Answers Tut 5

5.2 $k_i' = 1.009x10^{-4} m^3 kg^{-1}.s^{-1},\ \eta = 0.44$

5.3

a) $\eta = 0.1173$
b) $x_{ideal} = 0.96 > x\_(real)$ Yes, Mass transfer affects the rate
c) $x_{new} = 0.928, (k'_{eff} = 4.877x10^{-5})$
d) $x_{new} = 0.95, a_m = 1.846, \eta = 0.154, k'_{eff} = 5.72x10^{-5} m^3 kg^{-1} s^{-1}$

5.4 L = 0.114 m

5.5

b) $\eta = 0.999$
c) $T = 121°C$
d) $k_{app\ predicted} = 1.644x10^{-5} m^{-3} kg^{-1} s^{-1} = 1.45\ x\ k_{app\ real}$

5.6

a) $x_{2mm} = 0.55$
b) $x_{2mm} = 0.43$
c) For packed bed in a) higher velocity has no influence since internal mass transfer controls, For packed bed in b) conversion will increase since $k_c \propto u^{\frac{1}{2}}$

5.7

a) $D_p = 0.652\ mm,\ (k'_o = 248.2\ m^3 kg^{-1} s^{-1})$
b) $T = 374.8\ °C$ (Hint: assume in internal mass transfer controlled regime since d_p = 3 mm in order to simplify equations. Test assumption after solution by calculating the Thiele Modules)

5.8

a) $x = 0.32$
b) $W = 218\ kg$ (Please confirm answer)

5.9

a) $d_p = 5\ mm, T = 400\ K, rpm\ > 900$
b) $400\ K, d_p = 0.3\ mm,\ rpm < 400,\ and\ \ 400\ K, d_p = 0.1\ mm,\ rpm < 200$
c) Leave
d) $x = 0.59$
e) $x = 0.74$