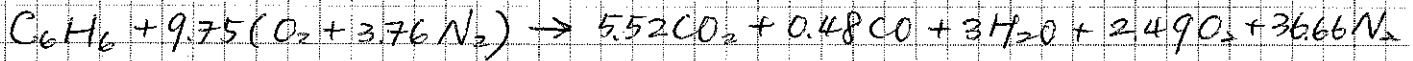


15-64

Combustion with 30% excess, and 92% of carbon burns to CO_2 , the remaining 8% forming CO .

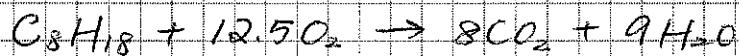


	\bar{h}_f	\bar{h}_{298K}	\bar{h}_{1000K}
C_6H_6	82,930	-	-
O_2	0	8682	31,389
N_2	0	8669	30,129
H_2O	-241,820	9904	35,882
CO	-110,530	8669	30,355
CO_2	-393,520	9364	42,769

$$\begin{aligned}
 -Q_{\text{out}} &= (5.52)(-393,520 + 42,769 - 9364 - 8.314 \times 1000) \\
 &+ (0.48)(-110,530 + 30,355 - 8669 - 8.314 \times 1000) \\
 &+ (3)(-241,820 + 35,882 - 9904 - 8.314 \times 1000) \\
 &+ (2.49)(0 + 31,389 - 8682 - 8.314 \times 1000) \\
 &+ (36.66)(0 + 30,129 - 8669 - 8.314 \times 1000) \\
 &- 1 \cdot (82,930 - 8.314 \times 298) \\
 &- (9.75)(4.76)(-8.314 \times 298) \\
 &= -2,200,529.302
 \end{aligned}$$

$$\Rightarrow Q_{\text{out}} = \underline{2,200,529.302 \text{ kJ}} \quad \dots \text{Ans}$$

15-96 (part b)

if pure O_2 are used to burn C_8H_{18} ,

	\bar{h}_f°	\bar{h}_{298K}
C_8H_{18}	-249,950	-
O_2	0	8682
N_2	0	8669
H_2O	-241,820	9904
CO_2	-393,520	9364

$$(8)(-393,520 + \bar{h}_{CO_2} - 9364) + (9)(-241,820 + \bar{h}_{H_2O} - 9904) = (1)(-249,950)$$

$$\Rightarrow 8\bar{h}_{CO_2} + 9\bar{h}_{H_2O} = 5,238,638 \text{ kJ}$$

$$\frac{5,238,638}{(8+9)} = 308,155 \text{ kJ/kmol} \rightarrow \text{higher than the highest enthalpy value listed for } H_2O \text{ and } CO_2$$

$$\text{At } 3200 \text{ K} = 8\bar{h}_{CO_2} + 9\bar{h}_{H_2O} = (8)(174,695) + (9)(147,457) = 2,724,673 \text{ kJ}$$

$$\text{At } 3250 \text{ K} = 8\bar{h}_{CO_2} + 9\bar{h}_{H_2O} = (8)(177,800) + (9)(150,700) = 2,775,024 \text{ kJ}$$

By extrapolation,

$$\frac{T_p - 3200}{3250 - 3200} = \frac{5,238,638 - 2,724,673}{2,775,024 - 2,724,673} \Rightarrow T_p = \underline{\underline{5696 \text{ K}}}$$