MARK SCHEME for the October/November 2007 question paper

0620 CHEMISTRY

0620/03

Paper 3 (Extended Theory), maximum raw mark 80

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

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UNIVERSITY of CAMBRIDGE International Examinations

	Page 2		Mark Scheme	Syllabus	Paper	
			IGCSE – October/November 2007	0620	03	
1	simple distillation diffusion or fractional distillation crystallisation fractional distillation filtration NOTE As the candidate are selecting from a list, the above are the only acceptable responses.					
2	(a)	²³ 11	la		[1]	
		⁴⁰ 18	Nr.		[1]	
		³¹ 15P	^{3–} [1] for charge and [1] for symbol etc.		[2]	
		$^{27}_{13}Al^{3+}$ [1] for charge and [1] for symbol etc. ACCEPT +3 and -3 NOTE Only the above are to be awarded the mark				
	(b)		cle B or ²³ 11Na or sodium		[1]	
		COND they have the same proton number or the same number of protons or the same atomic number				
	NOT the same number of electrons Accept same number of electrons and protons					
					[Total: 8]	
3	(a)		ect ratio MgBr ₂ or Mg 2Br ept anywhere in space		[1]	
	IF formula suggests covalency then [1] only for MgBr ₂ or Mg 2Br					
		corre	ect charges Mg ²⁺ and Br [−] not be concerned about location of minus sign		[1]	
		8e around bromine NOTE do not require correct coding – just 7 and 1 coded differently			[1]	
	NOTE ignore electrons around magnesium					
	(b)		pattern or order or regular or repeat or alternate		[1]	
			COND positive and negative <u>ions</u> or atoms or molect NOTE Accept a sketch that shows the above, that is way, e.g. any ionic compound such as sodium chlorid	particles arranged in	[1] a regular	
		• •	Any reason from the list: charges must balance		[1]	
			or based on valencies or group II and group VII			
	C		or magnesium loses 2 electrons and brom <u>ine</u> gains 1	electron (per atom)		
	(iii)		 iii) reducing or reduction or reductant lost electrons or given or donated electrons or transferred (to bromine) 		[1] [1]	
		I	reduced gained or accepted electrons		[1] [1]	
					[Total: 10]	

Page 3		Mark Scheme	Syllabus	Paper
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l (a) (i)	 (a) (i) bleach for wood pulp or preserving food or sterilising or in wine making or as a refrigerant or in metallurgy or (liquid) sulphur dioxide is used in the petroleum industry or kill microbes(etc) or insecticide 			[1]
(ii)	•	act with) oxygen or air T burnt/burn in air/oxygen		[1]
	450 van If fo		, .	[1] num [1]
(iii)		monium sulphate or superphosphate potassium sulphate or magnesium sulphate		[1]
(b) (i)	con NO	orisation or boiling or evaporation densation or liquefaction TE order in which changes are given is not importan T liquid => gas => liquid	t	[1] [1]
(ii)	NO righ NO yiel NO EXA mov	tet maximum yield of zinc or reduce all zinc oxide TE the above mark is awarded for why add excess of at or to favours the products or removes CO ₂ from ea- TE this mark is awarded for how does the addition d of zinc TE Allow any coherent explanation <u>flexibly</u> based or AMPLES : ves equilibrium to right [1] because carbon dioxide re- get maximum yield of zinc [1] as equilibrium moves to T just to make CO from CO ₂	quilibrium of excess carbon the above ideas emoved [1]	[1]
(c) (i)) Zn ²	* + 2e = Zn		[1]
(ii)	or 2 or 2 or 2	$H^{-} - 4e = O_{2} + 2H_{2}O$ $4OH^{-} = O_{2} + 2H_{2}O + 4e$ $2H_{2}O = 4H^{+} + O_{2} + 4e$ $2H_{2}O - 4e = 4H^{+} + O_{2}$ gen as product [1]		[2]
(iii)		ohuric acid TE there are no alternative answers to the above		[1]
ma ele ce ro	aking ectrop ells ofing	iron from rusting NOT with galvanising or sacrificial brass or making alloys NOT bronze lating or as an electrode in electrolysis al protection	protection	
CO	coinage TWO uses			[2]
	u			[Total: 15]

Page 4		4	Mark Scheme	Syllabus	Paper
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5	(a) (i)		librium to left or many molecules and few ions or ally ionised or reverse reaction favoured		[1]
	(ii)	meth	er donates <u>proton</u> nylamine accepts a proton rE If hydrogen ion then ONLY [1] provided both are	correct	[1] [1]
	• •	(b) less than 12 more than 7 smaller <u>concentration</u> of hydroxide ions or partially dissociated or			
	 (c) (i) CH₃NH₂ + HC<i>l</i> = CH₃NH₃C<i>l</i> methylammonium chloride NOTE the equation must be as written, the equation with sulphuric acid has given as guidance. 			[1]	
				[1] [1] as been	
	(ii)		vn precipitate CEPT orange or red/brown or brick red or brown/re	d	[1]
	(iii)	sodi	um hydroxide or any <u>named</u> strong base		[1] [Total: 9]
6	(a) (i)	heat	(energy)		[1]
	(ii)	exot	hermic		[1]
	(iii)		$_{5}OH + 3O_{2} = 2CO_{2} + 3H_{2}O$ $CO_{2} + H_{2}O$ ONLY [1]		[2]
	(iv)	strai betw	ing points correctly ght line /een –2640 and –2700kJ/mol rE minus sign needed		[1] [1] [1]
	(v)	sam cons	eral (molecular) formula e functional group secutive members differ by CH ₂ lar chemical properties or react same way		
			a comment about physical properties		[2]
	(b)		- CH(OH)-CH ₃ Г С ₃ Н ₇ OH		[1]
		prop NOT acce acce	For an 2-ol "2" is needed FE the name and the formula must correspond for b pept full structural formula – all bonds shown correctl pept formulae of the ether F CH ₃ - CH(HO)-CH ₃		[1]

Page 5			Mark Scheme	Syllabus	Paper
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(c)	(i)	NOT alka	<u>king</u> (alkane) or (alkane) and catalyst E thermal cracking or catalytic cracking [2] ne = alkene + hydrogen ′ TWO		[2]
		CH ₄ or w	steam reforming[2] $+ H_2O = CO + 3H_2$ [1]rater/steam[1]lyst or heat[1]		
	(ii)	inco	bustion or burning mplete or insufficient oxygen/air ACCEPT steam reforming as above [2]		[1] [1]
	(iii)	CON or vo	pressure ID forward reaction volume decrease olume of reactants greater than that of products		[1]
		or fe	ewer moles of gas on the right ewer gas molecules on right E accept correct arguments about either reactants	or products	[1]
(d)	(i)	meth	nyl ethanoate		[1]
	(ii)	prop	anoic acid or propanal		[1]
	(iii)	ethe	ne		[1] [Total: 20]
7 (a)	(i)	ACC	er <u>concentration</u> CEPT without reference to experiment 2 higher concentration must be referred to expt 1		[1]
			ID fewer collisions or lower rate of collision		[1]
	(ii)		dered so <u>larger surface area</u> ID so more collisions or higher rate of collisions		[1] [1]
	(iii)	or m	er temperature particles move faster nore particles have enough energy to react or have	more energy	
		CON	nore particles have Ea ID collide more frequently nore particles have energy to react		[1]
		or m	nore particles have energy to react nore collisions result in a reaction 'E for conformity faster collisions = rate of collisions		[1]

Page 6	Mark Scheme	Syllabus	Paper	
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gra	 (b) (i) from origin gradient decreases until = 0 therefore has to be a curve (ii) mass of one mole of CaCO₃ = 100 number of moles of CaCO₃ = 0.3/100 = 0.003 moles of HC<i>l</i> = 5/1000 x 1 = 0.005 reagent in excess is CaCO₃ ecf from above would need 0.006 moles of HC<i>l</i> or hydrochloric acid only reacts with 0.0025 moles of CaCO₃ NOTE this mark needs to show recognition of the 1:2 ratio (iii) mark ecf to (ii), that is from moles of limiting reagent in (ii) moles of CO₂ = 0.005 x 0.5 x 24 = 0.06 dm³ NOT cm³ unless numerically correct. 60 cm³ Ignore other units 			
nu mo rea ec				
or				
mc NC				
ŇĊ	TE If both number of moles integers then no ecf for ((ii) and (iii)	[Total: 13]	