

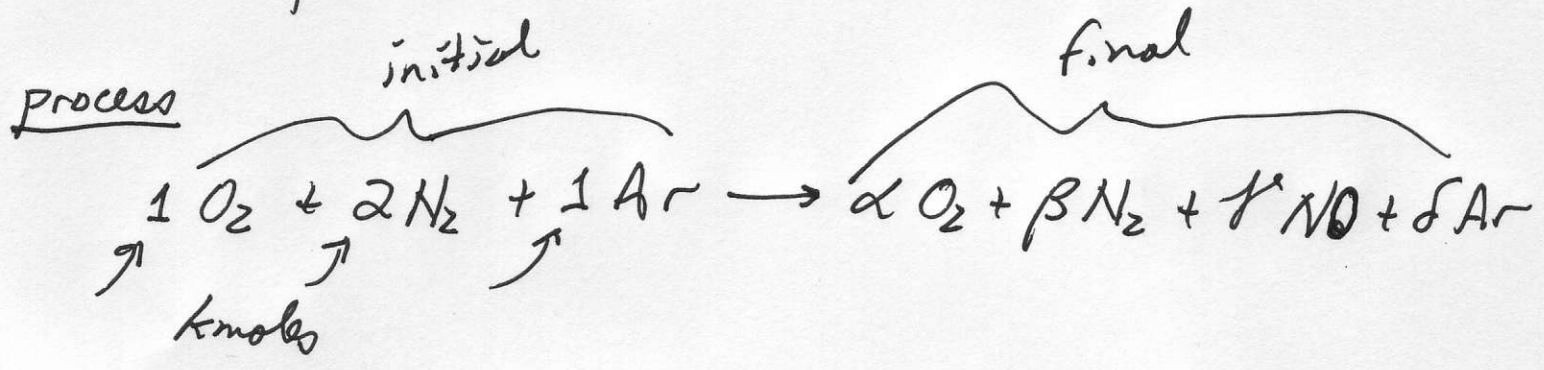
14.26

initial state: 1 kmole O_2 , 2 kmole N_2 , 1 kmole Ar

final state: some quantity of O_2 , N_2 , NO and Ar
(equilibrium)

$$T = 2727^\circ C = 3000K$$

$$P = 1 \text{ atm}$$



$$\mathcal{F} = 1$$

$$O: 2 = 2\alpha + \gamma$$

$$\alpha = \frac{2 - \gamma}{2}$$

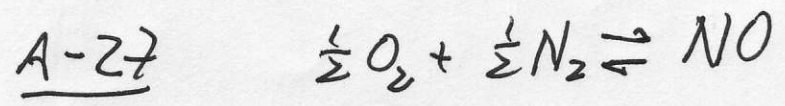
$$N: 4 = 2\beta + \gamma$$

$$\beta = \frac{4 - \gamma}{2}$$

final state $\Rightarrow \frac{2 - \gamma}{2} O_2, \frac{4 - \gamma}{2} N_2, \gamma NO, 1 Ar$

$$\begin{aligned}
 n_{TOT} &= \frac{2 - \gamma}{2} + \frac{4 - \gamma}{2} + \gamma + 1 = 1 - \frac{\gamma}{2} + 2 - \frac{\gamma}{2} + \gamma + 1 \\
 &= \underline{\underline{4}}
 \end{aligned}$$

Reaction involves O_2, N_2, NO



$$\log_{10} K(3000K) = -0.913 \Rightarrow K = 0.122$$

$$K = \frac{Y_{NO}}{Y_{O_2}^{1/2} Y_{N_2}^{1/2}} \left(\frac{1}{1} \right)$$

$$0.122 = \frac{y/4}{\left(\frac{2-y}{2} \cdot \frac{1}{4} \right)^{1/2} \left(\frac{4-y}{2} \cdot \frac{1}{4} \right)^{1/2}} = \frac{2y}{\sqrt{(2-y)(4-y)}}$$

solving iteratively $\Rightarrow y = 0.162$

Final composition is:

1 kmole Ar
 0.919 kmole O₂
 1.919 kmole N₂
 0.162 kmole NO

14.26 continued