

Write your name here

Surname	Other names
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**Pearson**  
**Edexcel GCSE**

Centre Number

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Candidate Number

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# Chemistry

## Unit C3: Chemistry in Action

**Foundation Tier**

Wednesday 21 June 2017 – Morning

**Time: 1 hour**

Paper Reference

**5CH3F/01**

**You must have:**

Calculator, ruler

Total Marks

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### 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 ►

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# The Periodic Table of the Elements

		1	2											3	4	5	6	7	0																
		1 H hydrogen 1																		4 He helium 2															
		Key																																	
		relative atomic mass atomic symbol name atomic (proton) number																																	
7	Li lithium 3	9	Be beryllium 4	11	Na sodium 11	12	Mg magnesium 12	13	Al aluminium 13	14	N nitrogen 7	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	[98] 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	[209] Po polonium 84	85	[210] At astatine 85	86	[222] Rn radon 86
87	[223] Fr francium 87	88	[226] Ra radium 88	89	[227] Ac* actinium 89	104	[261] Rf rutherfordium 104	105	[262] Db dubnium 105	106	[266] Sg seaborgium 106	107	[264] Bh bohrium 107	108	[277] Hs hassium 108	109	[268] Mt meitnerium 109	110	[271] Ds darmstadtium 110	111	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated													

\* 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 .

### Alkanes, alkenes and ethanol

- 1 The alkanes form an homologous series of compounds.  
Molecules of alkanes contain carbon and hydrogen only.

(a) Which of these alkanes contains three carbon atoms?

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

(1)

- A butane  
 B ethane  
 C methane  
 D propane

(b) Pentane is an alkane.

A molecule of pentane contains five carbon atoms.

The general formula for an alkane is  $C_nH_{2n+2}$ .

What is the formula of a molecule of pentane?

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

(1)

- A  $C_5H_5$   
 B  $C_5H_7$   
 C  $C_5H_{10}$   
 D  $C_5H_{12}$

- (c) The molecular formulae and boiling points of alkanes containing six to nine carbon atoms per molecule are given in the table.

alkane	molecular formula	boiling point /°C
hexane	$C_6H_{14}$	69
heptane	$C_7H_{16}$	98
octane	$C_8H_{18}$	126
nonane	$C_9H_{20}$	151

Use the information in the table to state the relationship between the number of carbon atoms in a molecule of an alkane and the boiling point of the alkane.

(1)

- (d) The alkenes form another homologous series of compounds.  
Ethene is an alkene.

Draw the structure of a molecule of ethene,  $C_2H_4$ , showing all the bonds.

(2)

(e) Glucose is a carbohydrate.  
Ethanol can be made by the fermentation of glucose solution.

(i) Which of these needs to be added to glucose solution to form ethanol by fermentation?

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

(1)

- A** hydrochloric acid
- B** sodium hydroxide
- C** yeast
- D** vinegar

(ii) Ethanol is present in all alcoholic drinks.

State **two** problems that may be caused by drinking too much alcohol.

(2)

1 .....

.....

2 .....

.....

**(Total for Question 1 = 8 marks)**

## Carboxylic acids and esters

- 2 (a) Ethanol can react to form ethanoic acid.

What type of reaction occurs when ethanol,  $C_2H_5OH$ , reacts to form ethanoic acid,  $CH_3COOH$ ?

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

(1)

- A** distillation
- B** neutralisation
- C** oxidation
- D** thermal decomposition

- (b) Magnesium reacts with dilute ethanoic acid to form magnesium ethanoate and hydrogen.

Write the word equation for this reaction.

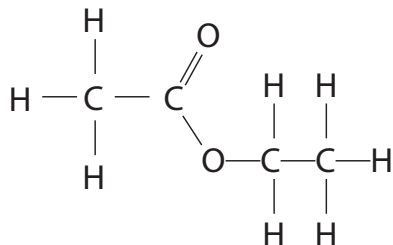
(2)

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- (c) Ethyl ethanoate is an ester.

A molecule of ethyl ethanoate has the structure shown.



Give the names of the elements present in a molecule of ethyl ethanoate.

(1)

---

(d) Esters and vinegar are useful substances.

Draw a straight line from each of the substances to one of its uses.

(2)

**substances**

ester

vinegar

**use**

perfume

fertiliser

preservative

(e) A fat or oil can be reacted with a reagent to form a soap.

Give the name of the reagent and the conditions for the reaction.

(2)

reagent .....

conditions .....

**(Total for Question 2 = 8 marks)**

## Hard water

3 Hard water contains dissolved solids.

(a) (i) Describe how to find the mass of dissolved solid in a  $25 \text{ cm}^3$  sample of hard water.

(3)

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(ii) A different  $25 \text{ cm}^3$  sample of a hard water contained 0.6 g of dissolved solid **X**.

Calculate the concentration of **X** in the solution, in  $\text{g dm}^{-3}$ .

(1)

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.....

(iii) Which of these ions, dissolved in water, causes hardness in the water?

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

(1)

- A** potassium,  $\text{K}^+$
- B** magnesium,  $\text{Mg}^{2+}$
- C** sodium,  $\text{Na}^+$
- D** ammonium,  $\text{NH}_4^+$



- (b) **A**, **B** and **C** are samples of water from three different sources.  
10 cm<sup>3</sup> of each water is placed in separate test tubes.  
The same volume of a soap solution is added to each test tube and the mixture is shaken.  
The height of the lather above the surface of the liquid in each test tube is measured.

The results are shown.

water sample	height of lather / cm
<b>A</b>	4
<b>B</b>	2
<b>C</b>	0

Explain, using the information from the table, which sample of water is the hardest.

(2)

- (c) State what is **seen** in a sample of hard water after it has been shaken with the soap solution.

(1)

- (d) Temporary hardness in water can be caused by dissolved calcium hydrogencarbonate.

When temporary hard water is boiled, the calcium hydrogencarbonate decomposes to form carbon dioxide, water and a precipitate of calcium carbonate.

Add the state symbols for the products to the word equation for this reaction.

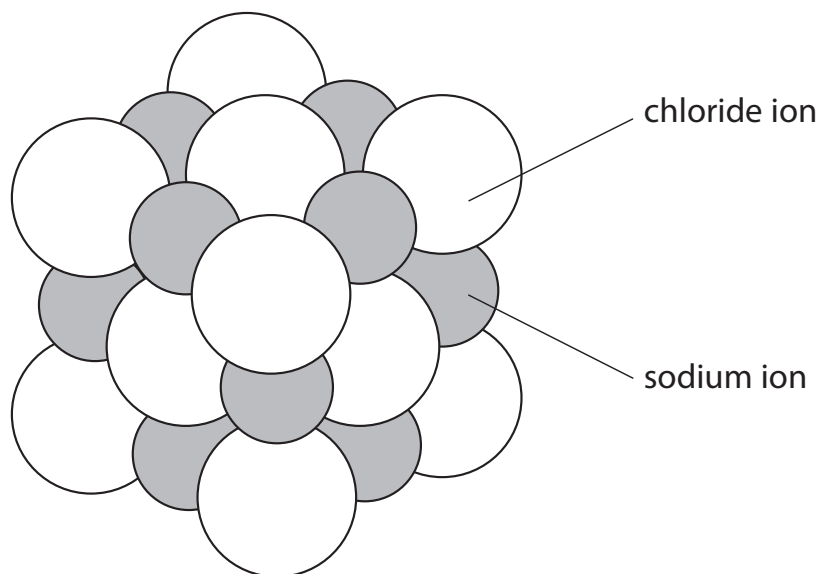
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**(Total for Question 3 = 10 marks)**

## Electrolysis

- 4 (a) Sodium chloride is an ionic solid.  
It contains sodium ions,  $\text{Na}^+$ , and chloride ions,  $\text{Cl}^-$ .  
In solid sodium chloride, the ions are arranged as shown in the diagram.



- (i) Solid sodium chloride does not conduct electricity.

Give a reason why solid sodium chloride does not conduct electricity, even though it contains ions.

(1)

- (ii) Molten sodium chloride can be electrolysed.

When it is electrolysed, sodium is produced at one of the electrodes.

Explain how the sodium ions,  $\text{Na}^+$ , become sodium atoms,  $\text{Na}$ .

(2)

(b) The electrolysis of sodium chloride solution produces hydrogen, chlorine and sodium hydroxide solution.

(i) Explain why the electrolysis of sodium chloride solution should be carried out in a well-ventilated laboratory.

(2)

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(ii) During the electrolysis, chloride ions,  $\text{Cl}^-$ , are oxidised to chlorine molecules,  $\text{Cl}_2$ . Explain why this is an oxidation reaction.

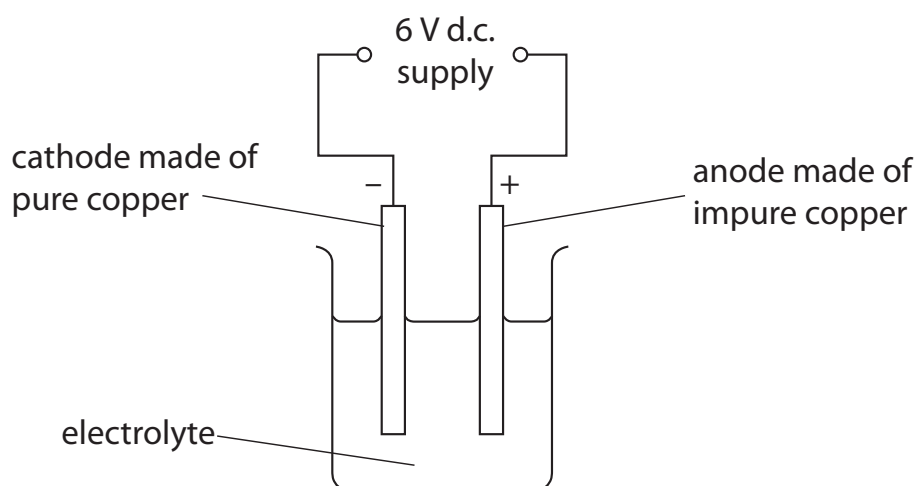
(2)

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(c) Electrolysis can also be used to purify a sample of impure copper using this apparatus.



(i) Suggest the name of a suitable solution to be used as the electrolyte.

(1)

(ii) Describe what is **seen** during the electrolysis.

(2)

(Total for Question 4 = 10 marks)

## Salts

- 5 (a) Zinc carbonate powder is added to dilute hydrochloric acid in a beaker.  
A gas is given off: the gas turns limewater milky.  
Zinc carbonate is added until some is left as a solid at the bottom of the beaker.  
At the end of the reaction, a mixture of zinc chloride solution and excess solid zinc carbonate is left in the beaker.

(i) Explain how pure zinc chloride solution is obtained from this mixture.

(2)

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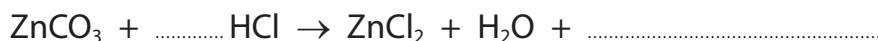
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(ii) Complete the equation for this reaction by adding the formula of the gas given off and then balancing the equation.

(2)



- (b) Dilute nitric acid is placed in a beaker.  
A few drops of indicator are added.  
Sodium hydroxide solution is added until the indicator changes colour.

Universal indicator is not a suitable indicator for this experiment.

Suggest the name of a suitable indicator and state the colour change.

(2)

name of indicator .....

colour change from ..... to .....

\* (c) Ammonium salts are soluble in water and some are used in artificial fertilisers.

Describe the benefits and problems of using artificial fertilisers when growing crops.

(6)

A series of horizontal dotted lines for writing the answer.

Handwriting practice area with 20 horizontal dotted lines.

**(Total for Question 5 = 12 marks)**

### Testing for ions

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

(1)

Sodium hydroxide solution is often used to test for ions in solution.

When sodium hydroxide solution is added to a solution, a green precipitate forms.

The green precipitate shows that the ions present in the original solution are

- A sodium,  $\text{Na}^+$
- B potassium,  $\text{K}^+$
- C iron(II),  $\text{Fe}^{2+}$
- D iron(III),  $\text{Fe}^{3+}$

(b) The table gives information about tests for aluminium and calcium ions in solutions.

ion in solution	effect of adding a few drops of sodium hydroxide solution	effect of adding excess sodium hydroxide solution
aluminium, $\text{Al}^{3+}$	white precipitate forms	white precipitate disappears
calcium, $\text{Ca}^{2+}$	white precipitate forms	white precipitate remains

A few drops of sodium hydroxide solution are added to a solution of one of these ions. A white precipitate forms.

Give a reason, using the information in the table, why it is **not** correct to say that the solution contains calcium ions.

(1)

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(c) A salt was dissolved in water to form a solution.  
Tests were carried out on this solution.

Sodium hydroxide solution was added to a sample of the solution.  
A pale blue precipitate formed.

Dilute hydrochloric acid and barium chloride solution were added to another  
sample of the solution.  
A white precipitate formed.

Give the name of the salt.

(2)

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(d) When sodium hydroxide solution, NaOH, is warmed with ammonium chloride,  $\text{NH}_4\text{Cl}$ ,  
the products are sodium chloride, NaCl, ammonia,  $\text{NH}_3$ , and water.

Write the balanced equation for this reaction.

(2)

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Handwriting practice area with 30 horizontal dotted lines.

**(Total for Question 6 = 12 marks)**

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**TOTAL FOR PAPER = 60 MARKS**

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