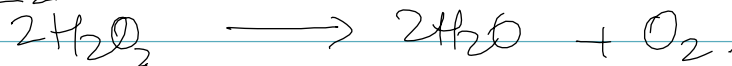


Sapna Gupta

Kinetics (3) Rate and Time Dependence - 1st order

Decomposition of H_2O_2 is 1st order with respect to H_2O_2



The rate constant at $20^\circ C$ is $1.8 \times 10^{-5} s^{-1}$. If starting conc. of H_2O_2 is $0.75 M$, Determine

- (a) conc. of H_2O_2 after 3 hr.
- (b) how long will it take for H_2O_2 conc. to drop to $0.10 M$?

Ans

$$\ln \frac{[A]_t}{[A]_0} = -kt$$

$$\ln \frac{[A]_t}{[A]_0} = -kt \quad (3 \text{ hrs.})$$

(a) $\ln \frac{[H_2O_2]_t}{0.75 M} = -1.8 \times 10^{-5} / s \times (10,800) s$

inverse of natural log (ln) $(e^{-0.1944})$

$$\frac{[H_2O_2]_t}{0.75 M} = 0.823$$

$$[H_2O_2]_t = 0.823 \times 0.75 M = \boxed{0.62 M}$$

(b) $\ln \frac{(0.10) M}{(0.75) M} = -1.8 \times 10^{-5} / s \times t$

$$-2.015 = -1.8 \times 10^{-5} / s \times t$$

$$\frac{-2.015}{-1.8 \times 10^{-5} / s} = t$$

$$= \boxed{1.12 \times 10^5 s}$$