Centre No.				Paper Reference				Surname	Initial(s)		
Candidate No.			5	0	3	9	/	0	1	Signature	

Paper Reference(s)

### 5039/01

# **Edexcel GCSE**

## **Chemistry**

C3 – Topics 3 and 4

Thursday 4 June 2009 – Morning

Time: 60 minutes

Materials required for examination Calculator

Items included with question papers

Examiner's use only							
Team L	eader's u	ise only					

Question Number	Leave Blank
1	
2	
3	
4	
5	
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7	

#### **Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

Check that you have the correct question paper.

Answer ALL the questions. Write your answers in the spaces provided in this question paper. Do not use pencil. Use blue or black ink.

Some questions must be answered with a cross in a box ( $\boxtimes$ ). If you change your mind about an answer, put a line through the box ( $\boxtimes$ ) and then mark your new answer with a cross ( $\boxtimes$ ). 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 individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 7 questions in this question paper. The total mark for this paper is 60. There are 20 pages in this question paper. Any blank pages are indicated.

#### **Advice to Candidates**

You are reminded of the importance of clear English and careful presentation in your answers.

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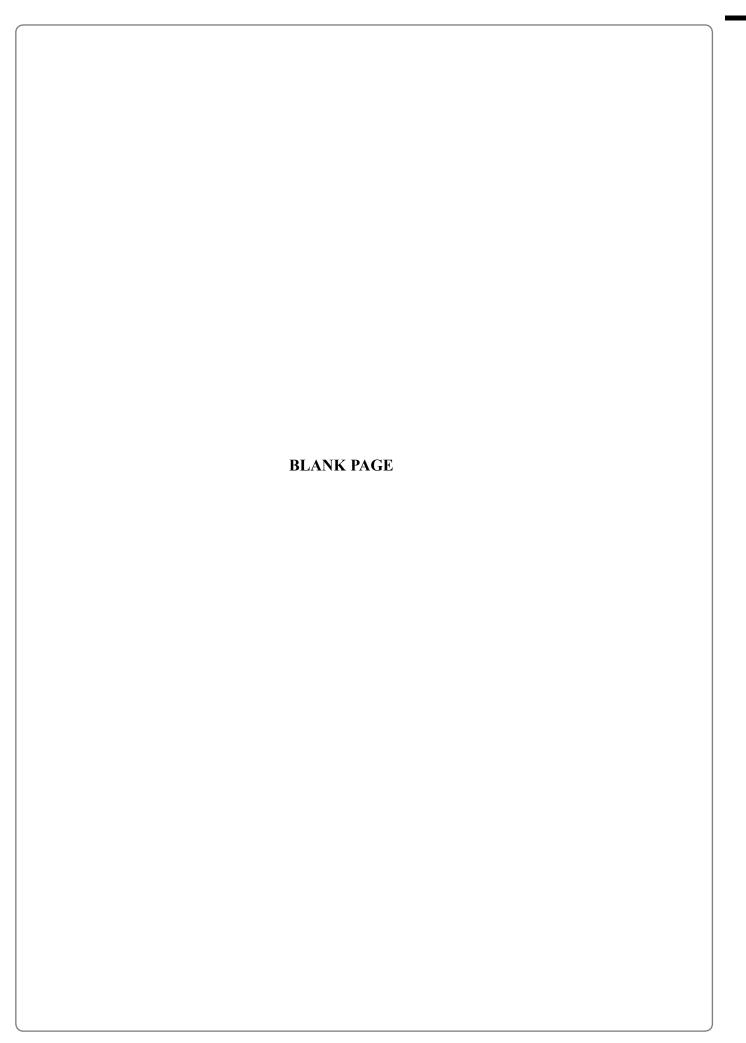


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		ı					
	0 <b>He</b> 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	20 <b>Ne</b> 10	40 <b>Ar</b> argon 18	84 <b>Kr</b> krypton 36	131 <b>Xe</b> xenon 54	[222] <b>Rn</b> radon 86	t fully
		19 fluorine 9	35.5 <b>CI</b> chlorine 17	80 <b>Br</b> bromine 35	127 	[210] <b>At</b> astatine 85	orted but not
	O	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	32 <b>S</b> suffur 16	79 <b>Se</b> selenium 34	128 <b>Te</b> tellurium 52	[209] <b>Po</b> polonium 84	Elements with atomic numbers 112-116 have been reported but not fully authenticated
	Ŋ	14 <b>N</b> nitrogen 7	31 <b>P</b> phosphorus 15	75 <b>As</b> arsenic 33	122 <b>Sb</b> antimony 51	209 <b>Bi</b> bismuth 83	s 112-116 hav authenticated
S	4	22 <b>C</b> carbon 6	28 Silicon 14	73 <b>Ge</b> germanium 32	<b>Sn</b> tin 50	207 <b>Pb</b> lead 82	omic number
Elements	ო	17 <b>a</b> porou	27 Al aluminium 13	70 <b>Ga</b> gallium 31	115 In indium 49	204 <b>T</b> thallium 81	nents with at
Elen				65 <b>Zn</b> zinc 30	112 <b>Cd</b> cadmium 48	201 <b>Hg</b> mercury 80	Elen
				63.5 <b>Cu</b> copper 29	108 <b>Ag</b> silver 47	197 <b>Au</b> gold 79	[272] <b>Rg</b> roentgenium
le of				59 nickel 28	106 <b>Pd</b> palladium 46	195 <b>Pt</b> platinum 78	Ds darmstadtum
odic Table of the				59 <b>Co</b> ©balt 27	103 <b>Rh</b> rhodium 45	192 <b>Ir</b> iridium 77	[268]
odic	hydrogen			56 <b>Fe</b> iron 26	101 <b>Ru</b> ruthenium 44	190 <b>0s</b> osmium 76	[277] <b>Hs</b> hassium 108
				55 Mn manganese 25	[98] <b>Tc</b> technetium 43	186 <b>Re</b> rhenium 75	[264] <b>Bh</b> bohrium 107
The Peri		mass <b>bol</b> number		52 <b>Cr</b> chromium 24	96 <b>Mo</b> molybdenum 42	184 <b>W</b> tungsten 74	[266] Sg seaborgium 106
	Key	relative atomic mass atomic symbol name atomic (proton) number		51 <b>V</b> vanadium 23	93 <b>Nb</b> niobium 41	181 <b>Ta</b> tantalum 73	[262] <b>Db</b> dubnium 105
		relati <b>at</b> c atomic		48 Ti titanium 22	91 <b>Zr</b> zirconium 40	178 <b>Hf</b> hafnium 72	[261] <b>Rf</b> rutherfordium 104
				45 Sc scandium 21	89 <b>≺ √</b> 39	139 <b>La*</b> lanthanum 57	[227] <b>Ac*</b> actinium 89
	0	9 <b>Be</b> beryllium 4	24 <b>Mg</b> magnesium	40 <b>Ca</b> calcium 20	88 Sr strontium 38	137 <b>Ba</b> barium 56	[226] <b>Ra</b> radium 88
	<b>←</b>	7 Li lithium 3	23 <b>Na</b> sodium 11	39 <b>K</b> potassium 19	85 <b>Rb</b> rubidium 37	133 <b>Cs</b> caesium 55	[223] <b>Fr</b> francium 87

 $^{st}$  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.





	mmy was given a substance to analyse.  e was told that it contained two metal ions and two non-metal ions.						
	mmy carried out a flame test on the substance and found that it produced a yellow me.						
(i)	Describe how Tammy could carry out the flame test.						
<i>(</i> ::	() Which ice	account the realless flower		(2)			
(11		caused the yellow flame? $S(\boxtimes)$ in the correct box.					
	1 00 0 01000						
		calcium ions	X				
		iron(III) ions	X				
		potassium ions	X				
		sodium ions	×				
				(1)			
ъ\ т <sub>о</sub>	illilly dissolv	red some of the substance in distilled	water to	o form a solution.			
(i)	To one por A red-brow Which ion	rtion of the solution, she added drops vn precipitate formed.  did this test show to be present?  s (🗵) in the correct box.	of sodi	um hydroxide solution.			
	To one por A red-brow Which ion	vn precipitate formed.  did this test show to be present?	of sodi	um hydroxide solution.			
	To one por A red-brow Which ion	wn precipitate formed.  did this test show to be present?  s (☒) in the correct box.		um hydroxide solution.			
	To one por A red-brow Which ion	wn precipitate formed.  did this test show to be present?  s (⋈) in the correct box.  calcium ions	×	um hydroxide solution.			

Put a	t was the colour of the precipitate that fo a cross (⋈) in the correct box.	rmed?		
	pale yellow			_
	red	$\boxtimes$		_
	white	$\boxtimes$		-
	yellow	$\boxtimes$		_
			(1)	
She adde Which re ions?	lecided to test for sulphate ions.  d dilute hydrochloric acid to another portagent should Tammy add to this mixture  ss (X) in the correct box.		llphate	
She adde Which re ions?	d dilute hydrochloric acid to another portagent should Tammy add to this mixture ass ( <b>⊠</b> ) in the correct box.	e to show the	llphate	
She adde Which re ions?	ad dilute hydrochloric acid to another portagent should Tammy add to this mixture ass (  in the correct box.  ammonia solution	e to show the	llphate	_
She adde Which re ions?	agent should Tammy add to this mixture ass (☒) in the correct box.  ammonia solution  barium chloride solution	e to show the	llphate	-
She adde Which re ions?	ad dilute hydrochloric acid to another portagent should Tammy add to this mixture ass (  in the correct box.  ammonia solution	e to show the	llphate	-
She adde Which re ions?	agent should Tammy add to this mixture ass (☒) in the correct box.  ammonia solution  barium chloride solution	e to show the		-
She adde Which re ions?	agent should Tammy add to this mixture ass (🗵) in the correct box.  ammonia solution  barium chloride solution  dilute sulphuric acid	e to show the	(1)	Q1

5

Turn over

2.	Clo	thes	can be washed using soaps or detergents.	Leave blank
			water areas, washing soda crystals are sometimes added before soap is used.	
	(a)	Apa	art from washing, suggest another use of water in everyday life.	
			(1)	
	(b)	Wh	ich sodium compound is contained in washing soda crystals?	
			(1)	
	(c)	Nar	me the <b>two</b> types of substances needed to make soap.	
		1		
		2	(2)	
	(d)		dern washing powders contain detergents. ey can be 'biological' or 'non-biological'.	
			Describe differences between using detergents and using soaps in hard water areas.	
			(2)	
		(ii)	Give <b>one</b> difference between 'biological' and 'non-biological' washing powders.	
			(1)	<b>Q2</b>
			(Total 7 marks)	

Sul	
	phuric acid is an important substance.  s used to make many other substances.
(a)	Name <b>two</b> substances that are produced from sulphuric acid.
	1
	2
	(2)
(b)	The first step in the manufacture of sulphuric acid is the burning of sulphur in air to form sulphur dioxide.
	$S + O_2 \rightarrow SO_2$
	Suggest why air rather than pure oxygen is used.
	(1)
(c)	The sulphur dioxide is then reacted with more oxygen from air in the presence of a hot catalyst.  The reaction is reversible.
	(i) Name the catalyst used.
	(1)
	(ii) Write the balanced equation for the reversible reaction.
(d)	(ii) Write the balanced equation for the reversible reaction.
(d)	(ii) Write the balanced equation for the reversible reaction.  (3)
(d)	(ii) Write the balanced equation for the reversible reaction.  (3)

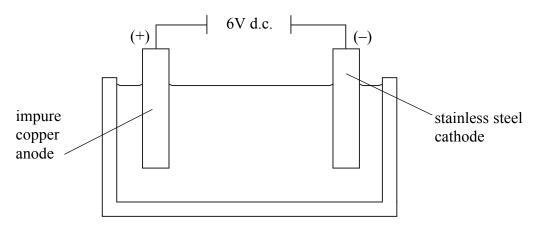
- **4.** Copper is used to make water pipes and in the electronics industry.
  - (a) Describe **two** properties of copper or its compounds that are typical of transition metals and their compounds.

1	 	 	 	 	

**(2)** 

(b) Very pure copper is produced from impure copper by electrolysis.

The diagram shows a cell in which impure copper is the anode and the cathode is stainless steel.



(i) Identify the electrolyte used in the cell.

<b>(1)</b>

(ii) Describe what happens to the impure copper electrode during electrolysis.

(1)	

(iii) Describe what happens at the negative electrode.

 		• • • • • • • • • • • • • • • • • • • •

(2)

(iv) During the electrolysis, impurities collect below the positive Explain the importance of these impurities.	<ul><li>(iv) During the electrolysis, impurities collect below the positive electrode.</li><li>Explain the importance of these impurities.</li></ul>	
	(Z)	Q.
	(Total 8 marks)	

Leave blank

**5.** Drinking water in the United Kingdom is high quality and contains a very low concentration of lead ions.

In some parts of the United States drinking water contains a higher concentration of lead ions.

A group is campaigning for lead-free water.



Lead ions are toxic and it is important to know the concentration of these ions in the water.

- (a) Arnie suggests
  - take 1000 cm<sup>3</sup> of tap water
  - heat to evaporate the tap water to dryness
  - find the mass of the residue
  - the mass of residue = the mass of lead

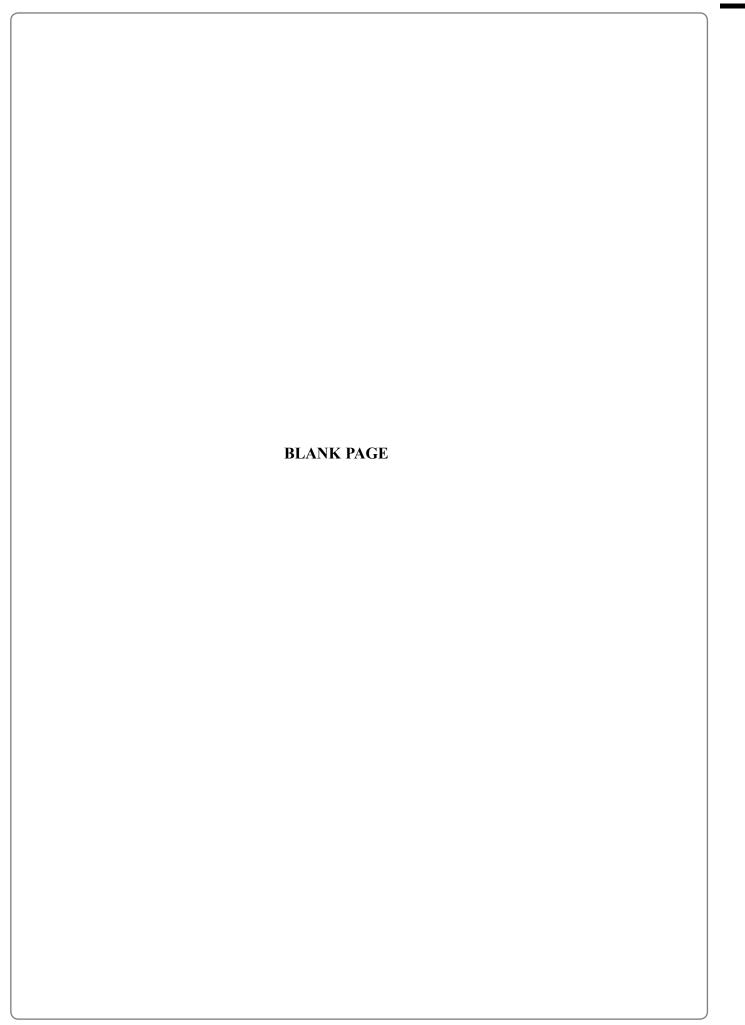
Suggest **two** reasons why this method would **not** give an accurate figure for the mass of lead ions in the water.

I	
2	
2	• • • • • • • • • • • • • • • • • • • •
	O



		_
He a ions.	id is trying to find the concentration of lead ions (Pb <sup>2+</sup> ) in a solution.  adds a few drops of potassium iodide solution to the solution containing lead  ellow precipitate forms.  I iodide is an insoluble compound with a distinctive yellow colour.	]   1
(i)	Write the ionic equation for the reaction.	
	(3)	
. ,	This is a reliable test for lead ions.  Why is it important that only lead ions give this distinctive yellow precipitate?	
	(1)	
	Faiza tells David that the test described above does not determine the <b>concentration</b> of lead ions in the solution but that this could be done by titration. Explain why Faiza is correct.	

Titration can be used to find the concentration of a sodium hydroxide solution. In an experiment sodium hydroxide solution is titrated with dilute hydrochloric acid of known concentration. Describe how you would carry out this titration. Include the names of the pieces of apparatus you would use.
(4)
(Total 12 marks)



**6.** Alcohols and esters are some of the substances used to make cosmetics.



(a) Suggest a reason why

(i)	alcohols	are used	in cost	netics

(1)

(ii) esters are used in cosmetics.

(1)

.....

(b) A molecule of ethanol reacts with a molecule of ethanoic acid to make one molecule of the ester ethyl ethanoate and one molecule of water.

Write the equation for this reaction.

(2)

(c) Another ester, methyl methanoate, can be made as follows

(i) Calculate the mass of methyl methanoate,  $HCOOCH_3$ , that can be made from 320 kg methanol,  $CH_3OH$ .

(Relative atomic masses: C = 12, H = 1.0, O = 16)

Answer.....kg

(3)

(ii)	Suggest why a manufacturer would need to carry out this sort of calculation.	Lo bl
	(1)	
(iii	) Describe another reaction of methanoic acid.	
	(2)	
	(Total 10 marks)	

The alkali metals react vigorously with water.  The following is a description of the reaction of potassium with water.	
The following is a description of the reaction of pollusorani with water.	
A small piece of potassium was dropped onto a large volume of wa potassium melted to form a ball. The ball whizzed across the surface water and a lilac flame was seen around it.	
(a) Suggest why the potassium melts.	
	(1)
(b) What burns to produce the flame?	
	(1)
(c) What causes the flame to be lilac coloured?	
	(1)
(d) What would you <b>see</b> if litmus solution is added to the liquid?	
	(1)
(e) Sodium hydroxide is made by the electrolysis of brine.	,
This process produces sodium hydroxide, chlorine and hydrogen.	
The overall equation for the electrolysis is	
$2\text{NaCl}( ) + 2\text{H}_2\text{O}( ) \longrightarrow 2\text{NaOH}( ) + \text{H}_2( ) + \text{Cl}_2($	)
(i) Add all the state symbols to the equation.	(1)
	(1)
(ii) Suggest why this is an important industrial process.	
	(1)

(iii) In the electrolysis of brine, chloride ions are converted to chlorine.  Explain why this reaction is an oxidation reaction.	Leave blank
(iv) Write the balanced half equation for the conversion of chloride ions, Cl <sup>-</sup> , into chlorine.	
(2)	Q7
(Total 9 marks)  TOTAL FOR PAPER: 60 MARKS	
END	



