57. Ammonium cyanate, NH_4NCO, rearranges in water to give urea, $(NH_2)_2CO$.

$$NH_4NCO(aq) \longrightarrow (NH_2)_2CO(aq)$$

Time (min)	$[NH_4NCO]$ (mol/L)
0	0.458
4.50×10^1	0.370
1.07×10^2	0.292
2.30×10^2	0.212
6.00×10^2	0.114

Using the data in the table:

(a) Decide whether the reaction is first order or second order.

(b) Calculate k for this reaction.

(c) Calculate the half-life of ammonium cyanate under these conditions.

(d) Calculate the concentration of NH_4NCO after 12.0 hours.

63. The decomposition of gaseous dimethyl ether at ordinary pressures is first order. Its half-life is 25.0 minutes at 500 °C:

$$CH_3OCH_3(g) \longrightarrow CH_4(g) + CO(g) + H_2(g)$$

(a) Starting with 8.00 g of dimethyl ether, what mass remains (in grams) after 125 minutes and after 145 minutes?

(b) Calculate the time in minutes required to decrease 7.60 ng (nanograms) to 2.25 ng.

(c) What fraction of the original dimethyl ether remains after 150 minutes?

71. ▲ Hypofluorous acid, HOF, is very unstable, decomposing in a first-order reaction to give HF and O_2, with a half-life of 30. minutes at room temperature:

$$HOF(g) \longrightarrow HF(g) + \tfrac{1}{2}\ O_2(g)$$

If the partial pressure of HOF in a 1.00-L flask is initially 1.00×10^2 mm Hg at 25 °C, what are the total pressure in the flask and the partial pressure of HOF after exactly 30 minutes? After 45 minutes?