**Name: Period: Seat#:**

**Worksheet #3**

**Directions:** Show all work in a way that would earn you credit on the AP Test! This is always the rule! Some answers are provided at the end in italics and underlined. If you need more space, use binder paper and staple to your worksheet.

**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!!*** |

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

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

**Plot the following:**

|  |  |  |
| --- | --- | --- |
| **[N2O5],** | **ln[N2O5],** |  |
| *Graph:* | *Graph:* | *Graph:* |
| *Equation:* | *Equation:* | *Equation:* |
| *R2 value:* | *R2 value:* | *R2 value:* |

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