Kinetics Formulas

Name	Formula	
Zero-Order	$\text{Rate} = k$	
Integrated Rate Law	$[A]_t = -kt + [A]_0$	Plot: [A] vs. t Slope: -k Units: M/s
Half-Life	$t_{1/2} = \frac{[A]_0}{2k}$	
First-Order	$\text{Rate} = k[A]^1$	
Integrated Rate Law	$\ln[A]_t = -kt + \ln[A]_0$	Plot: ln[A] vs. t Slope: -k Units: s^{-1}
Half-Life	$t_{1/2} = \frac{\ln(2)}{k} = \frac{0.693}{k}$	
Second-Order	$\text{Rate} = k[A]^2$	
Integrated Rate Law	$\frac{1}{[A]} = kt + \frac{1}{[A]_0}$	Plot: 1/[A] vs. t Slope: k Units: $M^{-1}s^{-1}$
Half-Life	$t_{1/2} = \frac{1}{k[A]_0}$	
Arrhenius Equations	$k = Ae^{-E_a / RT}$	Accounts for proper molecular orientation and energy needed in the collision for a reaction to occur. E_a = Activation Energy R = 8.3145 J/mol K
	$\ln(k) = \frac{-E_a}{R} \cdot \frac{1}{T} + \ln(A)$	Plot: ln(k) vs. 1/T Slope: $-E_a/R$
	$\ln(\frac{k_2}{k_1}) = \frac{E_a}{R} \cdot (\frac{1}{T_1} - \frac{1}{T_2})$	k_1 and k_2 are the rates measured at temperatures T_1 and T_2