

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2002

GCE Advanced Subsidiary Level

MARK SCHEME

MAXIMUM MARK : 60

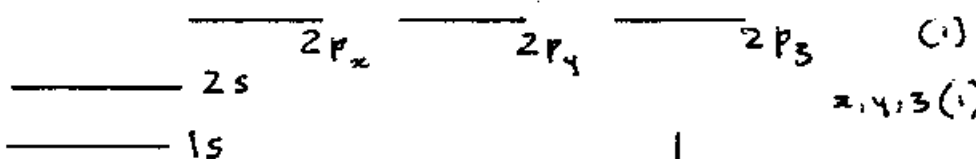
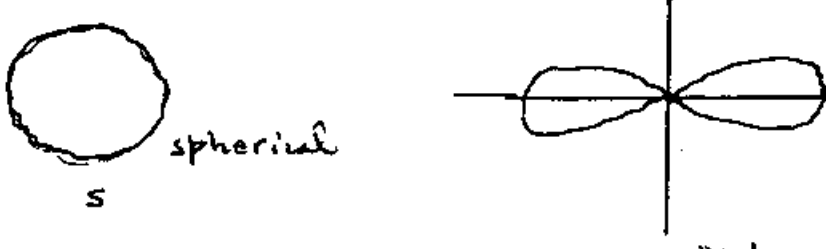
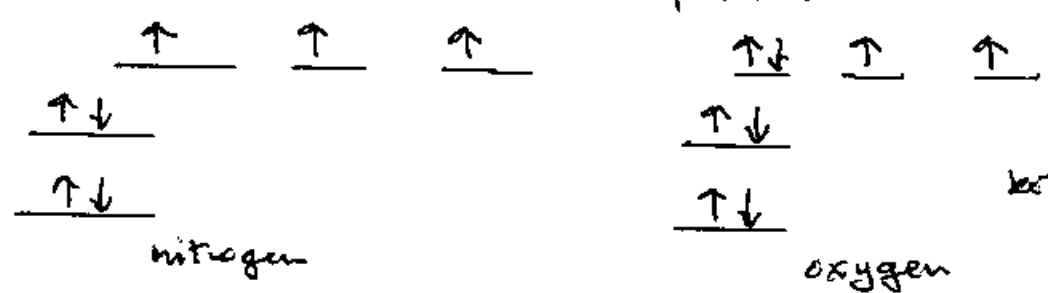
SYLLABUS/COMPONENT :9701 /2

**CHEMISTRY
(STRUCTURED QUESTIONS (AS))**



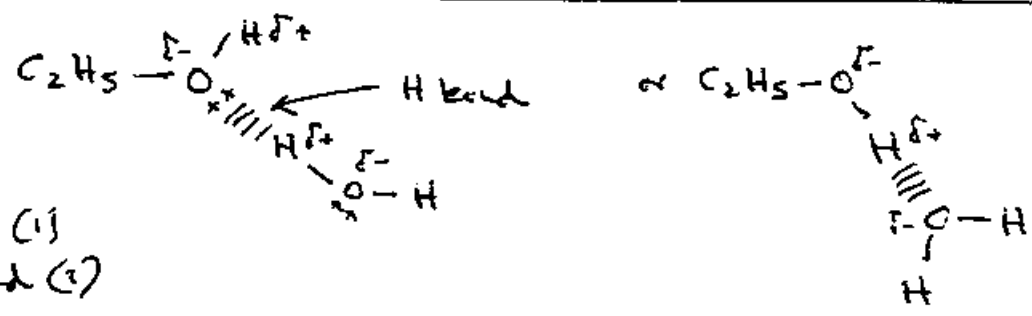
UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Page 1	Mark Scheme	Syllabus	Paper
	AS Level Examinations – June 2002	9701	2

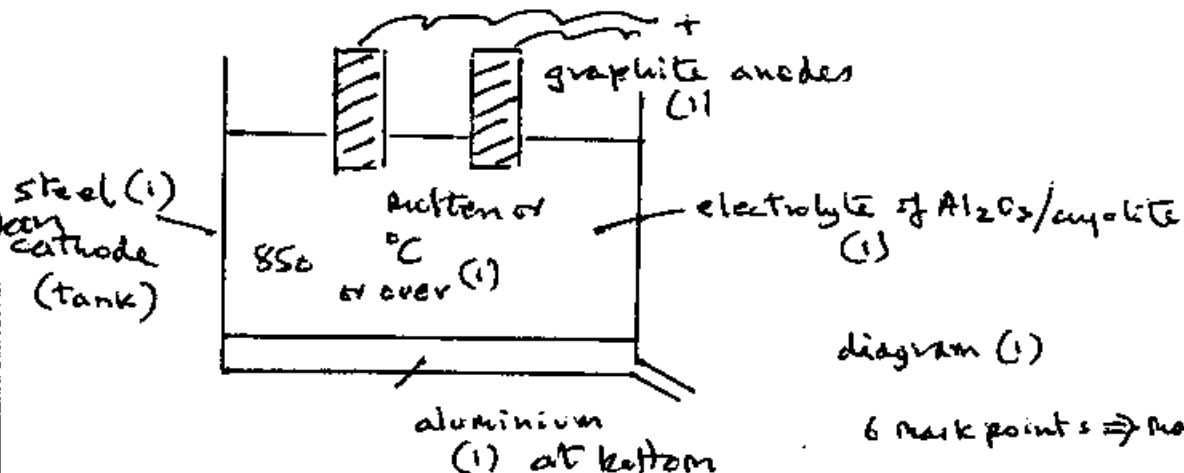
Question Number	Mark Scheme Details	Part Mark
(a)(i)	The six <u>electrons</u> of carbon. / some reference to charge.	
(ii)	The electrostatic attraction from the oppositely charged protons.	[3]
(iii)	The <u>nucleus</u> (give credit if answered in (ii)).	
(b)(i)		[2]
(ii)		[1]
(iii)		[1]
(iv)	1st IE. N is 1410 O is 1310 <u>OR</u> $N > O$ (1)	
	<p>explanation in terms of electron repulsion within doubly occupied p orbital</p> <p><u>OR</u> symmetry of ^{three} p orbitals of single occupancy (1)</p> <p><u>NOT</u> 3 electrons are stable</p>	[2]
(c)(i)	N^{3-} and O^{2-} both (1)	
(ii)	These anions have complete outer / inert gas configuration	[2]
	<u>OR</u> I.E values too large for stability of cations (1)	[1]

NOT electronegative.

Page 2	Mark Scheme	Syllabus	Paper
	AS Level Examinations – June 2002	9701	2

Question Number	Mark Scheme Details	Part Mark
2 (a)	$\text{C}_2\text{H}_4 + \text{H}_2\text{O} \longrightarrow \text{C}_2\text{H}_5\text{OH}$ $\begin{array}{ccc} -1418 & & -1367 \end{array}$ $\Delta H = (2 \times 44) - 1367 = -1279 \text{ kJ mol}^{-1}$	[2]
(b) (i)	* ΔH when 1 mol of a substance is completely combusted (1)	
(ii)	Under standard conditions H_2O & $\text{C}_2\text{H}_5\text{OH}$ are liquids (1)	
(iii)	$\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \longrightarrow 2\text{CO}_2 + 3\text{H}_2\text{O} \quad (1)$	4
(c)	 <p>dipole (1) H bond (1)</p> <p>[Total 8]</p> <p>* Some energy reference required.</p>	2


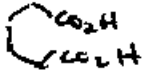


Page 3	Mark Scheme	Syllabus	Paper
	AS Level Examinations – June 2002	9701	2

Question Number	Mark Scheme Details	Part Mark
3 (a)	cryolite (mentioned in Syllabus), bauxite	[1]
(b)(i)	 <p>graphite anodes (i)</p> <p>steel (i) or carbon cathode (tank)</p> <p>850 °C or over (i)</p> <p>electrolyte of Al_2O_3/cryolite (i)</p> <p>aluminium (i) at bottom</p> <p>diagram (i)</p> <p>6 mark points \Rightarrow max</p>	[5]
(ii)	<p>cathode $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$</p> <p>anode $2\text{O}^{2-} - 4\text{e}^- \rightarrow \text{O}_2$ 1 each</p>	[2]
(iii)	anodes burn / CO_2 or CO formed / F_2 also formed Any one	[1]
(c)	<p>Has low density / lighter</p> <p>therefore saves fuel</p> <p>does not corrode / is protected by oxide film or rust</p> <p>Any two</p> <p>[Total: 11]</p>	[2]

Page 4	Mark Scheme	Syllabus	Paper
	AS Level Examinations – June 2002	9701	2

Question Number	Mark Scheme Details	Part Mark
(a) ⁴ (i)	$S + O_2 \rightarrow SO_2$ (1)	
(ii)	Air (oxygen) required for contact stage (1)	[2]
(b)	vanadium oxide (1) or V_2O_5	[1]
(c) (i)	Le Chatelier: to favour RHS side of eqn (1)	
(ii)	Reaction exothermic is reason why catalyst gets hot (1) or exothermic reaction - Le Chatelier: high temp favours LHS (1)	
(iii)	Catalysts are easily poisoned (1) damage to catalyst.	[3]
(d)	SO_2 damages buildings - marble, limestone etc (1) damages living things - animals, trees etc. (1) acid rain (1) any two effects <u>max</u>	[2]
(e) (i)	hydrogen chloride / HCl gas (1) allow HCl $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$ or $2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$ (1)	
(ii)	iodine (1)	[3]
[Total: 11]		

Page 5	Mark Scheme	Syllabus	Paper
	AS Level Examinations – June 2002	9701	2

Question Number	Mark Scheme Details	Part Mark
5 (a) (i)	C_2H_5Br allow any brominated ethane.	
(ii)	$\rightarrow CH_2-CH(CH_3)-$	
(iii)	$CH_2CHCH(OH)CH_3$	
(iv)		
(v)	 1 each	5
(b) (i)	$C_2H_6 + 3\frac{1}{2} O_2 \rightarrow 2CO_2 + 3H_2O$	
(ii)	$\begin{cases} C_3H_6 \\ CH_2=CHCH_3 \end{cases} + H_2O \rightarrow CH_3CH(OH)CH_3 \quad \text{or} \quad \begin{cases} C_3H_7OH \\ CH_3CH_2CH_2OH \end{cases}$	
(iii)	 + $H_2 \rightarrow$  or C_6H_{12} 1 each	3
(c) (i)	There is a greater demand for the ^{Petrol} gasoline fraction / about C_8 than for the heavier gas oils / diesel (1) The introduction of the alkene group gives more reactive products (1) <u>OR</u> gives ethane	
(ii)	Balanced equation (1) If products are labelled alkenes give the (i) mark [Total: 11]	3

Page 6	Mark Scheme	Syllabus	Paper
	AS Level Examinations – June 2002	9701	2

Question Number	Mark Scheme Details	Part Mark												
6 (a)(i)	Two of anaesthetics, refrigerants, flame retardants, plastics - (coolants) (fire extinguishers) solvents chemical inertness aerosols low b.p/relat. lity	1 1												
(b)(i)	C-Cl (1)	1												
(ii)	U.V light breaks bonds and gives (free) radicals (1) these lead to chain reactions (1) which damages ozone layer (1) Any two points	2												
(c)	<table border="0"> <tr> <td>C</td> <td>H</td> <td>Cl</td> <td>F</td> </tr> <tr> <td>$\frac{17.8}{12}$</td> <td>$\frac{1.5}{1}$</td> <td>$\frac{52.6}{35.5}$</td> <td>$\frac{28.1}{19}$</td> </tr> <tr> <td>= 1.48</td> <td>= 1.5</td> <td>= 1.48</td> <td>= 1.48</td> </tr> </table> <p>$\therefore \text{CHClF}$ (1) mass = 67.5 (1) \approx 62 of 135</p> <p>\therefore Molecular formula is $\text{C}_2\text{H}_2\text{Cl}_2\text{F}_2$ (1)</p> <p>[Total: 8]</p>	C	H	Cl	F	$\frac{17.8}{12}$	$\frac{1.5}{1}$	$\frac{52.6}{35.5}$	$\frac{28.1}{19}$	= 1.48	= 1.5	= 1.48	= 1.48	3
C	H	Cl	F											
$\frac{17.8}{12}$	$\frac{1.5}{1}$	$\frac{52.6}{35.5}$	$\frac{28.1}{19}$											
= 1.48	= 1.5	= 1.48	= 1.48											