Mark Scheme (Results)

Summer 2012

International GCSE
Chemistry (4CH0) Paper 2C

Edexcel Level 1/Level 2 Certificate
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INTERNATIONAL GCSE CHEMISTRY PAPER 2C – SUMMER 2012

Question number				Answer	Notes	Marks
1	a	(i)	M 1	nitrogen		1
		(ii)	M 1	cross in 2nd box (20)		1
		(iii)	M 1	unreactive		1
			M 2	water		1
	b	(i)	M 1	sulfurous acid / H_2SO_3	Accept sulfuric(IV) acid Accept ph spellings If name and formula given, both must be correct	1
		(ii)	M 1	nitrogen oxide(s) / nitrogen dioxide / NO_2 / NO_x	Ignore nitrogen monoxide / nitrous oxide and other acidic gases, eg carbon dioxide, sulfur trioxide, hydrogen chloride	1

Question number				Answer	Notes	Marks
1	b	(iii)	M 1	iron/steel/metal corrodes/rusts/reacts	Ignore physical process such as erosion/weathering/wearing away/dissolving Ignore burns/burning	2
			M 2	limestone/marble reacts/corrodes/is eaten away NOT just buildings	Ignore rusts or physical process such as erosion/weathering/wearing away/dissolving Ignore burns/burning	
			M 3	plants/trees/vegetation/crops/named example adversely affected in specific way, eg dies/stunted growth/harmed/damaged	Ignore deforestation Ignore leaching minerals	
			M 4	fish/aquatic animals/pond life/marine life/named example affected in specific way, eg dies/stunted growth/harmed/damaged	Ignore references to just animals	
					Accept destroys as an adverse effect for all marks	
					Any two for 1 each	
						Total 8 marks

Question number				Answer	Notes	Marks
2	a	(i)	M1	Iron(III) oxide	Accept Iron oxide / ferric oxide Ignore formula whether right or wrong	1
		(ii)	M1	calcium carbonate	Ignore formula whether right or wrong	1
	b	(i)	M1	A		1
		(ii)	M1	E		1
		(iii)	M1	B		1
		(iv)	M1	C		1
	c		M1	slag	Accept calcium silicate Ignore formula	1
	d	(i)	M1	aluminium/it is more reactive than iron/carbon OR above iron/carbon in reactivity series OR cannot be reduced by/does not react with carbon (monoxide) OR cannot be displaced by carbon	Comparison with iron or carbon must be stated or implied, eg not just aluminium is (very/too) reactive Accept reverse argument for iron	1
		(ii)	M1	(cost of) electricity	Accept keeping electrolyte molten Accept high current Ignore energy Ignore references to electrode replacement	1

Question number				Answer	Notes	Marks
2	e		M1	electrode(s) / to conduct electricity	Accept cathode / anode	1
	f		M1	$Al^{3+} + 3e \rightarrow Al$	M1 for both aluminium formulae on correct sides of equation M2 for both oxygen formulae on correct sides of equation M3 for balancing both equations even if one or both reversed	3
			M2	$2O^{2-} \rightarrow O_2 + 4e$ / $2O^{2-} - 4e \rightarrow O_2$		
			M3			
					Accept in either order	
					Total 13 marks	

Question number				Answer	Notes	Marks
3	a	(i)	M1	more accurate	Accept more precise / gives an exact value	1
		(ii)	M1	(thermal) insulator /poor conductor/keeps heat in/ reduces heat loss	Accepts traps heat	1
		(iii)	M1	stirring/mixing/swirling	Ignore name of apparatus used	1
		(iv)	M1	temperature goes down/stops rising/stays constant	Accept measure pH/when pH = 7/when pH is less than 7 Reject changing to any pH value > 7 Accept use of any indicator (named example or just indicator) Ignore colour changes	1
	b		M1	19.4		1
			M2	23.1		1
			M3	3.7	CQ on temperatures recorded Penalise negative sign	1
					Penalise second decimal place values, except zeroes, for M1 and M2 M1 and M2 both correct but wrong way around scores 1	

Question number				Answer	Notes	Marks
3	c	(i)	M1	9 points plotted correctly to nearest gridline	Deduct 1 for each error If points not visible beneath line, assume them to be on line	2
			M2			
			M3	straight line of best fit through first 5 points		1
			M4	straight line of best fit through last 4 points		1
					If lines do not cross or are joined by curve or straight line, only M3 or M4 can be awarded	
		(ii)	M1	volume of acid CQ on where lines cross	Accept answer ± 0.5 to minimum of 1 dp	1
			M2	maximum temperature CQ on where lines cross	Accept answer ± 0.1 to minimum of 1 dp	1
					Do not award either mark if lines do not intersect Apply dp penalty once only Award 1 mark if both values correct but recorded in wrong places	
	d		M1	55 (× 4.2 × .5)		1
			M2	1270.5	Accept any value between 1270 and 1271 Accept 1300 M2 CQ on M1 If vol used is 25, answer is 577.5 Accept any value between 577 and 578 accept 580 If vol used is 30, answer is 693 Accept 690 Ignore signs	1
					Correct final answer without working scores 2 marks	

Question number				Answer	Notes	Marks
3	e	(i)	M1	1.5 × 0.025		1
			M2	0.0375	Correct final answer scores 2 marks 37.5 scores M2 only	1
		(ii)	M1	1800 ÷ 0.0375 /1800 ÷ answer to (e)(i)	Accept correct use of 1.8 in place of 1800	1
			M2	48 (kJ/mol)	M2 CQ on M1 provided 1800 or 1.8 used correctly If 37.5 in (a)(i) then answer is 0.048 (kJ/mol) Correct final answer scores 2 marks Ignore answer in J/mol Ignore signs	1
						Total 19 marks

Question number				Answer	Notes	Marks
4	a	(i)	M1	(cane) sugar/ sugar beet	Do not accept any named sugar	1
		(ii)	M1	(conc / syrupy) phosphoric acid / H_3PO_4	Accept (conc) sulfuric acid / H_2SO_4 If both name and formula given, both must be correct Ignore oxidation numbers Penalise dilute acid Accept wrong spellings, eg phosphuric acid / phospheric acid	1
		(iii)	M1	(to prevent) zymase/enzyme being denatured	Accept zymase/enzyme work best at these temperatures / this is the optimum temperature for zymase/enzyme Accept yeast/zymase/enyme killed/destroyed	1
	b			reaction 1 reasons	Accept reaction 2 reasons	
			M1	gives pure(r) product / higher (percentage) yield /ethanol is the only product	gives impure product / lower (percentage) yield OR contains solid/sediment/yeast/water Ignore more ethanol produced	3
			M2	reaction fast(er)	reaction 2 slow(er)	
			M3	ethene/C_2H_4 available (from oil refinery)		
			M4		needs land to grow sugar (cane)	
			M5		needs warm climate	
			M6	reaction continuous	reaction batch	
					Any three for 1 each Ignore references to cost / efficiency	

Question number				Answer	Notes	Marks
4	c		M1	$C_2H_5OH \rightarrow C_2H_4 + H_2O$	Equation must be balanced Accept reversible arrow Accept structural/displayed formulae Accept word equation	1
			M2	dehydration	Accept elimination / (thermal) decomposition Treat other reaction types (eg reduction) as contradictions	1
						Total 8 marks

Question number				Answer	Notes	Marks
5	a	(i)	M1	arrow pointing towards negative electrode	Accept by X / on wire / by power supply (as long as pointing in correct direction	1
		(ii)	M1	hydrogen / H_2	Ignore H	1
		(iii)	M1	$4OH^- \rightarrow 2H_2O + (1)O_2 + 4e^-$	Accept fractions and multiples Accept e in place of e^- Accept equation with $– 4e^-$ on LHS	1
	b	(i)	M1	18 ÷ 24000	If division by 24 in place of 24000, no M1 but award M2 for 0.75 No marks for any calculation involving 35.5 or 71 Correct final answer scores 2 marks	1
			M2	0.00075 / 7.5 x 10^{-4}		1
		(ii)	M1	(b)(i) × 96500 × 2	CQ on (b)(i)	1
			M2	Answer in range 140 - 145 using 0.00075	Correct final answer scores 2 marks Accept answer in range 70 – 72.4 for 1 out of 2 No marks if no use of 96500 or no use of answer from (b)(i)	1

Question number				Answer	Notes	Marks
5	c	(i)	M1	bromine / Br / Br_2	Reject bromide / Br^-	1
		(ii)	M1	reduction <u>and</u> oxidation (at the same time)	Accept oxidisation Ignore oxygenation Accept loss <u>and</u> gain of electron(s) Reject loss of electrons by chlorine (molecules) / gain of electrons by bromide (ions) Reject reduction is loss of electrons / oxidation is gain of electrons Ignore references to other reaction types, eg displacement / reversible Ignore references to atoms / ions / molecules / elements	1

Question number				Answer	Notes	Marks
5	d	(i)	M1	reversible / can go in both directions / (both) forward and reverse reactions can occur	Accept just reference to reverse direction, eg reaction goes backwards / reaction goes in opposite direction Ignore equilibrium	1
		(ii)	M1	shifts to right / moves in forward direction / favours forward reaction/direction	Accept more PCl_5 / product (formed) Ignore references to rates M1 can be awarded in explanation part	1
			M2	fewer moles/molecules (of gas) on right / more moles/molecules (of gas) on left / 2 moles/molecules on left and 1 on right / favours side with fewer moles/molecules	Accept particles, but not atoms, in place of molecules Ignore references to pressure, volume and le Chatelier's principle Do not award M2 if M1 if shift is to left or no change	1
						Total 12 marks

PAPER TOTAL: 60 MARKS

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