Answer on Question #66939, Chemistry / General Chemistry

The rate constant for the equation 2 $C_2F_4 \rightarrow C_4F_8$ is 0.0488 M^{-1} s^{-1}. We start with 0.166 mol C_2F_4 in a 5.00-liter container, with no C_4F_8 initially present. What will be the concentration of C_2F_4 after 2.00 hours? Answer in units of M.

Solution:

$-d[A] / dt = k \times [A]^2$

$(1 / [A]^2)\, d[A] = -k \times dt$

$\int (1 / [A]^2)\, d[A] = \int -k\, dt$

$-1/[A] + 1 / [A_o] = -k\, \Delta t$

$1 / [A] = 1 / [A_o] + k\, \Delta t$

$1 / [A] = 1 / (0.166 \text{ moles} / 5.00\text{L}) + (0.0488\ M^{-1}\ s^{-1}) \times (7200\ s)$

$1 / [A] = 381.5 / M$

$[A] = 0.00262\ M$

Answer: 0.00262 M