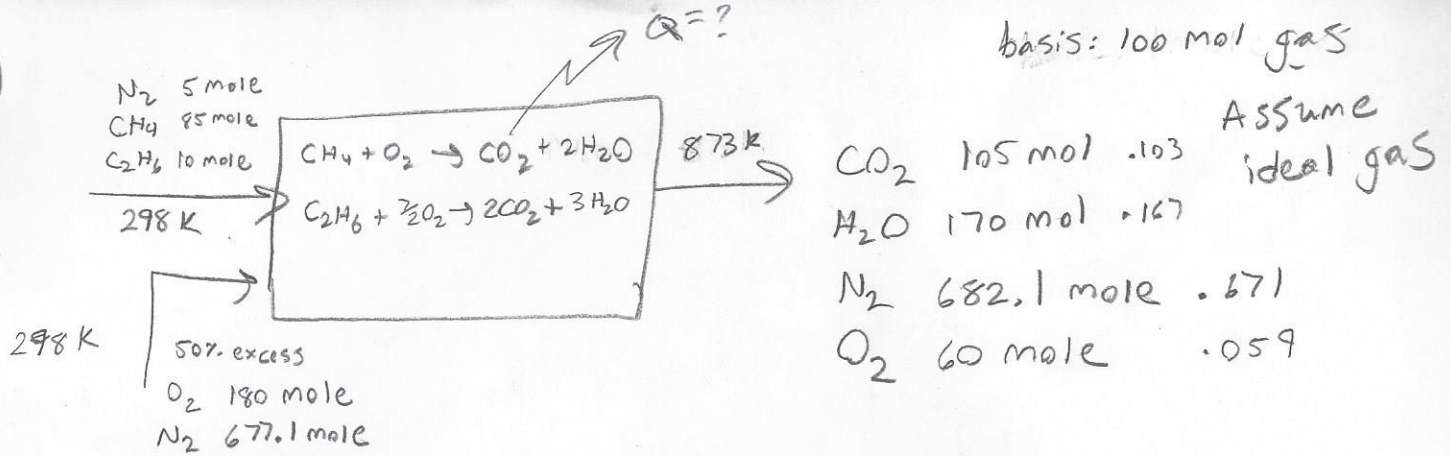


b)



$$N_{O_2}^{req} = 85 + \frac{7}{2}(10) = 120$$

$$120(1.5) = 180 \text{ mole}$$

$$\frac{180}{.21} = 857 \text{ mole air} \times .79 = 677.1 \text{ mole } N_2$$

$$\xi_1 = 85 \text{ mole}$$

$$\xi_2 = 10 \text{ mole}$$

reactants
 ΔH ↓

reactants
25°C

→
 ΔH_{rxn}

products 600°C

↑
products
25°C

$$Q = \Delta H_{total} = \cancel{\Delta H_r} + \Delta H_{rxn} + \Delta H_p$$

$$\Delta \tilde{H}_{rxn}^0 = \Delta \tilde{H}_{f, CO_2}^0 + \Delta \tilde{H}_{f, H_2O}^0 - \Delta \tilde{H}_{f, CH_4}^0 - \Delta \tilde{H}_{f, C_2H_6}^0 - \cancel{\Delta \tilde{H}_{f, O_2}^0} + \tilde{C}_p \Delta T$$

$$(170 \text{ mol})(-393,509 \text{ J/mol}) + (105 \text{ mol})(-241,818) - 85(-74,520) - 10(-83,820) + 105(2.70 \times 10^4) + 170(2.09 \times 10^4) + 682.1(1.74 \times 10^4) + 60(1.84 \times 10^4)$$

$$\Delta \tilde{H}_{CO_2} = \int_{298}^{873} R(5.457 + \frac{1.045}{10^3} T - 1.157 \times 10^{-5} T^{-2}) dT = 2.70 \times 10^4 \text{ J/mol}$$

$$\Delta \tilde{H}_{H_2O} = \int_{298}^{873} R(3.470 + 1.450 \times 10^{-3} T + 0.121 \times 10^{-5} T^{-2}) dT = 2.09 \times 10^4 \text{ J/mol}$$

$$\Delta \tilde{H}_{N_2} = \int_{298}^{873} R(3.280 + .543 \times 10^{-3} T + .040 \times 10^{-5} T^{-2}) dT = 1.74 \times 10^4 \text{ J/mol}$$

$$\Delta \tilde{H}_{O_2} = \int_{298}^{873} R(3.639 + .506 \times 10^{-3} T - .227 \times 10^{-5} T^{-2}) dT = 1.84 \times 10^4 \text{ J/mol}$$

$$\Delta H_{total} = -6.58 \times 10^7 \text{ J} = Q$$