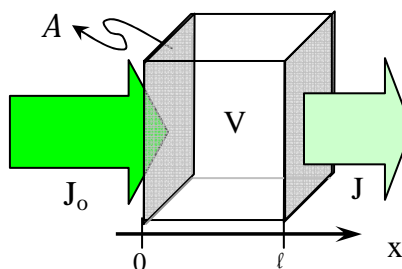


Photochemistry

$$J = J_0 e^{-2.303 \epsilon \ell c}$$

$$J_a = J_0 - J$$

$$J_a = J_0(1 - e^{-2.303 \epsilon \ell [A]}) \quad (\text{J m}^{-2} \text{ s}^{-1})$$



$$\Phi_f = J_f/J_a$$

$E = h\nu$ and flux in units of $\text{mol L}^{-1} \text{ s}^{-1}$:

$$J_0 = \frac{J_0}{N_A h\nu} \left(\frac{A}{V} \right)$$

$$J_a = J_0(1 - e^{-2.303 \epsilon \ell [A]}) = \frac{J_0}{N_A h\nu} \left(\frac{A}{V} \right) (1 - e^{-2.303 \epsilon \ell [A]})$$

$$\frac{d[A^*]}{dt} = J_a = J_0(1 - e^{-2.303 \epsilon \ell [A]})$$

optically thick: $\epsilon \ell [A] \gg 1$

$$\frac{d[A^*]}{dt} = J_a = J_0 = \frac{J_0}{N_A h\nu} \left(\frac{A}{V} \right)$$

optically thin: $\epsilon \ell [A] \ll 1$: $e^{-2.303 \epsilon \ell [A]} \approx 1 - 2.303 \epsilon \ell [A]$

$$J_a = 2.303 J_0 \epsilon \ell [A] = \frac{2.303 J_0 \epsilon \ell}{N_A h\nu} \left(\frac{A}{V} \right) [A]$$

$$\frac{d[A^*]}{dt} = J_a = 2.303 J_0 \epsilon \ell [A] \quad (\text{optically thin, } \epsilon \ell [A] \ll 1)$$

$$\Phi_B = \frac{d[B]/dt}{J_a} \quad \frac{d[B]}{dt} = \Phi_B J_a$$

$$\frac{d[B]}{dt} = \Phi_B J_a = \Phi_B J_0 (1 - e^{-2.303 \epsilon \ell [A]})$$

$$\frac{d[B]}{dt} = \Phi_B J_a = \Phi_B J_0 \quad (\text{optically thick, } \epsilon \ell [A] \gg 1)$$

$$\frac{d[B]}{dt} = \Phi_B J_a = 2.303 J_0 \Phi_B \epsilon \ell [A] \quad (\text{optically thin, } \epsilon \ell [A] \ll 1)$$

$$\frac{d[A^*]}{dt} = J_a = j_{A^*} [A] \quad j_{A^*} = 2.303 J_0 \epsilon \ell \quad (\text{optically thin})$$

$$\frac{d[B]}{dt} = \Phi_B J_a = j_B [A] \quad j_B = \Phi_B j_{A^*} = 2.303 J_0 \Phi_B \epsilon \ell \quad (\text{optically thin})$$