43. The dimerization of butadiene

$$2C_4H_6(g) \longrightarrow C_8H_{12}(g)$$

was studied at 500. K, and the following data were obtained:

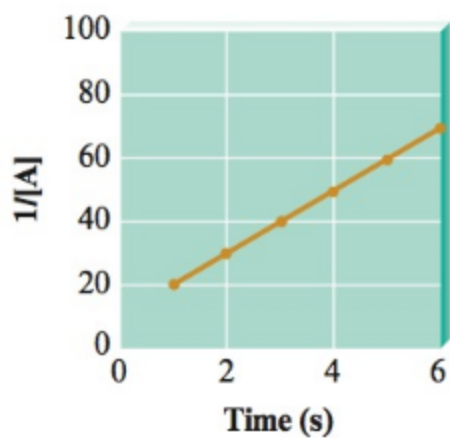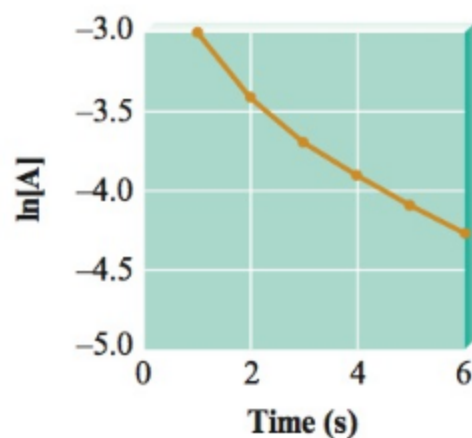| Time (s)	$[C_4H_6]$ (mol/L)
195	1.6×10^{-2}
604	1.5×10^{-2}
1246	1.3×10^{-2}
2180	1.1×10^{-2}
6210	0.68×10^{-2}

Assuming that
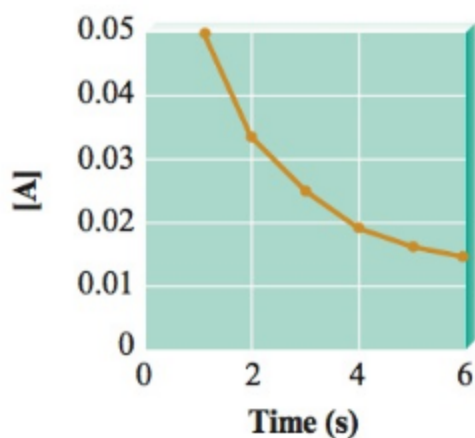
$$\text{Rate} = -\frac{\Delta[C_4H_6]}{\Delta t}$$

determine the form of the rate law, the integrated rate law, and the value of the rate constant for this reaction.

**45.** Experimental data for the reaction

$$A \longrightarrow 2B + C$$
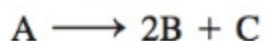
have been plotted in the following three different ways (with concentration units in mol/L):

What is the order of the reaction with respect to A, and what is the initial concentration of A?

48. The decomposition of hydrogen iodide on finely divided gold at 150°C is zero order with respect to HI. The rate defined below is constant at 1.20×10^{-4} mol/L $\cdot$ s.

$$2HI(g) \xrightarrow{\text{Au}} H_2(g) + I_2(g)$$
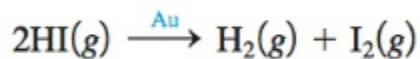
$$\text{Rate} = -\frac{\Delta[HI]}{\Delta t} = k = 1.20 \times 10^{-4} \text{ mol/L} \cdot \text{s}$$

a. If the initial HI concentration was 0.250 mol/L, calculate the concentration of HI at 25 minutes after the start of the reaction.

b. How long will it take for all of the 0.250 M HI to decompose?

50. A first-order reaction is 75.0% complete in 320. s.

    a. What are the first and second half-lives for this reaction?

    b. How long does it take for 90.0% completion?