Centre No.					Pape	er Refer	ence			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

Wednesday 25 May 2011 – Morning

Time: 1 hour

Materials	required	for	examination
Calculator			

Items included with question papers

Exam	iner's us	e only
Team L	eader's u	ise only

Question

1

2

3

4

5

Leave

7	
8	

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 (X). 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 8 questions in this question paper. The total mark for this paper is 60. There are 16 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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Turn over

Total



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The Periodic Table of the Elements

4 He lium	20 Ne neon 10	40 Ar argon 18	84 krypton 36	131 Xe xenon 54	[222] Rn radon 86	fully
	19 F fluorine 9	35.5 CI chlorine 17	80 Br bromine 35	127 	[210] At astatine 85	orted but not
	16 O oxygen 8	32 S sulfur 16	79 Se selenium 34	128 Te tellurium 52	[209] Po polonium 84	ve been repo
	14 N nitrogen 7	31 P phosphorus 15	75 As arsenic 33	122 Sb antimony 51	209 Bi bismuth 83	s 112-116 ha authenticated
	12 C carbon 6	28 Si silicon 14	73 Ge germanium 32	119 Sn tin 50	207 Pb	mic numbers
	11 B boron 5	27 Al aluminium 13	70 Ga gallium 31	115 In indium 49	204 TI thallium 81	Elements with atomic numbers 112-116 have been reported but not fully authenticated
·			65 Zn zinc 30	112 Cd cadmium 48	201 Hg mercury 80	Elem
			63.5 Cu copper 29	108 Ag silver 47	197 Au gold 79	Rg roentgenium
			59 nickel 28	106 Pd palladium 46	195 Pt platinum 78	[271] Ds damstadtium 110
			59 Co cobalt 27	103 Rh rhodium 45	192	[268] Mt meitnerium 109
hydrogen			56 ron 26	Ru ruthenium 44	190 Os osmium 76	[277] Hs hassium 108
			55 Mn manganese 25	[98] Tc technetium 43	186 Re rhenium 75	[264] Bh bohrium 107
	mass ɔol ıumber		52 Cr chromium 24	96 Mo molybdenum 42	184 W tungsten 74	[266] Sg seaborgium 106
Key	/e atomic . /mic symb _{name} (proton) n		51 V vanadium 23	93 Nb niobium 41	181 Ta tantalum 73	[262] Db dubnium 105
	relativ ato atomic		48 Ti titanium 22	91 Zr zirconium 40	178 Hf hafnium 72	[261] Rf rutherfordium 104
_			45 Sc scandium 21	89 Y yttrium 39	139 La* Ianthanum 57	[227] Ac* actinium 89
	9 Be beryllium 4	24 Mg magnesium	40 Ca calcium 20	88 Sr strontium 38	137 Ba barium 56	[226] Ra radium 88
	7 Li lithium 3	23 Na sodium 11	39 K potassium 19	85 Rb rubidium 37	133 Cs caesium 55	[223] Fr francium 87
	T Hydrogen	Key 1 hydrogen 1 Lage Lage Lage Lage N O F Be atomic symbol F N O F benyllium atomic (proton) number S G T 8 9	Key Telative atomic mass atomic (proton) number 1 hydrogen atomic mass atomic (proton) number 1 hydrogen atomic mass atomic symbol number 1 hydrogen atomic mass atomic symbol number 1 hydrogen atomic (proton) number 27	1	1	This continue This continu

^{*} 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.



				alkali metals	×	
(a)	The	group 1 elements	are called	transition metals	\boxtimes	
				halogens	\boxtimes	
(b)	The	potassium reacted	violently v	ropped on to water. vith the water. l a gas were formed		(1)
	(i)	Complete the wor formed.	d equation	for the reaction by	y filling in the name of th	e gas
		potassium + water	er → pota	ssium hydroxide +		(1)
	(ii)	Give the name of water.	a metal in	group 1 that is les	ss reactive than potassium	with
			• • • • • • • • • • • • • • • • • • • •			
						(1)
(c)	A fl		ed out on a	sample of potassiur		
(c)	A fl (i)					
(c)		lame test was carried Describe how a fla	ame test is	carried out.		(1)
(c)		lame test was carried Describe how a fla	ame test is	carried out.	n chloride.	(1)
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(c)		lame test was carried Describe how a fla	ame test is	carried out.	n chloride.	(1)
(c)	(i)	Describe how a fla	ame test is o	lours in the flame	n chloride.	(1)
(c)	(i)	Describe how a fla Which of the fol potassium ions in	llowing column	lours in the flame	would show the present	(1)
(c)	(i)	Describe how a fla Which of the fol potassium ions in	llowing column the potassic	lours in the flame am chloride?	would show the present	(1)
(c)	(i)	Which of the fol potassium ions in	llowing column the potassic	lours in the flame am chloride?	would show the present	(1)
(c)	(i)	Which of the fol potassium ions in	llowing column the potassic	lours in the flame um chloride?	would show the present	(1)

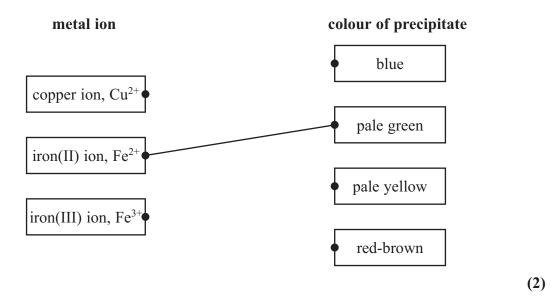
(Total 6 marks)

(a)	Which two of the following pro	perties are	typical of	transition me	etals?	
	Put a cross in two boxes (☒) to	show your	answers.			
	low boiling point	×				
	high melting point	×				
	poor conductors of electricity	X				
	form coloured compounds	X				
	larry danaitre					
(b)	Ammonia is made by reacting h					(2)
(b)	·	aydrogen was is faster if eaction.	iron is add	led.	ction in this w	
(b)	Ammonia is made by reacting he This reaction is very slow but it The iron is not used up in the reaction.	aydrogen was is faster if eaction.	iron is add	led.	ction in this w	
. ,	Ammonia is made by reacting he This reaction is very slow but it The iron is not used up in the reaction.	is faster if eaction.	reases the	led. rate of a read		ay? (1)
. ,	Ammonia is made by reacting hat This reaction is very slow but it The iron is not used up in the reaction. What name is given to a substant substa	is faster if eaction.	reases the	led. rate of a read		ay? (1)
. ,	Ammonia is made by reacting hat This reaction is very slow but it The iron is not used up in the rewith the what name is given to a substant Some metal ions in solution precipitates.	is faster if eaction.	reases the	led. rate of a read		ay? (1)

Leave blank

(ii) Metal ions can be identified by the colour of the precipitates they form with sodium hydroxide solution.

Draw a straight line from each metal ion to the colour of the precipitate it forms. The line for iron(II) ion, Fe^{2+} , has been done for you.



(iii) This test to identify metal ions is a qualitative test.

What is meant by a qualitative test?	
	(1)

(Total 7 marks)

Q2

- **3.** Ethyl butanoate is an ester. It has a pleasant smell.
 - (a) Suggest **two** uses of ethyl butanoate.

(b) The structure of a molecule of ethyl butanoate is

Ethyl butanoate is made by reacting an alcohol with butanoic acid.

(i) Give the name of this alcohol.

(1)

(ii) A solution of butanoic acid behaves as a typical acid. What colour would you see when a few drops of universal indicator are added to butanoic acid solution?

(1)

(iii) Magnesium metal reacts with butanoic acid solution to produce a gas. When the gas is mixed with air and ignited, it burns with a squeaky pop. Give the name of the gas.

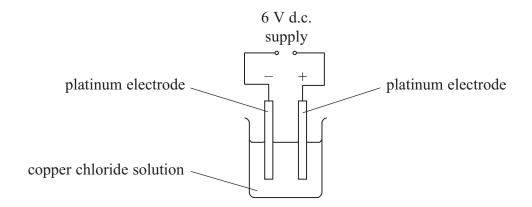
(1)

(Total 5 marks)



5. (a) Copper chloride solution can be electrolysed using the apparatus shown in the diagram.

Both electrodes are made of platinum, which is an unreactive metal.

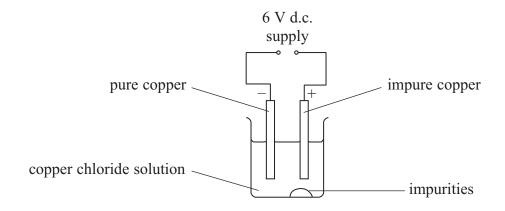


During the electrolysis copper is formed at the negative electrode.

(i)	Describe what you would see at the negative electrode.	
		•••••
		(2)
(ii)	Explain how a copper ion, Cu ²⁺ , becomes a copper atom, Cu.	
		(2)



(b) Copper is purified by electrolysis.



Explain why.	
	(2)

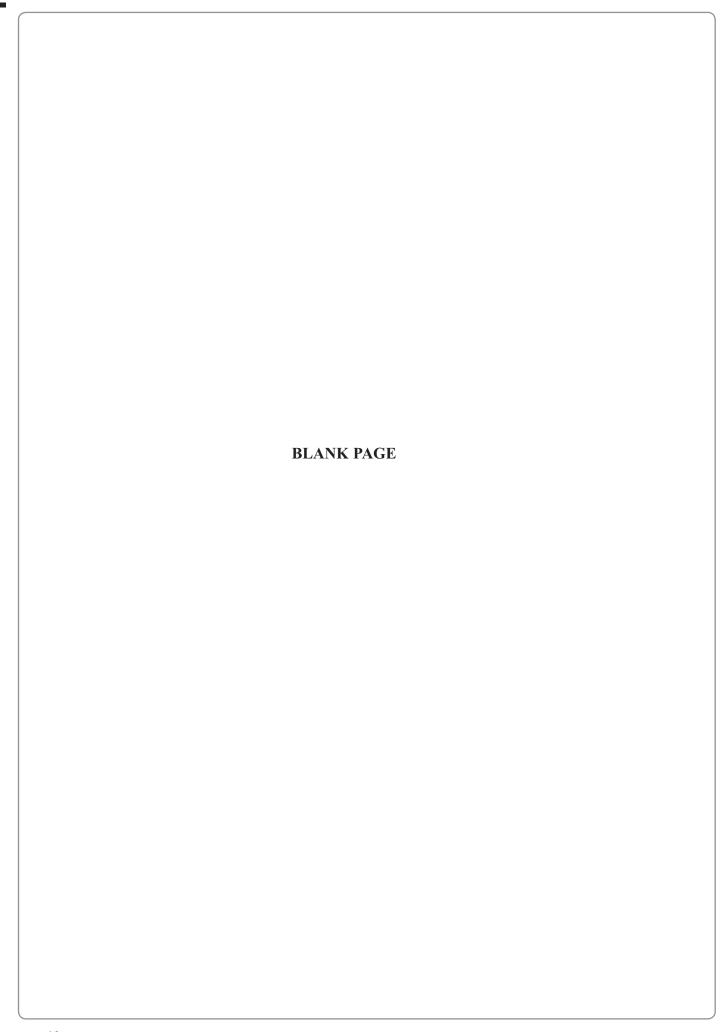
(ii) During electrolysis, impurities fall off the impure copper electrode and drop to the floor of the cell.

Give the nam	ne of a metal th	nat could be	found in	these impu	rities.

(1)

(Total 7 marks)

Q5



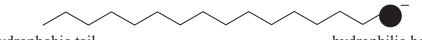
- **6.** Soaps and detergents are used to remove grease marks from clothes.
 - (a) Soaps are salts of carboxylic acids.Soaps are made by boiling esters with a concentrated solution of Z.What is Z?

Put a cross (\boxtimes) in the correct box to show your answer.

ethanol	\boxtimes
ethyl ethanoate	×
hydrochloric acid	X
sodium hydroxide	×

(1)

(b) The negative ion in a detergent can be represented as



hydrophobic tail

hydrophilic head

Describe how these detergent ions remove grease marks from clothes.

(2)

(c)	What advantage is there in using soapless detergents rather than soaps in hard-water areas?

Q6

(1)

(Total 4 marks)



(2)

7.	In t	he UK over 1 million tonnes of sulphuric acid are manufactured each year.
	(a)	Give a use of sulphuric acid in industry.
		(1)
	(b)	The first stage in the manufacture of sulphuric acid is to make sulphur dioxide.
		One way of making sulphur dioxide is by heating iron sulphide, FeS_2 , in air to make solid iron(III) oxide, Fe_2O_3 , and sulphur dioxide, SO_2 .
		Add numbers before the formulae on the right hand side to balance the equation for this reaction. Fill in the missing state symbols.
		Thi in the missing state symbols.
		$4\text{FeS}_2(s) + 11O_2(g) \rightarrow \dots Fe_2O_3(\dots) + \dots SO_2(\dots)$ (2)
	(c)	Another way of making sulphur dioxide is by burning sulphur in air.
		$S + O_2 \rightarrow SO_2$
		Calculate the maximum mass of sulphur dioxide that could be made by burning one tonne of sulphur.
		(Relative atomic masses: $O = 16$; $S = 32$)
		answer =tonnes

) Sul	phur dioxide can be reacted with oxygen to form sulphur trioxide.
	$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
(i)	Calculate the maximum volume of sulphur trioxide that is made if 1000 dm³ oxygen completely reacted.
	answer = dm^3 (1)
(ii)	In industry, in the contact process, this reaction is carried out using a metal oxide. Give the name of this oxide.
	(1)
	vdered sodium carbonate was added to dilute sulphuric acid. bon dioxide was formed.
(i)	What would you see when this reaction was carried out?
	(1)
(ii)	In one experiment 120 cm ³ of carbon dioxide was produced.
	Calculate the number of moles of carbon dioxide, CO ₂ , in 120 cm ³ .
	(1 mol of any gas occupies 24 000 cm ³ at room temperature and atmospheric pressure)
	answer = mol (1)
	(Total 9 marks)

8.	Son	me drain cleaners are concentrated solutions of sodium hydroxide.					
	(a)	How would you show that these drain cleaners are alkaline?					
		••••					
		••••	(2)				
	(b)	The	concentration of sodium hydroxide in a drain cleaner was found by titration. original drain cleaner was diluted by a known amount. see steps were used in the titration of the diluted solution.				
		1 2 3 4 5	A 25.00 cm ³ sample of diluted drain cleaner was measured out. This sample was transferred to a conical flask. A few drops of suitable indicator were added to the solution. The sample was titrated with dilute hydrochloric acid. The titration was repeated until concordant results were obtained. What apparatus should be used to measure the 25.00 cm ³ of diluted drain cleaner				
			as accurately as possible (step 1)? (1)				
		(ii)	Name a suitable indicator (step 3).				
			(1)				
		(iii)	Describe how you would carry out an accurate titration (step 4).				
			(3)				



What is the meaning of concordant (step 5)?		
	(1)	

(c) The titration results are shown.

	volume (cm ³)		
	experiment 1	experiment 2	experiment 3
final reading	25.50	24.90	25.00
initial reading	0.15	0.00	0.20
volume of hydrochloric acid added	25.35		

(i) Complete the table to show the volumes of hydrochloric acid added in experiments 2 and 3.

(1)

(ii) The titration results are used to calculate the concentration of sodium hydroxide in the diluted drain cleaner.

Calculate the volume of hydrochloric acid that should be used in the calculation.

 	 •••••	

answer = cm^3

(1)

END			
	(Total 15 marks TOTAL FOR PAPER: 60 MARK		
	ionic equation for this reaction.		
	ydroxide solution is used in the test for dissolved iron(III) ions, Fe ³⁺ . ate of iron(III) hydroxide, Fe(OH) ₃ , is formed.		
	answer = mol dm		
•••••			
•••••			
•••••			
•••••			