Que 11. COMBUSTION

We can write the combustion equation :-

$$\left(\frac{0.86}{12}C + 0.14H\right) + Y(.21O_2 + .79N_2) \longrightarrow aCO_2 + bH_2O + cO_2 + dN_2$$

(complete combustion assumed).

AFR = 80:1 $\therefore Y = \frac{80}{28.85} = 2.773$ kmol.

Equating atoms gives :-

	LHS	RHS	
C	$0.86/12$	a	$\therefore a = 0.0717$
H	0.14	$2b$	$\therefore b = 0.070$
O	$Y \times .21 \times 2$	$2a + b + 2c$	$\therefore c = 0.4757$
N	$Y \times .79 \times 2$	$2d$	$d = 2.191$

(a) For stoichiometric combustion $c = \phi$ & $Y_s = 0.5079$ (using ϕ)

$\therefore$ % excess air $= \frac{2.773 - .5079}{.5079} \times 100\% =$ 446 %

(b) Gravimetric analysis : 81 kg total products

Mass $CO_2 = 0.0717 \times 44 = 3.153$ kg ; % $\frac{3.153}{81} \times 100\% =$ 3.9 %

Mass $O_2 = 0.4757 \times 32 = 15.22$ kg ; % $\frac{15.22}{81} \times 100\% =$ 18.8 %

Mass $H_2O = 0.070 \times 18 = 1.26$ kg ; % $\frac{1.26}{81} \times 100\% =$ 1.55 %

Mass $N_2 = 2.191 \times 28 = 61.35$ kg ; % $\frac{61.35}{81} \times 100\% =$ 75.75 %