Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Chemistry

Unit C3: Chemistry in Action

Foundation Tier

Wednesday 17 June 2015 – Morning
Time: 1 hour

Paper Reference
5CH3F/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 4 6 8 5 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.

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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 ☒.

Organic substances

1 Vinegar contains ethanoic acid.

(a) Which of these is a use of vinegar?

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

(1)

☐ **A** fuel

☐ **B** perfume

☐ **C** preservative

☐ **D** soap

(b) An indicator can be used to show that ethanoic acid is acidic.

Give the name of an indicator that can be used and state its colour in the acid.

(2)

indicator .....

colour in acid .....

(c) Use the gases from the box to complete the sentences.

Each gas may be used once, more than once or not at all.

carbon dioxide	hydrogen	nitrogen	oxygen

(3)

(i) If a bottle of wine is left open, ethanoic acid is formed when ethanol in the wine is oxidised by ..... .

(ii) Ethanoic acid reacts with magnesium to give a gas. When the gas is mixed with air and ignited with a lighted splint, it gives a squeaky pop.

This gas is ..... .

(iii) When solid sodium carbonate is added to dilute ethanoic acid, effervescence occurs. The effervescence is bubbles of ..... .

(d) Ethanoic acid is reacted with ethanol to produce an ester, ethyl ethanoate, and water.

Write the word equation for this reaction.

(2)

.....

.....

(Total for Question 1 = 8 marks)

Identifying ions

2 Tests are used to identify ions in three salts **X**, **Y** and **Z**.

(a) (i) In a flame test salt **X** gives a yellow flame.

What is the metal ion in salt **X**?

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

(1)

☒ **A** calcium, Ca^{2+}

☒ **B** lithium, Li^{+}

☒ **C** potassium, K^{+}

☒ **D** sodium, Na^{+}

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

(3)

.....

.....

.....

.....

.....

.....

(b) Salt **Y** is a sulfate.
Salt **Y** is dissolved in water.
Dilute hydrochloric acid is added to the solution.
Barium chloride solution is then added to the mixture.

Describe what you would **see** when the barium chloride solution is added.

(2)

.....

(c) Salt **Z** contains iron(III) ions, Fe^{3+}.

Describe what is **seen** when sodium hydroxide solution is added to a solution of **Z**.

(2)

.....

(Total for Question 2 = 8 marks)

Water

3 (a) An acid can be reacted with a base in a titration experiment.

(i) State the name of the type of reaction when an acid reacts with a base.

(1)

.....

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

The general equation for the reaction of an acid with a base is

(1)

☒ **A** acid + base → alkali + water

☒ **B** acid + base → salt + carbon dioxide

☒ **C** acid + base → salt + water + hydrogen

☒ **D** acid + base → salt + water

(b) A solution of sodium hydroxide is prepared.

The mass of a container with solid sodium hydroxide is determined.
The sodium hydroxide is transferred to a flask.
The mass of the empty container is determined.
The sodium hydroxide is dissolved in water and the volume made up to 2 dm^3.

The results are
mass of container + solid sodium hydroxide = 17.12 g
mass of empty container = 7.02 g

The results are used to calculate the concentration of the sodium hydroxide solution.

(i) Calculate the mass of solid sodium hydroxide transferred to the flask.

(1)

.....

mass of solid sodium hydroxide = ... g

(ii) Calculate the concentration of the sodium hydroxide solution in g dm^{-3}.

(1)

.....

.....

concentration of sodium hydroxide solution = ... g dm^{-3}

(c) Some tap water is hard.
The hardness is caused by metal ions dissolved in the water.

(i) Give the name of a metal ion that causes tap water to be hard.

(1)

.....

(ii) Describe problems that can be caused by the use of hard water in the home.

(2)

.....

.....

.....

.....

(iii) The hardness in a water sample can be measured by finding the volume of soap solution needed to form a permanent lather with a known volume of the water.

The hardness in three types of water, **A**, **B** and **C**, was measured.
Fresh samples of **A**, **B** and **C** were boiled and allowed to cool.
The hardness in the boiled samples was then measured.

The table shows the results.

type of water	volume of soap solution needed / cm^3	
	original sample	boiled sample
A	2	2
B	18	18
C	14	2

Hard water can be temporary hard water or permanent hard water.

Water **A** is soft water.

Explain, using the results in the table, the type of hardness in water **B** and in water **C**.

(3)

(Total for Question 3 = 10 marks)

Ethanol and homologous series

4 (a) Ethanol is produced by the fermentation of glucose solution.

(i) Give the name of the substance added to the glucose solution to provide the enzymes needed for fermentation.

(1)

.....

(ii) Fermentation produces a dilute solution of ethanol.

Which process is used to obtain a concentrated solution of ethanol from this dilute solution?

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

(1)

☒ **A** cracking

☒ **B** crystallisation

☒ **C** filtration

☒ **D** fractional distillation

(iii) Alcoholic drinks contain ethanol.
State the effect of drinking alcohol on a person's reaction times.

(1)

.....

.....

(b) Propane, C_3H_8, and butane, C_4H_{10}, are members of the same homologous series, called the alkanes.

(i) Explain why both propane and butane are alkanes.

(2)

.....

.....

.....

(ii) Draw the structure of a molecule of butane, C_4H_{10}, showing all covalent bonds.

(2)

(c) Write the balanced equation for the combustion of methane, CH_4, in oxygen to form carbon dioxide and water.

(3)

.....

(Total for Question 4 = 10 marks)

Fertilisers

5 (a) Nitrogen reacts with hydrogen to form ammonia.

(i) Which of these is the balanced equation for this reaction?

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

(1)

☒ **A** $N + 3H \rightleftharpoons NH_3$

☒ **B** $N_2 + H_2 \rightleftharpoons NH_3$

☒ **C** $N_2 + 3H_2 \rightleftharpoons 2\,NH_3$

☒ **D** $N + H_3 \rightleftharpoons NH_3$

(ii) State the meaning of the symbol $\rightleftharpoons$ in an equation.

(1)

.....

.....

(b) Ammonia is used in the manufacture of some fertilisers.

(i) The table shows information about three fertilisers manufactured from ammonia.

substance	% by mass of nitrogen	% by mass of oxygen
ammonium nitrate	35	60
ammonium sulfate	21	48
urea	47	27

Use the information in the table to explain why urea might be the best fertiliser.

(2)

.....

.....

(ii) When rivers flow through areas where fertilisers have been spread on the land, plants and animals that live in the rivers can be affected.

Explain how this happens.

(2)

.....

.....

.....

.....

.....

*(c) A student is told to prepare pure, dry crystals of ammonium sulfate.

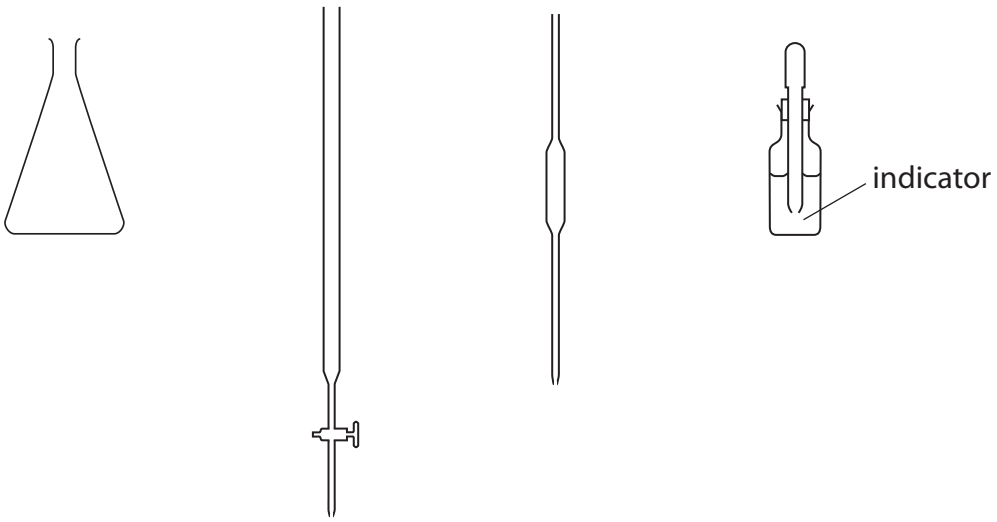
The student is told to carry out the experiment in four stages.

Stage 1: take 25.0 cm^3 of ammonia solution
Stage 2: find the volume of sulfuric acid that is needed to neutralise the ammonia solution
Stage 3: use this result to prepare an ammonium sulfate solution
Stage 4: prepare pure, dry crystals of ammonium sulfate from this solution

Describe how the student should carry out this experiment.

Some of the following apparatus may be used in the experiment.

(6)



(Total for Question 5 = 12 marks)

Electrolysis

6 A solution of sodium chloride contains the four ions shown in the box.

Na^+	Cl^-	OH^-	H^+

(a) The sodium chloride solution is electrolysed.

Give the formulae of the **two** ions that will be attracted to the positively charged electrode.

(1)

.....

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

When molten lead bromide is electrolysed the products are

(1)

☒ **A** lead and hydrogen

☒ **B** hydrogen and bromine

☒ **C** hydrogen and oxygen

☒ **D** lead and bromine

(c) During electrolysis, oxidation takes place at the anode and reduction takes place at the cathode.

Explain, in terms of electrons, what is meant by **oxidation** and **reduction**.

(2)

.....

.....

.....

.....

.....

(d) Explain why some metal objects are electroplated.

(2)

.....

.....

.....

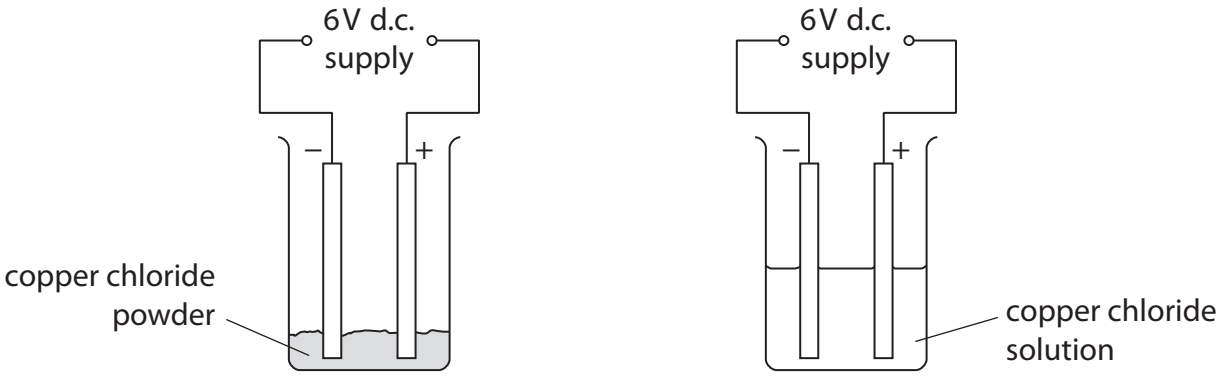
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*(e) Carbon electrodes were placed in copper chloride powder.

Some more copper chloride was dissolved in water to make a solution and carbon electrodes were placed in this solution.

In both cases the electrodes were connected to a direct current supply.



The following results were obtained.

substance tested	observation at the cathode (–)	observation at the anode (+)
copper chloride powder	no change	no change
copper chloride solution	red-brown solid formed	bubbles of a yellow-green gas

Explain the results shown in the table for copper chloride powder and the copper chloride solution.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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