RECOGNISING ACHIEVEMENT

Subject: Chemistry
How Far, How Fast Code: 2813/01

Session: January Year: 2001

Mark Scheme

MAXIMUM MARK	60

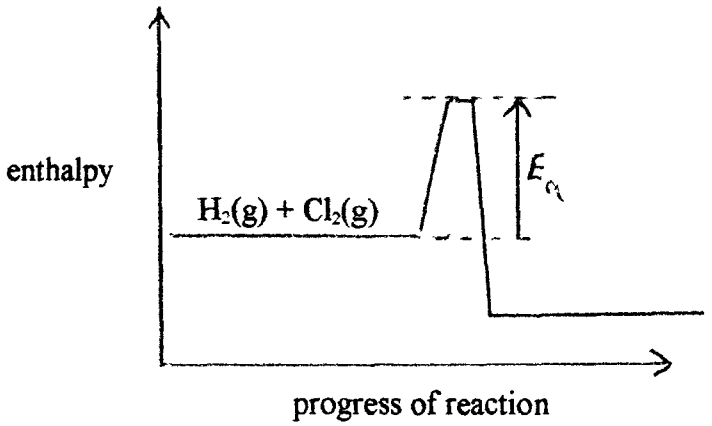
N.B. No scripts were received for this component. Hence the mark scheme has not been subject to the usual revision made during the standardisation meeting.

Mark Scheme Page 1 of 4	Unit Code 2813/01	Session Jan	Year 2001	Version post-QPEC
Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit _____ = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument			

Question	Expected Answers		Marks
1 (a) (i)	the enthalpy change when 1 mole of compound	✓	
	is formed from its elements (under standard conditions)	✓	[2]
(ii)	$\frac{1}{2}N_2(g) + O_2(g) \longrightarrow NO_2(g)$ *(balancing ✓) (state symbols ✓)* *(N.B. NOT→ $2NO_2$)*		[2]
(iii)	$\Delta H_x + 2 \times 90 = 2 \times 33$	✓	
	$\Delta H_x = 66 - 180$	✓ ecf	
	$= -114$ (kJ mol-1)	✓ ecf	[3]
(b)	ΔH is positive (or reaction is endothermic) *or* high activation energy *or* strong N≡N bond	✓	[1]
(c) (i)	$4\,CO + 2\,NO_2 \longrightarrow 4\,CO_2 + N_2$	✓	[1]
(ii)	heterogeneous	✓	
	different phases (solid/gas)	✓	[2]
(iii)	adsorption (of gases) onto the surface brings molecules together active sites subsequent desorption *(any two)*	✓✓	[2]
(iv)	reactions only occur on its surface	✓	
	so larger surface area = faster rate of reaction	✓	[2]
			[Total: 15]

Question	Expected Answers	Mark
2. (a) (i)	sunlight / ultraviolet light	✓ [1
(ii)	$Cl + O_3 \longrightarrow ClO + O_2$ $ClO + O \longrightarrow Cl + O_2$	✓ ✓ [2
(iii)	$2O_3 \longrightarrow 3O_2$ *or* $O_3 + O \longrightarrow 2O_2$	✓ [1
(iv)	homogeneous (catalyst and reactants both in) gaseous phase	✓ ✓ [2
(b) (i)	118.5	✓ [1
(ii)	$\mathbf{C_8H_{18}}$	✓ecf [1
(iii)	to avoid destroying the ozone layer	✓ [1
(iv)	(hydrocarbons are more) flammable *or* explosive *or* are greenhouse gases	✓ [1 [Total: 1C

Question	Expected Answers	Marks
3. (a)	the energy required to <u>break</u> <u>1 mole</u> of bonds	✓ ✓ [2]
(b) (i)	$x + 436 = 2(432) - 184$ $x = 244$ kJ mol^{-1}	✓ ✓ecf [2]
(ii)	$x + 568 = ½(436 + 158)$ $x = -271$ kJ mol^{-1}	✓ ✓ecf [2]
(c) (i)	a strong acid is completely ionised to $H^+(aq)$ a weak acid is incompletely ionised (NOT **un**ionised)	✓ ✓ [2]
(ii)	H-F is a stronger bond than H-Cl so is less likely to break (to give $H^+ + F^-$)	✓ ✓ [2]
(iii)	$2HCl + MgO \longrightarrow MgCl_2 + H_2O$ $2H^+ + MgO \longrightarrow Mg^{2+} + H_2O$	✓ [1]
(d) (i)	the spark provides the <u>activation energy</u>	✓ [1]
(ii)	diagram should: include E_a labelled show an exothermic reaction	✓ ✓ [2]



[Total: 14]

Question	Expected Answers			Marks
4. (a) (i)	*pressure:*	between 80 atm and 1000 atm	✓	
	temperature:	between 400°C and 550°C	✓	
	catalyst:	iron	✓	[3]
(b)	(increased pressure) increases the rate		✓	
	because molecules are closer together (so collide more often)		✓	
	(NOT molecules go faster/have more energy)			[2]
(c) (i)	high T pushes equilibrium over to l.h.side		✓	
	because reaction is exothermic (from l. to r.)		✓	[2]
(ii)	high pressure pushes equilibrium over to r.h.side		✓	
	because 4 moles of gas are going to 2 moles of gas		✓	[2]
(d)	if the temperature is too high, ⇒ low yield at equilibrium		✓	
	if the temperature is too low, ⇒ slow rate of reaction		✓	[2]
(e) (i)	$\underline{2}\,NH_3 + CO_2 \longrightarrow NH_2CONH_2 + H_2O$		✓	[1]
(ii)	$M_r(NH_3) = 17$	$M_r(NH_2CONH_2) = 60$	✓	
	34g gives 60g			
	so 1 kg gives 60/34			
	= **1.76 kg**		✓ ecf	[2]
				[Total: 14]

5.	*diagram:*	labelled axes		
		correct shape of distribution curve		
		higher temperature curve of correct shape/position		
		E_a labelled		
	text or diagram:	(shaded areas ⇒) more molecules with $E > E_a$ at higher T		
		E_a(catalysed) is lower than uncatalysed		
		hence more molecules with $E > E_a$(cat)		
		any 6 points	✓✓✓✓✓✓	[6]
		Q of w C:	✓	[1]
				Total: [7]