To find the order of the reaction using the integral method, we first assume that the decomposition of N2O5 is a first order reaction.

The relationship between concentration and time for an irreversible unimolecular-type first order reaction is (Pg. 38 of handout)

Data given: CA0 = 0.16 M and

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time, min | 1 | 2 | 3 | 4 |
| CA, M | 0.113 | 0.08 | 0.056 | 0.035 |

Calculating for all these data points,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time, min | 1 | 2 | 3 | 4 |
| CA, M | 0.113 | 0.08 | 0.056 | 0.035 |
| -ln(CA/CA0) | 0.348 | 0.693 | 1.05 | 1.386 |

Plotting vs time fits a linear correlation as shown below. Hence, the assumption of 1st order is correct. The rate constant, k, in this case, is the slope (or gradient) of the linear correlation = 0.3476 min-1.