## MARK SCHEME for the October/November 2010 question paper

## for the guidance of teachers

## 0620 CHEMISTRY

0620/31

Paper 3 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Page 2		2	Mark Scheme: Teachers' version	Syllabus	Paper	
			IGCSE – October/November 2010	0620	31	
1	(a) (i)	same number of protons and electrons			[1]	
	(ii)	all have the same number of protons / same proton number / same atomic number			c number [1]	
	(iii)	more electrons than protons number of protons and electrons not equal <b>ONLY</b> [1]			[2]	
	(iv)	same number of protons (and electrons) / same proton number / same atomic number different number of neutrons / different mass number / nucleon number				
	(b) (i)	2 + 8	3 + 5		[1]	
	(ii)	3/5			[1]	
	(iii)	/ nee / bec	metal because it accepts electrons eds 3e to complete outer energy level cause it is in Group V or 5e in outer shell need both non-metal and reason for [1]		[1]	
					[Total: 9]	
2	(a) (i)		er / stronger / any sensible suggestion which relates stays sharp longer / cuts better / more corrosion res		ies for purpose [1]	
	(ii)	zinc			[1]	
	(b) (i)	lattic	e		[1]	
	(ii)	with	lar pattern of one type of atom different atom interspersed show the difference – size, shading, label etc.		[1] [1]	
	(iii)		change its shape by force / plastically deform / car d etc.	n be hammered ir	nto sheets / can [1]	
	(iv)	cone or m	cles / ions / atoms / layers d can slide past each other netallic bond is non-directional cles can move past each other		[1] [1] [1] [1]	

	Page 3	3	Mark Scheme: Teachers' version	Syllabus	Paper
			IGCSE – October/November 2010	0620	31
	(c) (i)	not acce not	V) oxide + carbon → tin + carbon dioxide carbon monoxide as a reductant ept carbon monoxide as a product tin(IV) ept correct symbol equation		[1]
	(ii)	wate carb	r on dioxide		[1] [1]
	(iii)	(pure <u>impu</u> elect	ect labels for e) copper cathode <u>ire copper anode</u> crolyte copper(II) sulfate / any soluble copper(II) sal els on electrodes reversed [0]	t / Cu <sup>2+</sup>	[1] [1] [1]
	(iv)		s / pipes / jewellery / nails / roofing / ammunition oture	n / coins / cookv	vare / catalyst / [1]
					[Total: 15]
3	(i)	cher	nical		[1]
	(ii)		right to left hrough salt bridge		[1]
	(iii)	_	+ 2e $\rightarrow$ 2Br- r- as product [1]		[2]
	(iv)	/ bec	<u>ction because electron gain</u> cause oxidation number decreases I both points		[1]
	(v)	Fe <sup>3+</sup>			[1]
	(vi)	e.g.	correct discussion of the reactivity of the halogens the more reactive the halogen the higher the voltag petter conductor	е	[1]

[Total: 7]

	Page 4			Syllabus	Paper
			IGCSE – October/November 2010	0620	31
4	(a)	(i)	nitrogen 2+5		[1]
		(ii)	needs three electrons to complete energy level		[1] [1]
	(b)	(i)	expensive metal / iron cheaper / better catalyst		[1]
		(ii)	high pressure favours side with smaller volume / few this is right hand side / product / ammonia side	er moles	[1] [1]
		(iii)	recycled / sent over catalyst again <b>accept</b> used again		[1]
		(iv)	advantage high yield disadvantage slow reaction rate etc		[1] [1]
					[Total: 9]
5	(a)	(i)	many (simple) molecules form one (large) molecule	ıle / monomer mole	ecules form one [1]
		(ii)	addition - polymer is the only product <b>accept</b> - nX $\rightarrow$ Xn		[1]
			condensation polymer and simpler molecules formed accept $nX \rightarrow Xn + nHCl/H_2O$	ł	[1]
	(b)	(i)	$C_{12}H_{26} \rightarrow C_8H_{18} + 2C_2H_4$ / any other correct version		[1]
		(ii)	ethane and chlorine give range of products / ethene more readily available than ethane / waste half chlorine as hydrogen chloride / ethene more reactive than ethane		[1]
		(iii)	electrolysis aqueous sodium chloride		[1] [1]
		(iv)	must have <b>three</b> correct units <b>cond</b> continuation		[1] [1]
			accept –(CH2–CH(C <i>l</i> ))n–		[Total: 9]

Page 5		5	Mark Scheme: Teachers' version	Syllabus	Paper
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6	(a) (i)	) (i) does not form compounds / does not accept and does not lose electrons shell/has 8e in outer shell / it is a Noble Gas / it is in Group 0/8			
	(ii)		Il number of outer electrons / lose electrons then po e number of outer electrons / gain electrons then ne		[1] [1]
	(iii)		<b>two</b> from nitrogen, oxygen and fluorine <b>ept</b> symbols / molecular formulae		[1]
	(b) (i)	zinc	/ aluminium / lead / tin / chromium		[1]
	(ii)		<u>e precipitate</u>		[1]
			pitate dissolves / colourless solution forms / forms uble in excess	a clear solution	[1]
	(c) (i)	LiF NF₃			[1] [1]
	(ii)	LiF i / LiF as lio LiF i	has higher mp / bp is a (crystalline) solid, NF <sub>3</sub> is probably a gas / a liqui is less volatile quids only LiF conducts is soluble in water, NF <sub>3</sub> is not n both solids LiF is harder	d	
		any	two		[2]
	(iii)	$NF_3$	is an ionic compound is a covalent/molecular compound stating that one is ionic and the other covalent [1] wi	thout specifying w	[1] [1] hich is which
					[Total: 13]
7	(i)	ozor	hane / water vapour / oxides of nitrogen / hydrofl ne sulfur dioxide	uorocarbons / pe	rfluorocarbons / [1]
	(ii)	prod	g organisms / plants and animals / cells <u>luce energy</u> (from food / glucose / carbohydrates) forms carbon dioxide (could be in an equation)		[1] [1] [1]
	(iii)	/ cro	n growing the crop removed carbon dioxide from at p photosynthesised and used carbon dioxide bustion returned the carbon dioxide	mosphere	[1] [1]
	(iv)		eased combustion ssil fuels / named fossil fuel		[1] [1]
		less	eforestation photosynthesis greater population		[1] [1]
		·			[Total: 8]

Page 6		Mark Scheme: Teachers' version	Syllabus	Paper			
		IGCSE – October/November 2010	0620	31			
3	(partially allow to dry cryst "dry" on evaporat	ntrifuge / decant ) evaporate / heat / boil crystallise / cool / let crystals form als / dry between filter paper / leave in a warm pla its own must be a verb re to dryness only marks 1 and 2 scuss residue only mark 1	ce to dry	[1 [1 [1			
(b	number of number of mass of maximur accept 9 mark ecf	b) number of moles of HCl used = $0.04 \times 2 = 0.08$ number of moles CoCl <sub>2</sub> formed = $0.04$ number of moles CoCl <sub>2</sub> .6H <sub>2</sub> O formed = $0.04$ mass of one mole of CoCl <sub>2</sub> .6H <sub>2</sub> O = 238 g maximum yield of CoCl <sub>2</sub> .6H <sub>2</sub> O = $9.52g$ accept 9.5 g mark ecf to moles of HCl do <b>not</b> mark ecf to integers					
	to show	to show that cobalt(II) carbonate is in excess					
	number	of moles of HC <i>l</i> used = 0.08 must use value above	e ecf				

mass of one moles of  $\text{CoCO}_3 = 119\text{g}$ number of moles of  $\text{CoCO}_3$  in 6.0g of cobalt(II) carbonate = 6.0/119 = 0.050 [1] reason why cobalt(II) carbonate is in excess 0.05 > 0.08/2 [1]

[Total: 10]