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Other names

Pearson
Edexcel GCSE

Centre Number

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Candidate Number

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Chemistry
Unit C3: Chemistry in Action

Higher Tier

Wednesday 22 June 2016 – Morning

Time: 1 hour

Paper Reference

5CH3H/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 ►

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PEARSON

The Periodic Table of the Elements

	1	2	3	4	5	6	7	0									
	7 Li lithium 3	9 Be beryllium 4	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> 1 H hydrogen 1 </div>					19 F fluorine 9	4 He helium 2								
	23 Na sodium 11	24 Mg magnesium 12	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> Key relative atomic mass atomic symbol name atomic (proton) number </div>					35.5 Cl chlorine 17	20 Ne neon 10								
	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	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	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	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					

* 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 .

Hard and soft water

- 1 20 cm³ samples of waters, **A**, **B**, **C** and **D**, are tested for hardness by adding soap solution and shaking the mixture.

The soap solution is added until a permanent lather is formed.

Each sample of water is tested before and after boiling.

The results are shown.

water sample	volume of soap solution needed to form permanent lather / cm ³	
	before boiling	after boiling
A	0.1	0.1
B	5.0	2.0
C	7.5	7.5
D	3.0	0.1

- (a) (i) Which of the water samples is most likely to be pure water?

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

(1)

- A**
- B**
- C**
- D**

- (ii) Which water sample is most likely to contain **only** temporary hardness?

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

(1)

- A**
- B**
- C**
- D**

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(b) Without using soap solution, describe how you would show that a sample of hard water contains dissolved solid.

(2)

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(c) Explain one method which removes both temporary **and** permanent hardness from water.

(2)

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(d) Explain a disadvantage of having a domestic water supply that is hard.

(2)

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(Total for Question 1 = 8 marks)



Ions

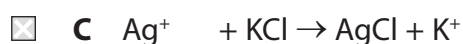
2 (a) The qualitative test for chloride ions in solution is

add dilute nitric acid
then add silver nitrate solution

(i) Describe what you **see** if this test is carried out on a solution containing chloride ions. (2)

(ii) What is the **ionic equation** for the reaction that occurs between silver nitrate solution and potassium chloride solution?

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



(iii) Doctors often request blood tests. The tests they require to be carried out are quantitative tests.

Describe the difference between a **qualitative** and a **quantitative** test.

(2)

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(b) Describe a test to show that aluminium iodide contains aluminium ions.

(3)

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(Total for Question 2 = 8 marks)

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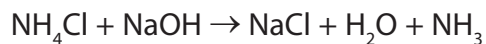
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Ammonia

- 3 (a) Ammonia gas, NH_3 , is formed by reacting ammonium chloride, NH_4Cl , with sodium hydroxide, NaOH .



In an experiment 4.0 g of sodium hydroxide react completely with ammonium chloride.

Calculate the maximum volume, in dm^3 , of ammonia gas formed at room temperature and pressure.

(relative atomic masses: $\text{H} = 1.0$, $\text{N} = 14$, $\text{O} = 16$, $\text{Na} = 23$, $\text{Cl} = 35.5$

one mole of any gas occupies 24 dm^3 , measured at room temperature and pressure)

(3)

maximum volume of ammonia = dm^3

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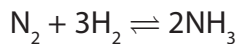
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(b) Ammonia is manufactured using the Haber process.

The reaction of nitrogen with hydrogen to form ammonia is exothermic.

The process is carried out at 450 °C.

This reaction can reach a dynamic equilibrium.



(i) Explain what is meant by **dynamic equilibrium**.

(2)

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(ii) Explain why a temperature of 450 °C is used for this process even though a higher temperature would increase the rate of production of ammonia.

(2)

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(c) When ammonia gas is dissolved in water, an alkaline solution is formed.

State the name and the formula of the ion which causes the solution to be alkaline.

(2)

name.....

formula.....

(Total for Question 3 = 9 marks)



Electrolysis

4 (a) Which of the following does **not** conduct electricity?

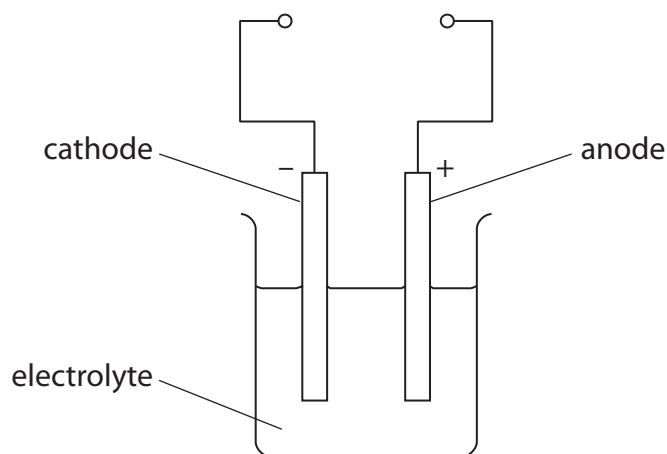
Put a cross (☒) in the box next to your answer.

(1)

- A sodium chloride crystals
- B sodium chloride solution
- C molten sodium chloride
- D seawater

(b) Impure copper is purified by electrolysis.

A diagram of the apparatus that can be used is shown.



(i) Describe the use of this apparatus to purify a piece of impure copper.

(4)

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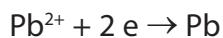
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(ii) During the electrolysis a deposit forms under the anode.

Explain how this deposit forms.

(2)

(c) (i) In the electrolysis of molten lead bromide, PbBr_2 , the half equation for the reaction occurring at the cathode is



Explain what **type** of reaction is shown in this equation.

(2)

(ii) Bromine, Br_2 , is formed at the anode.

Write the half equation for the reaction occurring at the anode.

(2)

(Total for Question 4 = 11 marks)

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*(c) Sodium ethanoate solution can be formed by neutralising sodium hydroxide solution with dilute ethanoic acid.

Pure crystals of sodium ethanoate can be obtained from this solution.

The volumes of sodium hydroxide solution and dilute ethanoic acid required to form the pure sodium ethanoate solution must be found by titration.

Describe how you would prepare a pure solution of sodium ethanoate from sodium hydroxide solution and dilute ethanoic acid, and how you would obtain pure, dry sodium ethanoate crystals from this solution.

(6)

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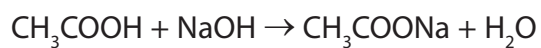
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P 4 5 9 3 2 A 0 1 5 2 0

(d) In an experiment 25.0 cm^3 of $0.0100 \text{ mol dm}^{-3}$ ethanoic acid, CH_3COOH , was titrated with $0.0200 \text{ mol dm}^{-3}$ sodium hydroxide solution, NaOH .



Calculate the volume, in cm^3 , of $0.0200 \text{ mol dm}^{-3}$ sodium hydroxide solution needed to neutralise the ethanoic acid in this experiment.

(3)

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volume of sodium hydroxide solution needed = cm^3

(Total for Question 5 = 12 marks)



Organic chemistry

- 6 (a) Complete the sentence by putting a cross (☒) in the box next to your answer. (1)

Butane is an alkane.

The formula of a molecule of butane is

- A C_3H_6
 B C_4H_{10}
 C C_3H_8
 D C_4H_8

- (b) Ethanol is an alcohol.

Ethanol is present in various alcoholic drinks, such as wine, beer and whisky.

- (i) It is dangerous to drive after having an alcoholic drink.

Suggest why it is more dangerous to drive a car after drinking 25 cm³ of whisky than it is after drinking 25 cm³ of beer.

(2)

- (ii) If a bottle of wine is left open to the air, some of the ethanol is converted into ethanoic acid.

Give the name of the homologous series in which ethanoic acid is found.

(1)

- (c) Propanol, C_3H_7OH , can be dehydrated to form propene.

Write the balanced equation for this reaction.

(2)

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*(d) The table gives information about four substances, **A**, **B**, **C** and **D**.

The substances, in no particular order, are ethane, ethanoic acid, ethanol and ethene.

	substance A	substance B	substance C	substance D
symbols of all atoms found in the formula	C H	C H O	C H O	C H
oxidises when left in the air	no	yes	no	no
observation when magnesium added	no reaction	no reaction	effervescence	no reaction
observation when added to sodium carbonate solution	no reaction	no reaction	effervescence	no reaction
observation when bromine water added	orange to colourless	stays orange	stays orange	stays orange
can be polymerised	yes	no	no	no

Identify substances **A**, **B**, **C** and **D**, explaining how you have used the information in the table to identify them.

(6)



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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS



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