CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2002

GCE Advanced Subsidiary Level

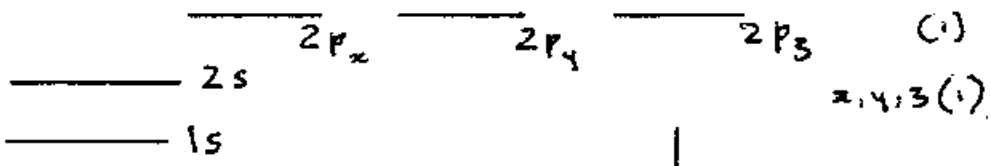
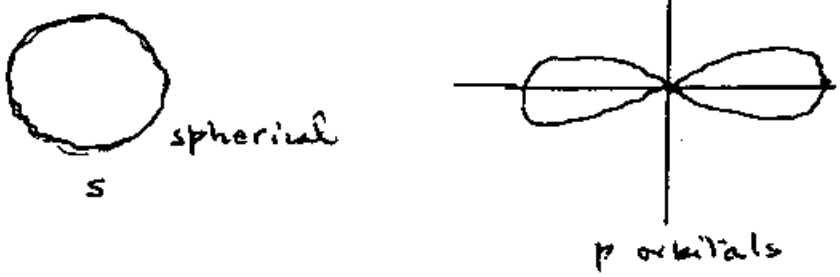
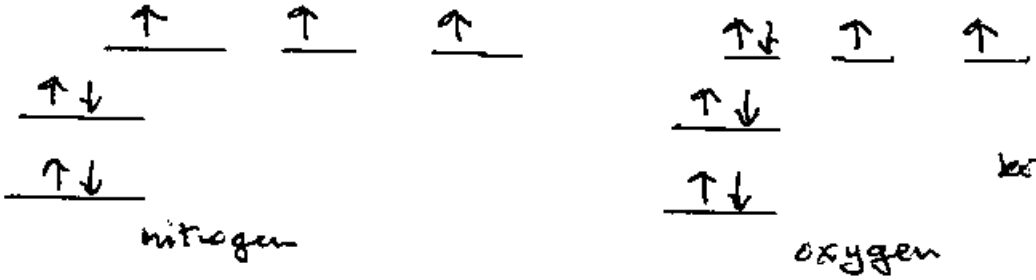
MARK SCHEME

MAXIMUM MARK : 60

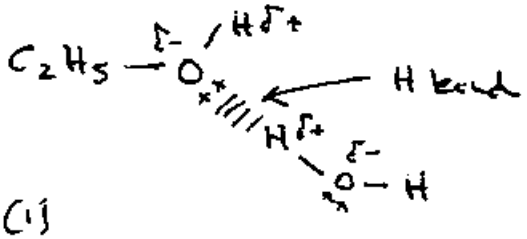
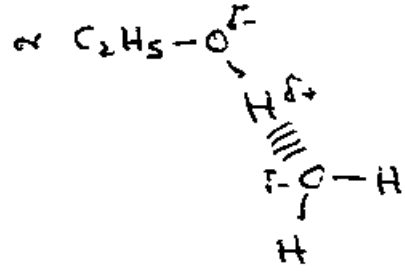
SYLLABUS/COMPONENT :9701 /2

CHEMISTRY
(STRUCTURED QUESTIONS (AS))

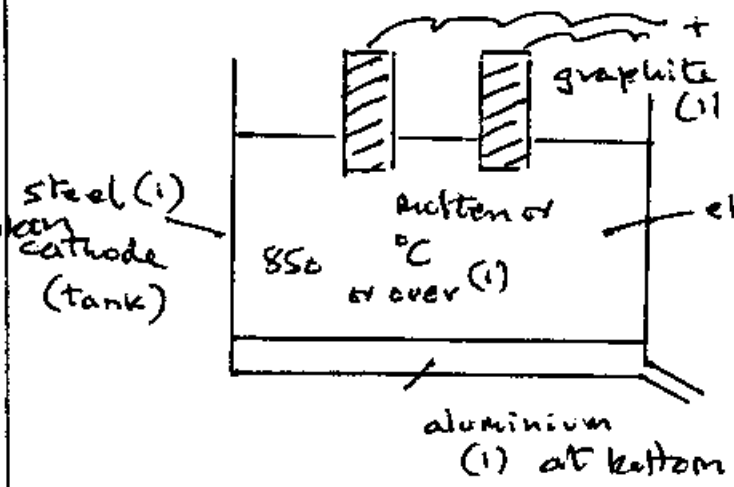
UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

Question Number	Mark Scheme Details	Part Mark
(a)(i)	The six electrons of carbon. /some reference to charge.	
(ii)	The electrostatic attraction from the oppositely charged protons.	[3]
(iii)	The nucleus (give credit if answered in (ii)).	
(b)(i)	 (1) x, y, z (1)	[2]
(ii)	 both	[1]
(iii)	 both (1)	[1]
(iv)	for IE. N is 1402 O is 1310 OR N > O (1)	
	explanation in Terms of electron repulsion within doubly occupied p orbital OR symmetry of three p orbitals of half-filled single occupancy (1)	[2]
	NOT 3 electrons are stable	
(c)(i)	N^{3-} and O^{2-} both (1)	
(ii)	These anions have complete octet / inert gas configuration OR I.E values too large for stability of cations (1)	[2] [11]

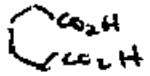
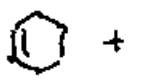
NOT electronegative.

Question Number	Mark Scheme Details	Part Mark
2 (a)	$C_2H_4 + H_2O \longrightarrow C_2H_5OH$ -1411 $\quad -1367$ $\Delta H = (?)\ 44$ kJ mol^{-1}	[2]
(b) (i)	* ΔH when 1 mol of element or compound (1) in a substance is completely combusted (1)	
(ii)	Under standard conditions H_2O & C_2H_5OH are liquids (1)	
(iii)	$C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$ (1)	4
(c)	 or  dipole (1) H bond (1)	2
	[Total 8]	

* Some energy reference required.

Question Number	Mark Scheme Details	Part Mark
3 (a)	cryolite (mentioned in Syllabus), bauxite	[1]
(b)(i)	 diagram (1) 6 mark points ⇒ max	[5]
(ii)	cathode $Al^{3+} + 3e^- \longrightarrow Al$ anode $2O^{2-} - 4e^- \longrightarrow O_2$ 1 each	[2]
(iii)	anodes burn / CO_2 or CO formed / F_2 also formed Any one	[1]
(c)	Has low density / lighter therefore saves fuel does not corrode / is protected by oxide film or rust Any two	[2]
	[Total: 11]	

Question Number	Mark Scheme Details	Part Mark
(a) 4 (i)	$S + O_2 \longrightarrow SO_2$ (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 equilm (1)	
(ii)	Reaction exothermic in 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 – metals, limestone etc (1)	
	damages living things – animals, trees etc. (1)	
	acid rain (1) any two effects max	[2]
(e) (i)	hydrogen chloride / HCl gas (1) allow HCl	
	$NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$	
	or $2NaCl + H_2SO_4 \longrightarrow Na_2SO_4 + 2HCl$ (1)	
(ii)	Iodine (1)	[3]
	[Total: 11]	

Question Number	Mark Scheme Details	Part Mark
5 (a)(i)	C_2H_5Br allow any brominated ethane.	
(ii)	$-CH_2-CH(CH_3)-$	
(iii)	$CH_3CH(OH)CH_3$	
(iv)		
(v)	 1 each	5
(b) (i)	$C_2H_6 + 3\frac{1}{2}O_2 \longrightarrow 2CO_2 + 3H_2O$	
(ii)	$CH_2=CHCH_3$ (C_3H_6) $+ H_2O \longrightarrow CH_3CH(OH)CH_3$ or $CH_3CH_2CH_2OH$ (or C_3H_7OH)	
(iii)	 $+ H_2 \longrightarrow$  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 gasoils / diesel (1)	
	The introduction of the alkene group gives more reactive products (1) OR gives ethane	
(ii)	Balanced equation (1)	3
	If products are labelled alkenes give the (i) mark	
	[Total : 11]	

Question Number	Mark Scheme Details	Part Mark
6 (a)(i)	Two of anaesthetics, refrigerants, flame retardants, plastics - (coolants) (fire extinguishers) solvents aerosols	1
	Chemical inertness low b.p/ volatility	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)	C: 17.8/12 = 1.48; H: 1.5/1 = 1.5; Cl: 52.6/35.5 = 1.48; F: 28.1/19 = 1.48 ∴ CHClF (1) mass = 67.5 (1) or mass of 135 ∴ Molecular formula is $C_2H_2Cl_2F_2$ (1)	3
	[Total: 8]	