Centre No.			
Candid	ate No.		

		Paper	Referen	ice		
1	5	3	0	/	4	H

Paper Reference(s)

## 1530/4H

## Edexcel GCSE Chemistry A [1530]

Paper 4H

# **Higher Tier**

Wednesday 23 June 2004 – Afternoon

Time: 1 hour

Materials	required	for	examination
Calculator			

Items included with question papers

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Question Number

5

6

Blank

Examiner's use only

#### **Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initials and signature. The paper reference is shown above.

Answer ALL questions in the spaces provided in this book.

Show all stages in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

#### **Information for Candidates**

The marks for the various parts of questions are shown in round brackets: e.g. (2).

This paper has seven questions. There are two blank pages.

#### Advice to Candidates



This symbol shows where the quality of your written answer will also be assessed.

 $\frac{\text{Printer's Log. No.}}{N18356A}$ 



Turn over

Total

Edexcel

Group

Period

 $\begin{array}{c} \text{F} \\ \text{Fluorine} \\ \text{g} \\ \text{g} \\ \text{35.5} \\ \text{CI} \\ \text{Chlorine} \\ \text{17} \\ \text{80} \\ \text{Bromine} \\ \text{35} \\ \text{127} \\ \text{I} \\ \text{I} \\ \text{I} \\ \text{Odine} \\ \text{53} \\ \text{210} \\ \text{Astauine} \\ \text{85} \\ \text{85} \\ \text{85} \\ \end{array}$ Ooxygen 8 8 8 32 Sulphur 116 179 Selenium 34 128 Tellurium 512 210 Poolonium 84  $\begin{array}{c|c} N \\ N \\ Nitrogen \\ \hline & 1 \\ \hline & 1 \\ \hline & 1 \\ \hline & 15 \\ \hline & 75 \\ \hline & AS \\ Arsenic \\ \hline & 33 \\ \hline & 33 \\ \hline & 122 \\ Sb \\ Antunony \\ & 51 \\ \hline & 209 \\ \hline & Bismuth \\ & 83 \\ \hline \end{array}$ Carbon

Carbon

Carbon

Silicon

14

14

13

Ge

Ge

Carbon

Tin

So

28

Silicon

Tin

So

Pb

Lead

82  $\begin{array}{c} \text{65} \\ \text{Zn} \\ \text{Zinc} \\ \text{30} \\ \text{112} \\ \text{Cd} \\ \text{Cadmium} \\ \text{48} \\ \text{48} \\ \text{Mercury} \\ \text{80} \end{array}$ Copper Copper Copper Silver 197 Ag Au Gold Nickel
Nickel
28
28
106
Pd
Pd
46
195
Pt
Platinum
78 Co Cobalt 27 103 Rh Rhodium 45 IF2 Iridium 777  $\begin{array}{c} 56 \\ Fe \\ Iron \\ 26 \\ 101 \\ Ru \\ Ru \\ Ru \\ 44 \\ 44 \\ 190 \\ Os \\ Os \\ Osmium \\ 76 \\ \end{array}$ Mn Aanganese 25 99 TC echnetium 186 Rhenium 75

52 Cr -bromium 24 96 MO olybdenun olybdenun 184 W W

 $\begin{array}{c} \text{S1} \\ \text{V} \\ \text{V} \\ \text{V} \\ \text{S2} \\ \text{93} \\ \text{93} \\ \text{93} \\ \text{Nobium} \\ \text{41} \\ \text{181} \\ \text{181} \\ \text{Ta} \\ \text{Ta$ 

 $\begin{array}{c} 48 \\ Ti \\ Titanium \\ 22 \\ 91 \\ Sirconium \\ 40 \\ 178 \\ Hf \\ Hafnium \\ 72 \end{array}$ 

 $\begin{array}{c} Sc \\ Scandium \\ 21 \\ 89 \\ Y \\ Yttrium \\ 39 \\ 139 \\ 139 \\ 139 \\ La \\ La \\ anthanum \\ 277 \\ 227 \\ 227 \\ AC \\ Actunum \\ 89 \end{array}$ 

 $\begin{array}{c} \text{He} \\ \text{He} \\ \text{inum} \\ \text{2} \\ \text{20} \\ \text{20} \\ \text{20} \\ \text{20} \\ \text{30} \\ \text{40} \\ \text{50} \\ \text{50}$ 

Relative atomic mass Symbol Name

1. The table shows the masses of ions present in 1 dm<sup>3</sup> of a bottled mineral water.

ion	mass (mg)	ion	mass (mg)
calcium	208.0	hydrogencarbonate	222.7
magnesium	53.5	sulphate	534.6
sodium	42.0	chloride	68.0
potassium	2.8	nitrate	0.77

(a)	Suggest the name of a rock which had been in contact with the water before the water was bottled.
	(1)
(b)	What would you <b>see</b> on shaking 10 cm <sup>3</sup> of the mineral water with a few drops of soap solution?
	Explain your answer.
	(2)
(c)	In some areas, scale forms on the inside of water pipes.
	(i) Suggest why scale is an advantage in old houses with water pipes made of lead.
	(2
	(ii) Suggest why scale is a problem for all houses in these areas of the country.
	(1

#### Facts about domestic water filters

The market for domestic water filters has increased enormously in recent years. This is partly due to the extravagant advertising about them, which casts doubt on the quality of tap water. Tap water is entirely safe to drink and you need not worry about it affecting your health.

In some cases filters can improve taste. They do, however, remove all chlorine and this means that the protection against contamination is also removed. If you do use a filter, remember to change the cartridge regularly and always keep the filtered water in a cool place. The fridge is best.

From www.portsmouthwater.co.uk

(i) Why does the water company make this information available on a website?	
	(1)
(ii) Why do water companies add chlorine to their water supply?	
	(1)
(iii) Suggest why filter cartridges should be replaced regularly.	
	(1)
(iv) Suggest why filtered water should be kept in a fridge.	
	Q1
(Total 10 mark	(1)

(a) Tests on the solution of X

Some of the solution was mixed with an equal volume of dilute sodium hydroxide solution and boiled. A pungent smelling gas, which turned moist universal indicator paper purple, was given off.

The rest of the solution was mixed with an equal volume of dilute nitric acid followed by a few drops of silver nitrate solution. A white precipitate formed.

(i)	Name the gas given off when the solution of $\mathbf{X}$ was heated with dilute sodi hydroxide solution.	um
		(1)
(ii)	Name the cation present in $X$ .	
		(1)
(iii)	Name the white precipitate formed when the acidified solution of $X$ reacted w silver nitrate solution.	ith
	······································	 (1)
(iv)	Name the anion present in X.	
		····· (1)

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(b)	b) Tests on the solution of Y	Lec   bla	
	Some of the solution was mixed with an equal vo- followed by a few drops of barium chloride solution.	lume of dilute hydrochloric acid	
	The rest of the solution was evaporated to dryness. T	he solid gave a lilac flame test.	
	(i) Name the white precipitate.		
		(1)	
	(ii) Give the name of Y.		
		(2)	
	(iii) Describe how you would carry out a flame test or	n a solid.	
		(3)	)2
		(Total 10 marks)	

3. Sulphuric acid is one of the most important chemicals produced in the United Kingdom. About 92% of sulphuric acid is obtained from sulphur.

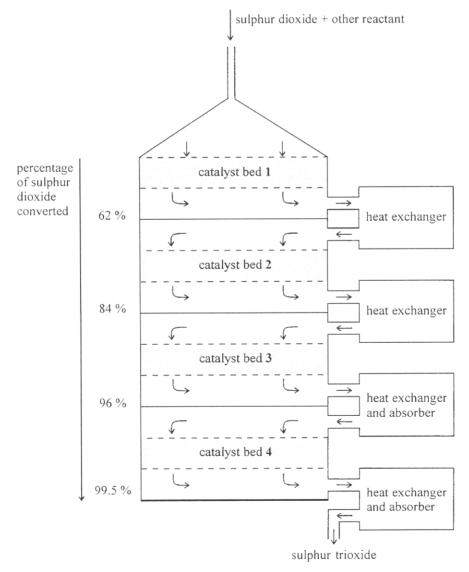
Leave blank

The three main stages in the process are

- stage 1 conversion of sulphur to sulphur dioxide
- stage 2 conversion of sulphur dioxide to sulphur trioxide
- stage 3 absorption of sulphur trioxide into concentrated sulphuric acid
- (a) In stage 1, molten sulphur is sprayed into a furnace and burns in air at high temperatures.Write the balanced chemical equation for this reaction.

(2)

(b) Stage 2



	(i) What does sulphur dioxide react with in stage 2?	Leav
		(1)
	(ii) Name the catalyst used in stage 2.	
		(1)
	(iii) Why is the mixture passed through the catalyst four times rather than once?	
		(1)
(c)	State one industrial use of sulphuric acid.	
		Q3
	(Total 6 m	arks)

Several reactions take place during the production of iron from iron ore in the blast furnace. Leave blank Some reactions are exothermic, while others are endothermic. (a) The oxidation of coke to carbon dioxide is an exothermic reaction  $C(s) + O_2(g) \longrightarrow CO_2(g)$ (i) Where in the blast furnace does this reaction take place? (1) (ii) In terms of energy, explain the significance of this reaction in the blast furnace. (1) (b) One endothermic reaction taking place in the blast furnace is the formation of carbon monoxide from coke and carbon dioxide. Write the balanced equation, including state symbols, for the reaction. (3)(c) Cast iron from the furnace contains up to 4% carbon, which causes the iron to be brittle. Most of the iron from the blast furnace is converted to steel. Mild steel, which is used in the construction industry, contains only 0.15-0.25% carbon. Explain how the carbon content of the iron from the blast furnace is lowered to produce mild steel.

04

(2)

(Total 7 marks)

(a)	(i)	Give the name of the homologous series of compounds to which ethyl propan belongs.	oate
			(1)
	(ii)	Draw the structural formula of ethyl propanoate showing all the bonds.	
			(2)
(b)	Eth	yl propanoate is formed by the reaction of ethanol with propanoic acid.	
	Wh	at is the formula of propanoic acid?	
			(1)
(c)		h year, in the United Kingdom, about 330 000 tonnes of ethanol are produced by ration of ethene. Ethanol is also manufactured by the fermentation of sugars.	y the
	(i)	Write the balanced equation for the hydration of ethene to form ethanol.	
			(2)
	(ii)	Suggest why both methods of producing ethanol are widely used.	
	N		•••••
	3/-		
			(2)
			(3)

(Total 9 marks)

ĺ.	Aluminium is a very reactive metal but its tr	ue reactivity is hidden due to a thin layer of
	aluminium oxide on the surface of the metal.	The oxide layer can be removed by treating
	the metal with mercury(II) chloride solution.	The pure metal reacts vigorously with dilute
	hydrochloric acid.	

Leave blank

hydrochloric acid.			
		$2 \text{ Al(s)} + 6 \text{ HCl(aq)} \longrightarrow 2 \text{ AlCl}_3(\text{aq}) + 3 \text{ H}_2(\text{g})$	
(a)	The	oxide layer can be made thicker by anodising the aluminium.	
	Exp	lain how anodising thickens the aluminium oxide layer.	
	••••		
	••••		
		(2)	
(b)	(i)	Describe the <b>two</b> changes you would <b>see</b> when sodium hydroxide solution is added, drop by drop until in excess, to an aqueous solution containing aluminium ions.	
		(2)	
	(ii)	Write the ionic equation for the first change which occurs	

12

(3)

Leave blank	when 2.70 g of pure aluminium reacts completely with excess dilute hydrochloric acid.	(c)
	(Relative atomic mass: Al = 27.0 1 mol of a gas occupies 24.0 dm <sup>3</sup> at room temperature and pressure)	
Q6	(3)	
	(Total 10 marks)	

Vinegar is a solution of ethanoic acid. The concentration of ethanoic acid was determined by titrating some of the vinegar with 0.500 mol dm <sup>-3</sup> sodium hydroxide solution (NaOH).					
Here are the results of the titration.					
volume of vinegar used for each titration		$= 10.0 \text{ cm}^3$			
volumes of sodium hydroxide solution	trial titration	$= 18.1 \text{ cm}^3$			
	1st titration	$= 17.8 \text{ cm}^3$			
	2nd titration	$= 17.7 \text{ cm}^3$			
The equation for the reaction is					
CH <sub>3</sub> COOH(aq) + NaOH(aq) —	→ CH <sub>3</sub> COONa(	$aq) + H_2O(1)$			
(a) After the trial titration, why was it neces	ssary to carry out tv	vo further titrations?			
			(1)		
(b) Describe how to carry out one of the acc	curate titrations in t	his experiment.			
			• • • • • • • • • • • • • • • • • • • •		
			(3)		

Leave blank

14

7.

(c)	Calculate the concentration, in mol dm <sup>-3</sup> , of ethanoic acid (CH <sub>3</sub> COOH) present in the vinegar.	Leave blank
	(4)	Q7
	(Total 8 marks)	

**TOTAL FOR PAPER: 60 MARKS** 

**END**