CH353 – Physical Chemistry I
Spring 2012, Unique 52135

Quiz 6

Hydrogen peroxide (H_2O_2) decomposes in a first-order mechanism to form water and molecular oxygen.

a) Write the correctly balanced stoichiometric formula for the decomposition of hydrogen peroxide.

b) Write the rate equation for this decomposition.

c) A 0.20 mol L^{-1} solution of hydrogen peroxide decomposes with an initial rate of 1.7×10^{-5} mol L^{-1} s^{-1}. Determine the rate constant of the decomposition reaction.

a) $H_2O_2 \rightleftharpoons H_2O + \frac{1}{2} O_2$

b) $v(t) = k[H_2O_2]$

c) $[H_2O_2] = 0.20 \text{ mol/L}$

$v(t) = 1.7 \times 10^{-5} \text{ mol/Ls}$

$$k = \frac{v(t)}{[H_2O_2]} = \frac{(1.7 \times 10^{-5} \text{ mol/Ls})}{(0.20 \text{ mol/L})} = \boxed{8.5 \times 10^{-5} \text{ s}^{-1} = k}$$