	JAR			National S	5 Chem	istry		TAR	on	Traf	ffic L	ight
H	chem		U	nit 3.1d Extr	action	of Metal	S	chem	Less	Red	Amber	Green
10	During the	extractio	on of m	etals, metal ions are	reduced f	orming metal	l atom	IS.		(<u>;</u>)	\bigcirc	\odot
11a 12a	The least re e.g. silver, g	eactive m gold, plat	ietals a inum a	re obtained by heat nd mercury silver (I) oxide 2Ag ₂ O	ing metals → →	compounds a silver $4Ag$	alone + +	oxygen O2		3	:	0
11b 12b	Metals with monoxide o Copper (I 2Cu iron (III) 2Fe	n medium e.g. coppe I) oxide 10) oxide 203	n reacti er, lead + +	vity are obtained by , tin, iron and zinc carbon C carbon monoxide 3CO	y heating n	netal compou copper 2Cu iron 4Fe	nds w + + + +	vith carbon or carbon carbon dioxide CO ₂ carbon dioxide 3CO ₂		33	:	©
11c 12c	The most r e.g. potassi	eactive m um, sodii	netals r um, lith	nust be obtained by nium, calcium, magn aluminium oxide 2Al ₂ O ₃	molten ele esium and 	ectrolysis of r l aluminium aluminium 4Al	netal + +	compounds oxygen 30 2		::	:	0
13 14	Electrolys into its ele • a c ele	is is the c ements u d.c. suppl ectrolysis	decomp sing ele y must s are to	position of an ionic o ectricity be used if the produ be identified.	compound ucts of	Heat-resistant container —		Electricity Supply + electrodes molten aluminium oxide		\odot	:	٢
15	Positive me Negative ne	etal ions g on-metal	gain ele ions lo	ectrons at the negations electrons at the p	ive electro positive ele	de (reduction ectrode (oxid	n) ation)	e.g. $Cu^{2+} + 2e^{-} \rightarrow Cu$ e.g. $2Cl^{-} \rightarrow Cl_2 + 2e^{-}$		$\overline{\mbox{\scriptsize (s)}}$		\odot

Nat5 Past Paper Question Bank											ho	MA.			
Traffic	: Lights		U	nit 3	3.1d	Ext	trac	tion	of /	Neta	als			-115	**1
Outcome	<u>Original</u>	<u>New</u> Specimen	Nat5	Nat5	<u>Nat5</u>	Nat5	Nat5	Nat5	Nat5	Nat5					
Gurcome	Paper	Paper	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	2020	2021					
10		L11a	L12a				L11d								
11a 12a	mc16	mc17	mc16			mc16									
11b 12b					mc15										
11c 12c			L12c												
13 14				mc7		mc4									
15		L11b													

Nat5	Answer	% Correct	Reasoning								
				Method	Electrol	lysis		Heat Wit	th Carbon		Heat Alone
2014 ^{MC} 16	D	73		Metals Made This Way Reason	Potassium Lithium Magnesium A most reactive	Sodium Calcium Aluminium ve metals	m	Zinc Nickel Lead edium rea	Iron Tin Copper ctive metal	5	Mercury Silver Gold Platinum
2015 ^{MC} 7	С	46	X X X	A Calcium at su B Calcium would C Solid calcium D Calcium would	face as it is l be a solid at would float or be a solid at	less dense 800°C as n the surf 800°C as	it r ace it r	54g cm ⁻³) t nelts at c of the nelts at	han calciu 842°C molten ca 842°C	um alc	n chloride (2.15g cm ⁻³) cium chloride
				Method	Electrol	lysis		Heat Wit	th Carbon		Heat Alone
2016 ^{MC} 15	D	64		Metals Made This Way	Potassium Lithium Magnesium A	Sodium Calcium Aluminium		Zinc Nickel Lead	Iron Tin Copper		Mercury Silver Gold Platinum
				Reason	most reactive	ve metals	m	edium rea	ctive metal	S	least reactive metals
2017 ^{"c} 4	D	60	X X X	A Magnesium m B Magnesium ma C Magnesium ha D Magnesium fo as magnesium	elts at 650°C elts at 650°C s density 1.74 ormed is a liqu metal has a li	∴ temper ∴ temper 4 g cm ⁻³ an uid at 730° lower dens	atu atu d f °C a	ure is 73 ire is 73 loats in and floa ^r	80°C so m 80°C so m magnesiu ts in molt	lag um ter	nesium is liquid nesium is liquid chloride (2.32gcm ⁻³) n magnesium chloride
2017 "c 16	С	79	X X	A tin is a mediu B magnesium is C gold is a very D sodium is a ve	m reactivity n a upper react unreactive me ry reactivity	netal and i ivity meta etal and fo metal and	is f l ai oun fo	ound co nd founc d uncom und com	mbined in d combine bined in bined in	n t ed th th	he Earth's crust in the Earth's crust e Earth's crust e Earth's crust

Nat5	Answer		Reasoning										
2014 12a	Reduction	Metal ores an form of posit be reduction Mg ²⁺ + 2e ⁻ → 1	Metal ores are compounds of metals and the metals are in the form of positive ions. Positive ions are turned back in atoms again be reduction where electrons are gained by the positive ions e.g. $Mg^{2*} + 2e^- \rightarrow Mg$										
2014 12c	(molten) Electrolysis	Method Metals Made This Way Reason	Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium most reactive metals	ZincIronNickelTinLeadCoppermedium reactive metals	Heat Alone Mercury Silver Gold Platinum								
²⁰¹⁸ 11d	Insoluble	Magnesium is able to move :	nesium is insoluble (p8 of data booklet) and the ions are not to move so the circuit would not be complete.										

Na	⁺⁵ Past Paper Question Bank															
Traffic	Lights		U	nit 3	3.1d	Ext	rac	tion	of I	Neta	als				.ne	N MI
Outcomo	<u>Int2</u>	Inta	2 <u>Int2</u>	Int2	Int2	Int2	Int2	Int2	Int2	Int2	Int2	Int2	Int2	Int2	Int2	Int2
Ourcome	2000	<u>200</u>	1 2002	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
10	L2b	L6a										L12a		mc29	L14c	
11a 12a		L6b	mc23				mc28		mc28			mc28			mc30	
11b 12b					mc29 mc30											
11c 12c	L2c				mc30 mc29											
13 14		L7a		L12c	L12c L4a L4b L4b											
15			mc8		mc7	L14c	mc27	mc28 mc29 L12a	L4c(i)	mc10		L12b(ii)	L12a	L1b	mc8	mc30
Int2	Ansı	ver	% Correct						I	Reasonin	g					
2002 ^{MC} 8	² C	-	31	⊠Ane ⊠Bne ⊡Cne ⊠Dne	egative eutral c egative eutral c	ions a atoms c Cl ⁻ ion atoms c	re attr are not s lose (are not	racted attrac electro attrac	to the ted to ons at t cted to	negati the ne he neg the ne	ve elec egative ative e egative	trode i electr lectroo electr	not pos ode de and rode	sitive ic form C	ins I2 mole	cules
2002 MC 23)	39	EAC EBC ECZ IDS	alcium opper i inc is t ilver is	is too 1 s too r oo read unread	reactiv eactive ctive: Z ctive a	e: Calc 2: Copp Linc is 1 nd can	ium is 1 er is m made b be mac	made b ade by y heat le by h	y molto heatin ing zino eating	en elec g copp c ore w silver (rolysis er ore vith car ores to	with co bon releas	arbon e silve	r
2004 ^{MC} 7	4	١	48	⊠AR ⊠BPo ⊠CPo ⊠DPo	eactior ositive ositive ositive	i at neg ions ga ions tr ions tr	gative o in elec avel to avel to	electro trons t the ne the ne	ode: Ag to beco egative egative	+ e ⁻ - me neu electr electr	→ Ag utral at ode no ode no	oms no t the p t the p	ot lose ositive oositive	electro electro electr	ons ode ode	
2004 ^{MC} 30	<i>•</i>	١	58	☑AA 薬BC 薬CIr 薬DG	luminiu opper i ron is n old ore	im is so s made nade by : releas	react by hea heating ses gold	ive tha ating co ng iron d meta	t it mu opper c ore wi l by he	st be r pre wit th carl ating t	nade b h carbo con in c he ore	y molte on a blast alone	en elec [.] furnac	trolysis :e	5	
2006 ^{MC} 27	Ċ	-	55	⊠AC ⊠BC ⊡CC ⊠DC	 ■D Gold ore releases gold metal by heating the ore alone ■A Copper ions are reacting into copper atoms at the negative electrode ■B Copper ions are reacting into copper atoms at the negative electrode ■C Copper ions gain electrons (reduction) to become copper atoms: Cu²⁺ + 2e⁻ → Cu ■D Copper ions gain electrons (reduction) and do no loss electrons (avidation) 											
2006 MC 28	Ê	3	58	 Copper ions gain elections (reduction) and do no lose electrons (oxidation) A Lead is too reactive to made my heating lead oxide alone B Mercury is an unreactive metal and can be made my heating mercury oxide C Tin is too reactive to made my heating tin oxide alone D Zinc is too reactive to made my heating zinc oxide alone 												
2007 ^{MC} 28	E	3	47	図A 2 図B 2 図C Pc 図D Pc	$ \begin{array}{l} I^{-} \rightarrow I_{2} \\ I^{-} \rightarrow I_{2} \\ ositive \\ ositive \end{array} $	2 + 2e ⁻ + 2e ⁻ i ions ma ions ma	is the c s the c ove to ove to	oxidati oxidation the neg the neg	on read on read gative d gative	ction no ction at electro electro	ot a red the po de ode	ductior ositive	n react electro	ion ode		

2007			☑A Calcium is a s	olid at 800°C and is les	ss dense so floats on	top							
MC	Λ	52	🗷 B Calcium has no	ot melted at 800°C so	calcium is still a solid								
20	A	53	EC Calcium is less	s dense than molten ca	lcium chloride so calc	cium floats on top							
27			🗷 D Calcium has n	ot melted at 800°C so	calcium is still a solid	1							
2008			🗷 A Alumiunium is	too reactive to be und	combined (made by m	olten electrolysis)							
<u>жс</u>	5	75	🗷 B Iron is too re	active to be found unc	ombined (made by he	ating ore with carbon)							
20	D	C /]	⊠C Lead is too re	active to be found unc	ombined (made by he	ating ore with carbon)							
20			☑D Silver is unre	active and found uncor	nbined in the Earth's	crust							
2000			⊠A copper ions g	ain electrons to becom	e copper atoms: Cu ²⁺	+ 2e ⁻ → Cu							
2009 MC	~	10	B bromide ions	ose electrons to becor	me bromine molecules	$s: 2Br^{-} \rightarrow Br_{2} + 2e^{-}$							
10	D	48	EC bromide ions	ose electrons to becor	ne bromine molecules	$s: 2Br^{-} \rightarrow Br_{2} + 2e^{-}$							
10			☑D copper ions g	ain electrons to becom	e copper atoms: Cu ²⁺	+ 2e⁻ → Cu							
			Method	Electrolysis	Heat With Carbon	Heat Alone							
2010				Potassium Sodium									
MC	D	59	Metals Mad	e Lithium Calcium	Zinc Iron Tinc Copper	Mercury Silver							
29	U		This Way	Magnesium Aluminium	lin Lead	Gold Platinum							
			Reason	most reactive metals	medium reactive metals	least reactive metals							
2011			🗷 A Calcium is onl	y made from calcium o	xide by molten electr	rolysis							
MC	5	54	🗷 B Copper can be	made by heating copp	er oxide with carbon								
20	D	OC	 	ade by heating zinc ox	ide with carbon								
28			☑D silver is unrea	active and can be made	by heating silver oxi	ide alone							
2012			🗷 A metal is belov	A metal is below Zn and Mg in reactivity (metal between would need electrolysis) B metal is below Mg and K in reactivity (metal between would need electrolysis)									
2012	~	15	B metal is below										
	C	65	☑C zinc is made b	v heating with carbon	and copper can be me	ade by heat alone							
29			D metal is above	, e copper and gold in re	activity (they can be	, made by heat alone)							
2012			A displacement:	higher up metals disp	lace lower down ions	from compounds							
2013	0		⊠B metal atoms l	ose electrons to becom	ne metal ions (oxidati	ion is loss of electrons)							
	В	45	EC precipitation:	insoluble substance fo	ormed when two solut	ions are mixed							
29			D metal atoms I	ose electrons to becon	ne metal ions (reduct	ion is gain of electrons)							
			Method	Flectrolysis	Heat With Carbon	Heat Alone							
2013				Potassium Sodium	Zinc Tron								
MC		58	Metals Made	Lithium Calcium	Nickel Tin	Mercury Silver							
30	U	50	This Way	Maonesium Aluminium	Lead Copper	Gold Platinum							
			Reason	most reactive metals	medium reactive metals	s least reactive metals							
2014			VAH ⁺ ions move	to the negative electro	de and form Ha age								
2014		- /	×B Ho is formed	in the reaction at the	-ve electrode but not	present at the start							
MC	A	56	INC CL ⁻ ions move to the positive electrode and form Cl ₂ aas										
8			ID Cl ₂ is formed in the reaction at the +ve electrode but not present at the start										
			Mathad	Flactrolycic	Heat With Carbon	Haat Alona							
2014			Mernod	Detersium Sodium	Zing Tran								
MC	D	60	Metals Made	Lithium Calcium	Nickel Tin	Mercury Silver							
30	D	00	This Way	Magnesium Aluminium	Lead Copper	Gold Platinum							
50			Peason	most reactive metals	medium reactive metals	s least reactive metals							
			VA coloium form	ac a colid on the surf	ace due to density or	d malting point							
2015				bus a sona on the surr	ace use to defisity and	na urad in 800°C							
MC	A	58	8 In Calcium is a solid us in mension of 2 c and the temperature used is 800										
30				ad on surface as it has	a lower density than	calcium chioride							
1		1		en on sur face as it has	a lower density man								

Int2	Answer	Reasoning								
2000										
2b	Reduction	Copper ions in $Cu^{2*}O^{2*}$ are reduced to form Cu atoms: $Cu^{2*} + 2e^{2*} \rightarrow Cu$								
2000	Any motal from:	potassium sodium lithium calcium magnesium aluminium								
2c	Any metal from.	i.e. any metal above zinc in the reactivity series								
2001		In the production of a metal, the metal ion gains electrons to become a								
6a	Reduction	an uncharged metal atom e.g. Fe ³⁺ + 3e ⁻ — Fe								
2001	Mercury,	Only the least reactive metals in metal oxide will release the metal on								
6b	silver or gold	heating alone								
2001	d.c. supply has steady	D.C. (direct current) has constant positive and negative terminals and the								
70	+ and - so ions move in	the elements. A.C. (alternating current) has reversing positive and negative								
74	one direction	terminals and ions cannot move to the terminals to be electrolysed.								
	(<u>+ -</u>)	At Positive electrode:								
	chlorine / Copper	$2Cl^2$ $Cl_2 + 2c^2$								
2003										
12c		At Negative electrode:								
		$Cu^{2+} + 2a^{-} - Cu$								
	Copper (II) chloride solution									
2005	M = ² t = 2 = - = M =	Molten magnesium chloride contains magnesium ions.								
14c	Mg [_] + 2e → Mg	Magnesium ions pick up electrons from negative electrode to become magnesium atoms.								
2007	Electrode A or	Hydrogen is produced by: $2H^- \rightarrow H_2 + 2e^-$								
12a	positive electrode	\therefore Negative hydride H ⁻ ions will travel to the positive electrode.								
	Compound breaks									
2008	down to elements by	Electrolysis used d.c. electricity to provide the energy to break								
4a	passing electricity	compounds down into its constituent elements								
	through it									
		D.C. electricity has a single direction of electron flow which means a								
2008	Direction of electron	 Positive ions (usually metal ions) move to the negative electrode. 								
4b	flow remains the	and pick electrons to become atoms								
	same	 Negative ions move to the positive electrode to lose electrons and become an element again 								
2008		Positive electrode: $2Cl^- \rightarrow Cl_2 + 2e^-$								
4 c(i)	POSITIVE NEGATIVE Bubbles of gas Brown solid made	Negative electrode: Cu ²⁺ + 2e ⁻ → Cu								
		Metal compounds contain metal ions. When metals are extracted from metal								
2011		compounds the metal ions turn into metal atoms. This involves the reduction of								
2011	reduction	metais ions into metai atoms as the metal ions must gain electrons to become metal atoms.								
12a		$Cu^{2+} + 2e^{-}$								
		copper (II) ions gain of electrons copper atoms								

2011	011 Positive Negative		Bubbles of Gas = Chlo	rine aas	Brown Solid					
12b(ii)	Positive N	Negative	2Cl ⁻	\rightarrow Cl ₂ + 2e ⁻	Cu ²⁺ + 2e ⁻	→ Cu				
120(1)			Positive electrod	e picks up electrons	Negative electrode suppli	es electrons				
2012			All acids contair	H⁺ ions which will	be attracted to the ne	gative				
12a	Hydrog	gen	electrode where they turn into hydrogen gas: $2H^{+}(aq) + 2e^{-} \rightarrow H_{2(g)}$							
²⁰¹³ 1b	Positive electrode	Negative electrode	Chlorine gas is f Strontium meta	ormed at the position $2CI^{-}(1)$	tive electrode: → Cl _{2(g)} + 2e ⁻ negative electrode: → Sr(l)					
2014 14c	Reduct	tion	Al₂O₃ contains A Al³+ + 3e⁻ →	I ^{I3+} ions which are Al	reduced to form atoms	of Al				

Na	Nat5 Past Paper Question Bank															
Traffic	: Lights		U	nit 3	3.1d	Ext	trac ⁻	tion	of I	Neta	als		J	A190	ne	M
Outcome	<u>2000</u> Credit	<u>2001</u> <u>Credit</u>	<u>2002</u> <u>Credit</u>	<u>2003</u> Credit	<u>2004</u> Credit	<u>2005</u> Credit	<u>2006</u> <u>Credit</u>	<u>2007</u> Credit	<u>2008</u> Credit	<u>2009</u> Credit	<u>2010</u> Credit	<u>2011</u> Credit	<u>2012</u> Credit	2013 Credit		
10		11d							16d							
11a 12a		11b	15a					17e	16c		16b(ii)			16a		
11b 12b			15a						16b		16b(ii)			16a		
11c 12c			15a						16b		16b(ii)		21a	16a		
13 14							17a			10a	13a	18a				
15																

SG Credit	Answer	Reasoning									
2001 <i>C</i>	W: Pt, Au, Ag or Hg	W must be the leas	t reactive metals if h	eating alone rele	ases the metal from the o	ore.					
11b	Y: K, Na, Li, Ca or Mg	Y must be the mos	t reactive metals if	they react with	cold water.						
2001 <i>C</i>	Doduction	Doduction is on	in of clostness	• • • • • • • • • • • • • • • • • • •							
11d	Reduction	Reduction is ga	in of electrons e	.g. M⁻ + 2e	F M						
2002 <i>C</i>	Metal Extraction Method	Method heat alone	Reactivity	/	Metals Made this Method						
15a	lead heat + carbon	heat + carbon	Medium read	tive Zn	Fe Sn Pb Cu	1					
2004.0	magnesium molten electrolysis	molten electrolysis	Most React	ive K	Na Li Ca Mg Al						
17-	Electrolysis	Electrolysis is t	the process when	re electricity	splits an ionic						
1/a	,	compound to to	rm elements								
2007 <i>C</i>	gold or silver	Only the least re	active metals will	release them i	netal from the metal o	ore					
17e	or mercury or platinum	by heat alone.									
2008 <i>C</i>	Metal Extraction	Aluminium is too rea	active to be made by	heating with carb	oon. Carbon is not powerfu	ıl					
16b	Aluminium molten electrolysis	enough to take oxyg	jen away from alumini split axyaen from alu	um in aluminium o Iminium	oxide. Molten electrolysis i	is					
20086	Via laga na astiva than										
160	A is less reactive than	The least reactive main and the metals are for	etals (e.g. mercury, silv prmed without the nee	ver and gold) can b d of carbon being	pe made by heating their ore present.	es					
100					F						
20080	reduction	Reduction is ga	in of electrons: ,	A ³⁺ + 3e ⁻ →	Al						
16d											
2009C	Flectrolysis	Electrolysis: Pass	sing electricity th	rough a substa	nce and the substance	2					
10a	LIECTI OTYSIS	breaks back down to its elements.									
20106		Direct current (d.c.) must be used as this give constant positive and negative									
130	charge at all times	Alternating curren	t (a.c.) has reversing	n flow is always a current direct	tne same. ion so the charae on each	h					
150	onal go ar an mhoo	electrode would ke	ep changing.	,							
		Method	Metals Mad	le This Way	Reason						
20100	Mercury	Electrolys	is Potassium Soc	dium Lithium	most reactive metals						
1/1			Calcium magn	Colum Aluminum							
10D(ii)	Aluminium	Heat With Ca	rbon Zinc Irc	n Copper	medium reactive metals						
10D(ii)	Aluminium Copper	Heat With Ca	rbon Zinc Irc Tin Lec Mercury	n Copper	medium reactive metals						
10D(ii)	Aluminium Copper	Heat With Ca Heat Alon	rbon Zinc Irc Tin Lec e Mercury Gold	n d Copper Silver Platinum	medium reactive metals least reactive metals						
2011C	Aluminium Copper	Heat With Ca Heat Alon d.c. is direct curr	rbon Zinc Irc Tin Lec e Mercury Gold	n d Silver Platinum v of electrons	medium reactive metals least reactive metals is a steady direction.						
2011 <i>C</i> 18a	Aluminium Copper d.c.	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating	rbon Zinc Irc Tin Lec e Mercury Gold rent and has a flow	n Copper d Silver Platinum v of electrons direction of e	medium reactive metals least reactive metals is a steady direction. lectron flow changing.						
2011 <i>C</i> 18a	Aluminium Copper d.c.	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method	rbon Zinc Irc Tin Lec e Mercury Gold rent and has a flow o current with the Electrolysis	n Copper d Silver Platinum v of electrons direction of e Heat With Co	medium reactive metals least reactive metals is a steady direction. lectron flow changing. urbon Heat Alone						
2011C 18a 2012C	Aluminium Copper d.c. By electrolysis	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method Metals Made	rbon Zinc Irc Tin Lec e Mercury Gold rent and has a flow g current with the Electrolysis Potassium Sodium Lithium Calcium	n Copper d Copper Platinum v of electrons direction of e Heat With Co Zinc Iron C	medium reactive metals least reactive metals is a steady direction. lectron flow changing. urbon Heat Alone Mercury Silve	er					
2011C 18a 2012C 21a	Aluminium Copper d.c. By electrolysis	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method Metals Made This Way	rbon Zinc Irc Tin Lec e Mercury Gold rent and has a flow g current with the Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium	n Copper Silver Platinum v of electrons direction of e Heat With Co Zinc Iron Tin Lead	medium reactive metals least reactive metals is a steady direction. lectron flow changing. urbon Heat Alone opper Mercury Silve Gold Platin	er hum					
2011C 18a 2012C 21a	Aluminium Copper d.c. By electrolysis	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method Metals Made This Way Reason	rbon Zinc Irc Tin Lec e Mercury Gold rent and has a flow a current with the Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium most reactive metals	n Copper Silver Platinum v of electrons direction of e Heat With Co Zinc Iron Tin Lead	medium reactive metals least reactive metals is a steady direction. lectron flow changing. urbon Heat Alone opper Mercury Silve Gold Platin metals least reactive met	er ium tals					
2011C 18a 2012C 21a 2013C	Aluminium Copper d.c. By electrolysis	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method Metals Made This Way Reason Method	rbon Zinc Irc Tin Lec e Mercury Gold rent and has a flow a current with the Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium most reactive metals Electrolysis Potassium Sodium	n Copper Silver Platinum v of electrons direction of e Heat With Co Zinc Iron Tin Lead medium reactive Heat With Ca	medium reactive metals least reactive metals is a steady direction. lectron flow changing. urbon Heat Alone opper Mercury Silve Gold Platin metals least reactive met rbon Heat Alone	er num tals					
2011C 18a 2012C 21a 2013C	Aluminium Copper d.c. By electrolysis heat alone reacting with carbon	Heat With Ca Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method Metals Made This Way Reason Method Metals Made This Way	rbon Zinc Irc Tin Lec Pe Aercury Gold Pent and has a flow a current with the Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium most reactive metals Electrolysis Potassium Sodium Lithium Calcium	n Copper Silver Platinum v of electrons direction of e Heat With Co Zinc Iron Tin Lead medium reactive Heat With Ca Zinc Iron Tin Leat	medium reactive metals least reactive metals is a steady direction. lectron flow changing. irbon Heat Alone Gold Platin metals least reactive met h Mercury Silver Gold Platin Mercury Silver Gold Platin	er jum tals					
2011C 18a 2012C 21a 2013C 16a	Aluminium Copper d.c. By electrolysis heat alone reacting with carbon electrolysis	Heat With Ca Heat Alon d.c. is direct curr a.c. is alternating Method Metals Made This Way Reason Method Metals Made This Way	rbon Zinc Irc Tin Lec Pe Aercury Gold Pent and has a flow a current with the Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium most reactive metals Electrolysis Potassium Sodium Lithium Calcium Magnesium Aluminium Magnesium Aluminium Magnesium Aluminium	n Copper Silver Platinum v of electrons direction of e Heat With Co Zinc Iron Tin Lead Medium reactive Heat With Ca Zinc Iron Tin Lead Copper medium reactive	medium reactive metals least reactive metals is a steady direction. lectron flow changing. Income Heat Alone Mercury Silver Gold Platine metals least reactive metals Mercury Silver Gold Platine Mercury Silver Gold Platine Mercury Silver Gold Platine	er num tals					

Na	Nat5 Past Paper Question Bank															
Traffic	: Lights		U	nit 3	3.1d	Ext	rac	tion	of M	Neta	als		J	A150	che	M
Outcome	2000 General	2001 General	2002 General	2003 General	2004 General	2005 General	2006 General	2007 General	2008 General	2009 General	2010 General	2011 General	2012 General	2013 General		
10												14b				
11a 12a																
11b 12b													18d			
11c 12c																
13 14	18a	12a				15a		17a(i)			15b			14a		
15		12b 12c				15c		17a(ii)		12a 12b				14b 14c		

SG General	Answer	Reasoning						
2000 <i>G</i>	alaataaluaia	Passing electricity through molten or solution of an ionic compound.						
18a	electrolysis	The compound breaks back down into its elements.						
2001 <i>G</i>		Passing electricity through molten or solution of an ionic compound. The						
12a	electrolysis	compound breaks back down into its elements.						
2001 <i>G</i>	metal ions are	Metals always form positive ions.						
12b	positive	Non-metals form negative ions (except hydrogen)						
2001 <i>G</i>		Chloride Cl ⁻ ions move to the positive electrode and turn into chlorine gas						
12c	bubbles of gas	$2Cl^{-} \longrightarrow Cl_2 + 2e^{-}$						
2005 <i>G</i>	The breaking up of a							
15a	compound using electricity	Molten ionic compounds conduct by electrolysis						
2005 <i>G</i>								
15c	Chlorine	CI ions move to positive electrode where 2CI (1) $CI_2(g)$						
2007 <i>G</i>	battery or	The power supply must be a d.c. power supply so that the electrode						
17a(i)	d.c. power supply	maintain the same positive and negative electrodes.						
2007 <i>G</i>	lead iodide	1 1 . 1 . 1 . 1 . 1.						
17a(ii)	↓ lead + iodine	ieua iouiae> ieaa + ioaine						
2009 <i>G</i>	. I. L	Positive electrode: $2Cl^2 \longrightarrow Cl_2 + 2e^2$						
12a	chiorine	Negative Electrode: Cu²+ + 2e⁻ ───► Cu						
2009 <i>G</i>	. L traver	Electrons travel through the wires						
12b	electrons	Ions travel through the solution						
2010G		Electrolysis is the passing of d.c. current resulting in the breakdown of						
15b	electrolysis	the compound back into elements. The ionic substance must be molten or in solution as ions are not free to move in the solid state.						
2011G								
14b	ore	Ores are chemicals from which metals can be extracted e.g. metal oxides						
2012 <i>G</i>	carbon or	Reduction with C: $2Fe_2O_3 + 3C \longrightarrow 4Fe + 3CO_2$						
18d	carbon monoxide	Reduction with CO: $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$						
2013 <i>G</i>	Electrolysia							
14a	CIECTROIYSIS	Electrolysis is the process where d.c. electricity is used to split ionic compounds in the liquid or solution state back to the elements						
2013G		 negative ions are attracted to the positive electrode: 						
14b	Negative	• positive ions are attracted to the negative electrode: • $Cu^{2^+} + 2e^- \longrightarrow Cu$						
2013G	Gas (chlorine)							
14c	is given off							