Integrated Forms of Common Rate Laws for R → P

	Zero-Order Reaction	First-Order Reaction	Second-Order Reaction
The Rate Law	Rate = k	Rate = k[R]	Rate = $k[R]^2$
The Differential Form of the Rate Law	$-\frac{d[R]}{dt} = k$	$-\frac{d[R]}{dt} = k[R]$	$-\frac{d[R]}{dt} = k[R]^2$
The Integrated Form of the Rate Law and its Derivation (Last equation is linear form for plotting)	$d[R] = -kdt$ $\int d[R] = -k\int dt$ $[R]_t - [R]_o = -kt$ $[R]_t = [R]_o - kt$	$\frac{1}{[R]}d[R] = -kdt$ $\int \frac{1}{[R]}d[R] = -k\int dt$ $\ln[R]_t - \ln[R]_o = -kt$ $\ln[R]_t = \ln[R]_o - kt$	$\frac{1}{[R]^2}d[R] = -kdt$ $\int \frac{1}{[R]^2}d[R] = -k\int dt$ $-\frac{1}{[R]_t} + \frac{1}{[R]_o} = -kt$ $\frac{1}{[R]_t} = \frac{1}{[R]_o} + kt$
What to Plot and How to Interpret	A plot of $[R]_t$ vs. time is linear with a slope of $-k$ and a y-intercept of $[R]_o$	A plot of $\ln[R]_t$ vs. time is linear with a slope of $-k$ and a y-intercept of $\ln[R]_o$	A plot of $[R]^{-1}$ vs. time is linear with a slope of k and a y-intercept of $[R]_o^{-1}$

You are not responsible for these derivations; you are, however, responsible for knowing the linear forms of the integrated rate laws and how to use them to (i) determine a reaction's rate law; and (ii) to determine values for a reaction's rate constant and the initial concentration of reactant. Study them!