EGEE/ME 430

(a) 1st order rxn

\[- \frac{d[A]}{dt} = k_1[A] \Rightarrow [A] = [A]_0 \exp(-k_1t)\]

If \([A] = \frac{1}{e} [A]_0 = 0.37[A]_0\), then \[T_{chem} = \frac{1}{k_1}\]

(b) Bimolecular rxn, pseudo 1st order (one reactant in excess...)

\[- \frac{d[A]}{dt} = k_2 [A][B] = k_2' [A] \Rightarrow [A] = [A]_0 \exp(-k_2't)\]

... same as case (a), \([B] = [B]_0\), \([A] = 0.37[A]_0\)

\[T_{chem} = \frac{1}{k_2'} = \frac{1}{[B]k_2}\]

(c) Termolecular rxn, pseudo 1st order \([B]= [B]_0\); \([M]= [M]_0\)

\[- \frac{d[A]}{dt} = k_3 [A][B][M] = k_3' [A] \Rightarrow T_{chem} = \frac{1}{k_3'} = \frac{1}{k_3[B][M]}\]

* Convenient! Diff and rxn occur in series, so can add these characteristic times (remember Ohm's law!) or define RDS!