**Dougherty Valley HS AP Chemistry**

**WORKSHEET #3**

**Kinetics – Reference Sheet**

First-Order Reactions: (rate is directly proportional to the concentration)

using calculus, as the t approaches 0, the Rate equation becomes

which can be rearranged into the “y = mx + b” format

so… IF the reaction is first-order with respect to R,

plotting ln[R]t versus time results in a straight line with **k = -slope**

SUMMARY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Order** | **Rate Equation** | **Integrated Rate Equation** | **Straight Line Plot** | **Slope** | **k Units** |
| 0 | Rate = k[R]0 | [R]t – [R]0 = -kt | [R]t vs. t | -k | mol / L\*s |
| 1 | Rate = k[R]1 | Ln([R]t/[R]0) = -kt or see below table | Ln[R]t vs t | -k | s-1 |
| 2 | Rate = k[R]2 | (1/[R]t – (1/[R]0) = kt | 1/[R]t vs t | k | L / mol\*s |
|  |  |  | ***Memorize this!!*** |  |

|  |  |  |
| --- | --- | --- |
| **Second-Order Reactions** | **Zero-Order Reactions**  | **First-Order Reactions** |
|  |  |  |
|  |  |  |
|  |  |  |

Practice Problem: Show all work. Complete the following.

Data for the decomposition of N2O5 in a particular solvent at 45°C are as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **[N2O5] mol⋅L-1** | **t (min)** |  | **Ln[N2O5]** |  |
| 2.08 | 3.07 |  |  |  |
| 1.67 | 8.77 |  |  |  |
| 1.36 | 14.45 |  |  |  |
| 0.72 | 31.28 |  |  |  |

Plot [N2O5], ln[N2O5], and versus time, t.

What is the order of the reaction? What is the rate constant, k, for the reaction?