionic compounds

(1)

☒ **A** conduct electricity when solid

☒ **B** do not conduct electricity when molten

☒ **C** have low boiling points

☒ **D** have high melting points

(Total for Question 4 = 9 marks)

Barium sulfate

5 (a) Barium sulfate contains

barium ions, Ba^{2+}
sulfate ions, SO_4^{2-}

(i) Give the formula of barium sulfate.

(1)

.....

(ii) Give the meaning of the term **ion**.

(1)

.....

.....

(b) This is an X-ray photograph of part of a patient's body.
Before the photograph was taken a suspension of barium sulfate was introduced into his body to show the required part.

Source: andi-sheba.blogspot.com

Many barium salts are toxic.
Barium sulfate is insoluble in water.

Explain why it is safe for the patient to have barium sulfate in his body.

(2)

.....

.....

.....

*(c) Barium sulfate is prepared by reacting barium chloride with sodium sulfate. The barium sulfate is formed as a precipitate.

Describe an experiment to prepare a pure, dry sample of barium sulfate, starting with barium chloride crystals and sodium sulfate crystals.

(6)

(d) Barium reacts with chlorine to produce barium chloride, $BaCl_2$.

Write the balanced equation for this reaction.

(2)

(Total for Question 5 = 12 marks)

BLANK PAGE

Reactions

6 (a) A technician made some dilute sodium hydroxide solution by carefully adding some solid sodium hydroxide to pure water.

This is the hazard symbol on a bottle of solid sodium hydroxide.

(i) State what this symbol shows about sodium hydroxide.

(1)

.....

(ii) Sodium hydroxide solution reacts with dilute hydrochloric acid. During the reaction heat is released.

What type of reaction is this?

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

(1)

☒ **A** displacement

☒ **B** endothermic

☒ **C** neutralisation

☒ **D** precipitation

(b) A catalyst is added to some reactions.

Explain the meaning of **catalyst**.

(2)

.....

.....

.....

(c) Dilute hydrochloric acid reacts with calcium carbonate to produce carbon dioxide gas.

Three different experiments were carried out using large pieces of calcium carbonate, small pieces of calcium carbonate and powdered calcium carbonate. The size of the calcium carbonate pieces was the only factor that was changed.

In each experiment the volume of carbon dioxide released in five minutes was measured.

The results are

size of calcium carbonate pieces used	volume of carbon dioxide released in five minutes / cm^3
large	3
small	7
powdered	50

Describe what this shows about the effect of the surface area of calcium carbonate on the rate of this reaction.

(2)

.....

.....

.....

*(d) Hydrochloric acid reacts with magnesium metal to produce hydrogen gas.

magnesium + hydrochloric acid → magnesium chloride + hydrogen

Describe how you could use magnesium ribbon and a solution of hydrochloric acid to show that decreasing the concentration of the hydrochloric acid changes the rate of this reaction.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

BLANK PAGE