Ex. stoichiometric table

$$\frac{1}{2}N_2 + \frac{3}{2}H_2 \longrightarrow NH_3$$

sökt: $C_{H_2}, C_{NH_3}$ om $X_{H_2} = 0.6$

$N_2 : H_2$

Reaktor     $T = 1727°C$

$1:1$           $P = 16.4$ atm
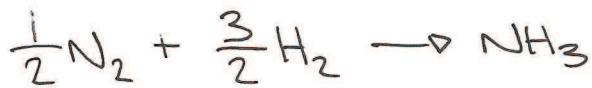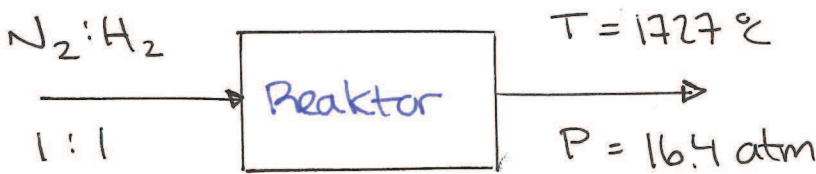
$\longrightarrow$ skriver om reaktionsbalansen:
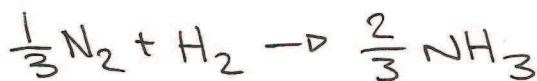
$$\frac{1}{3}N_2 + H_2 \longrightarrow \frac{2}{3}NH_3$$

$$F_{H_2} = F_{H_2}^o - X_{H_2}F_{H_2}^o$$

$$F_{N_2} = F_{N_2}^o - \frac{1}{3}X_{H_2}F_{H_2}^o = \cancel{F_{H_2}^o - X_{H_2}F_{H_2}^o} = F_{H_2}^o - \frac{1}{3}X_{H_2}F_{H_2}^o$$

$$F_{NH_3} = \cancel{F_{NH_3}^o} + \frac{2}{3}X_{H_2}F_{H_2}^o$$

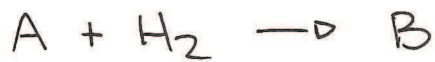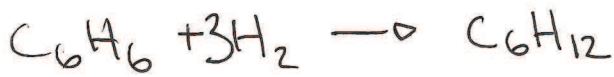$$\overline{F_{tot} = 2F_{H_2}^o - \frac{2}{3}X_{H_2}F_{H_2}^o}$$

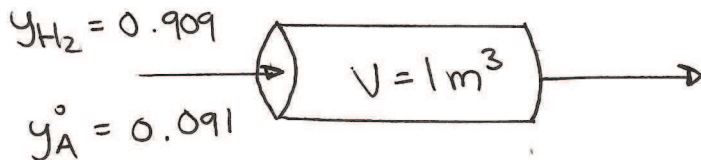$$C_{H_2} = y_{H_2}\frac{P}{RT} = \frac{1-X_{H_2}}{2-\frac{2}{3}X_{H_2}}\cdot\frac{P}{RT} = \cdots$$

$$C_{NH_3} = y_{NH_3}\frac{P}{RT} = \frac{\frac{2}{3}X_{H_2}}{2-\frac{2}{3}X_{H_2}}\frac{P}{RT} = \cdots$$

Allt är känt!
Bara att sätta
in siffror. ___

Isoterm reaktor med densitetsvariationer

$$C_6H_6 + 3H_2 \longrightarrow C_6H_{12}$$

$$A + H_2 \longrightarrow B$$

PFR - plug flow reaktor



$y_{H_2} = 0.909$

$y_A^\circ = 0.091$

$V = 1 m^3$

~~$r = kC_{H_2}$~~     $K = 0.145 \dfrac{\text{mol bensen}}{s \cdot bar \cdot m^3}$     1:a ordn. map väte!

$r = kP_{H_2}$

$F_A^\circ = 0.202 \dfrac{mol}{s}$     sökt: $X_A$

$P_{tot} = 15.4 \, bar$

$$\frac{dF_A}{dV} = r_A$$

$$F_{A_0}\frac{dX_A}{dV} = -r_A \longrightarrow F_{A_0}\frac{dX_A}{dV} = kP_{H_2}$$

Vill skriva om $P_{H_2}$ som funktion av utbytet

~~$P_{H_2} = y_A P_{tot}$~~     $P_{H_2} = y_{H_2} \cdot P_{tot}$

$$F_A = F_{A_0} - X_A F_{A_0}$$

$$F_{H_2} = F_{H_2}^\circ - 3X_A F_{A_0} = \left(\frac{y_{A_0}}{y_{H_2 0}}\right) F_{A_0} - 3X_A F_{A_0}$$

$$F_B = F_B^\circ + X_A F_A^\circ$$

$$\overline{F_{tot} = \left(1 + \frac{y_{A_0}}{y_{H_2 0}}\right) F_{A_0} - 3X F_{A_0}}$$

$$P_{H_2} = \frac{\dfrac{y_{H_2O}}{y_{A_0}} - 3X}{\left(1 + \dfrac{y_{H_2O}}{y_{A_0}}\right) - 3X}\ P_{tot}$$

$$F_{A_0}\frac{dX_A}{dV} = k\ \frac{y_{H_2O} - 3X}{\left(1 + \dfrac{y_{H_2O}}{y_{A_0}}\right) - 3X}\ P_{tot}$$