South Pasadena • AP Chemistry

Name _____
Period ___ Date ___/___/___

# 15 • Kinetics

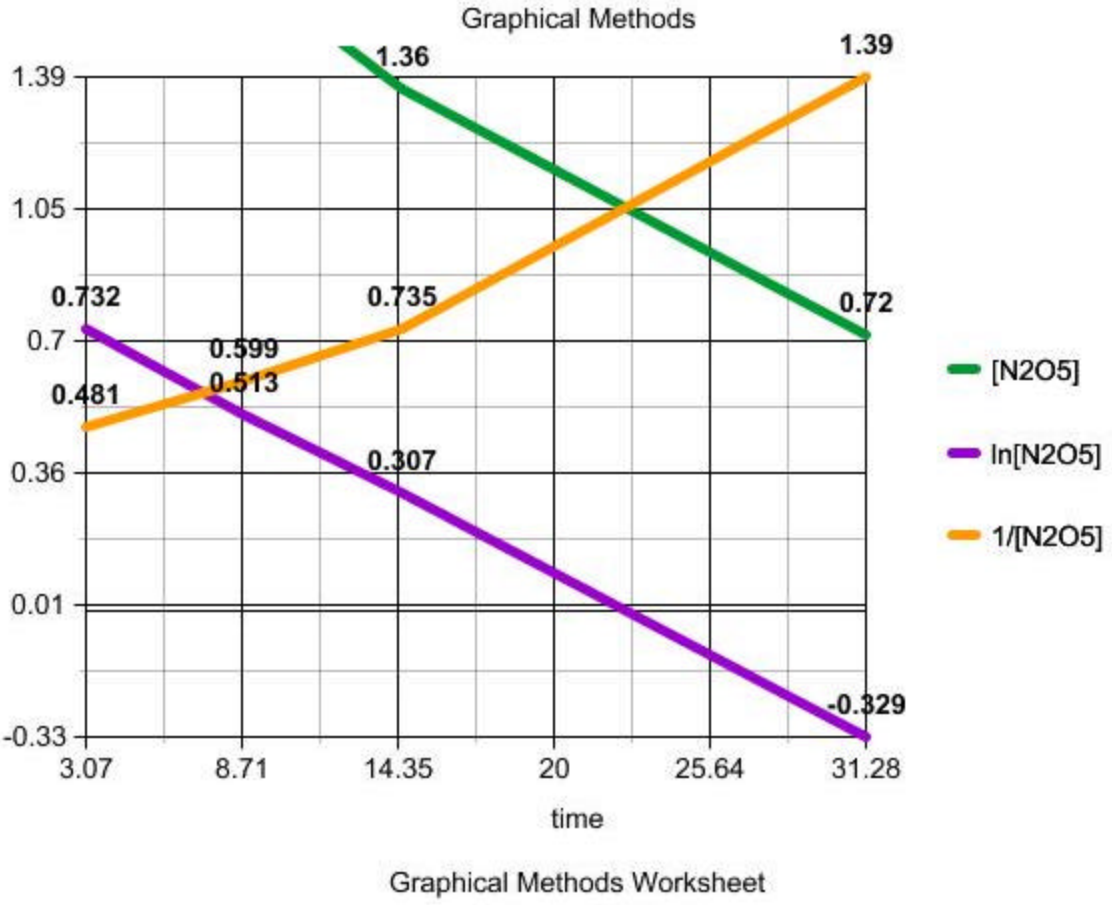
## Graphical Methods of Determining Reaction Order and the Rate Constant

### Practice Problem:

Data for the decomposition of $N_2O_5$ in a particular solvent at 45°C are as follows:

| $[N_2O_5]$ (mol/L) | *t* (min) | $ln[N_2O_5]$ | $1/[N_2O_5]$ |
|---|---|---|---|
| 2.08 | 3.07 | **.732** | **.481** |
| 1.67 | 8.77 | **.513** | **.599** |
| 1.36 | 14.45 | **.307** | **.735** |
| 0.72 | 31.28 | **-.329** | **1.39** |

Plot $[N_2O_5]$, $ln[N_2O_5]$, and $1/[N_2O_5]$ versus time, *t*.
What is the order of the reaction? What is the rate constant, *k*, for the reaction?




Graphical Methods Worksheet

The graph of **$ln[N_2O_5]$ vs. time** is a straight line. The reaction is **first order** with respect to $[N_2O_5]$.

$$\text{slope} = -k = -\frac{(-0.329) - 0.732}{31.28 - 3.07} = \frac{-1.061}{28.21} = \mathbf{0.0376\ min^{-1}}$$