

Write your name here

Surname

Other names

Pearson
Edexcel GCSE

Centre Number

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Candidate Number

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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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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 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	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 ☒.

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
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(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)

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(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)

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(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)

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(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)

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(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 dm³.

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)

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(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)

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(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)

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(Total for Question 4 = 10 marks)



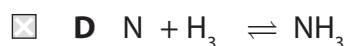
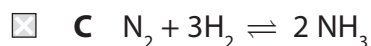
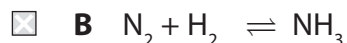
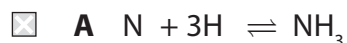
Fertilisers

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)



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

(1)

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(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)

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(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)

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*(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 cm³ of ammonia solution

Stage 2: find the volume of sulfuric acid that is needed to neutralise the ammonia solution

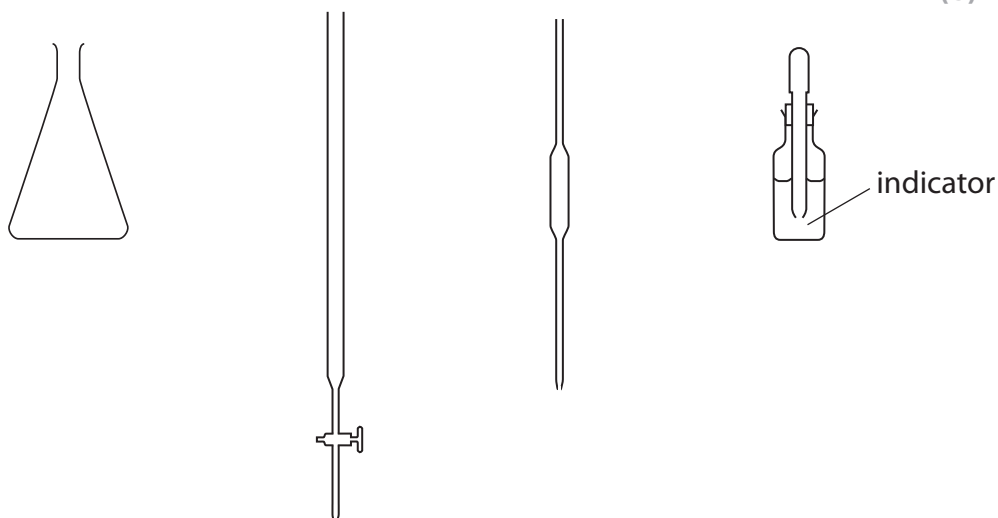
Stage 3: use this result to prepare an ammonium sulfate solution

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.

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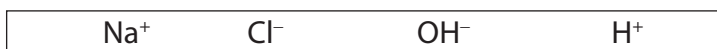
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(Total for Question 5 = 12 marks)



Electrolysis

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



(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)

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(d) Explain why some metal objects are electroplated.

(2)

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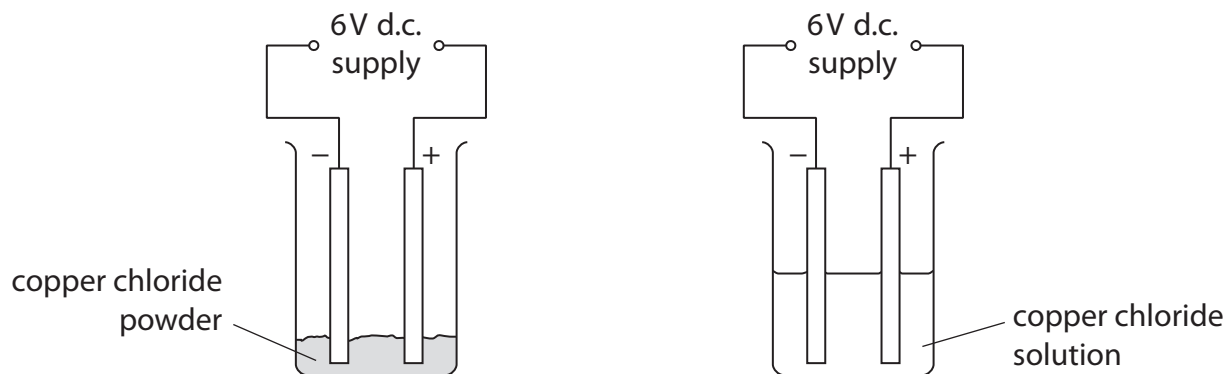
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*(e) Carbon electrodes were placed in copper chloride powder.

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



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