Answer key

Session 2/ CH 117
16 Jan. 2014

1. Write the integrated rate law equation for the ___ order reaction where the rate of reaction is independent of changes in concentration.

$[A] = -kt + A_0$

2. The rate law expression of a reaction is Rate= $5*10^{-3}\ s^{-1}$ [NO]. Find the concentration of NO at t=3 seconds if initial concentration of NO is 4 M.

3.94

3. Use the Data from the table to determine the rate law expression.
$2A + B \rightarrow P$

Experiment	[A]	[B]	Initial Rate (M/s)
1	.4	.2	$2*10^{-2}$
2	.4	.4	[illegible] 4×10^{-2}
3	.6	1.0	$3*10^{-2}$
4	.8	.2	$2*10^{-2}$

Rate = $k[B]$

b. Using experiment 1, find k.

$a\ 1\ s^{-1}$

c. True or False. If 1/[B] is graphed as a function of time (t on x-axis), the graph would be linear.

False, It is first order so ln(B) would make it most linear.

d. Find concentration of B at t=2 if initial concentration of B is 5.

$\ln(B) = -(k)(t) + \ln(B)_0$

$\ln B = -.1(2) + \ln(5)$

$e^{\ln B} = e^{1.409} = 4.0937$

4. Reaction M has a k value of $3*10^{-2}\ s^{-1}$. What is the $t_{1/2}$ of Reaction M.

$t_{1/2} = \frac{.693}{k} = \frac{.693}{(3 \times 10^{-2})}$

b. How long would it take for [M] to be reduced to 12.5% of the initial amount.

$\ln(M) = -kt + \ln(M)_0$

$\ln(12.5) = -(3\times10^{-2})(x) + \ln(100)$

$2.53 = -3\times10^{-2}x + 4.605$

solve for x

5. The half-life for decomposition of cyclopentene at 825 K is 241s. How long would it take for a sample of cyclopentene to decompose to 7% of the original amount.

$241 = \frac{.693}{*}$

$K = .00288$

2.88×10^{-3}

$\ln(A)_t = -k(t) + \ln(A)_0$

$\ln(7) = (-2.88\times10^{-3})(t) + \ln(100)$

$1.946 = -2.88\times10^{-3}\,t + 4.605$

solve for t

6. Explain why increasing temperature increases the rate of reaction. If possible, use an energy distribution curve diagram to explain.

Increasing T increases Av. kinetic energy of molecules. More molecules have energy needed to go over E_a.