

Quiz 5, Problem 1

$$(a) \quad A = A_0 e^{-kt} = (0.0248) \exp\left(- (2.2 \times 10^{-5})(3600)\right) = 0.0229 \text{ M}$$

$$(b) \quad t = -\frac{1}{k} \ln\left(\frac{A}{A_0}\right) = \frac{(-)}{(2.2 \times 10^{-5})} \ln\left(\frac{0.0150}{0.0248}\right) = 2.29 \times 10^4 \text{ sec}$$

Quiz 5, Problem 2

$$(a) \quad \frac{1}{A} = \frac{1}{A_0} + kt \quad \text{so} \quad k = \frac{1}{t} \left( \frac{1}{A_0} - \frac{1}{A} \right) = 0.159 \frac{1}{\text{M min}}$$

$$(b) \quad \frac{1}{A} = \frac{1}{A_0} + kt \quad \text{so} \quad \frac{1}{A} = \frac{1}{0.05} + (0.159)(75) = 31.9 \quad \text{and} \quad A = 0.0313 \text{ M}$$

$$(c) \quad t = \frac{1}{k} \left( \frac{1}{A} - \frac{1}{A_0} \right) = 189 \text{ min}$$

Quiz 5, Problem 3

$$(a) \quad \ln\left(\frac{k_2}{k_1}\right) = -\frac{E_a}{R} \left( \frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$\ln\left(\frac{0.791}{0.0352}\right) = -\frac{E_a}{8.314} \left( \frac{1}{811} - \frac{1}{733} \right) \quad \text{so} \quad E_a = 197200 \text{ J/mol}$$

Note: The easiest way to calculate  $\frac{1}{811} - \frac{1}{733}$  is to use a key such as  $\boxed{1/x}$  or  $\boxed{x^{-1}}$  on your calculator. Do  $811\boxed{1/x} - 733\boxed{1/x}$

$$k = A \exp\left(-\frac{E_a}{RT}\right)$$

$$(b) \quad 0.791 = A \exp\left(-\frac{197200}{(8.314)(811)}\right) \quad \text{so} \quad A = 3.98 \times 10^{12} \frac{1}{\text{M s}}$$

$$(c) \quad k = (3.98 \times 10^{12}) \exp\left(-\frac{197200}{(8.314)(775)}\right) \quad \text{so} \quad k = 0.203 \frac{1}{\text{M s}}$$