

Michaelis–Menten kinetics

The dependence of an initial *rate of reaction* upon the concentration of a *substrate* S that is present in large excess over the concentration of an enzyme or other *catalyst* (or reagent) E with the appearance of saturation behaviour following the Michaelis–Menten equation:

$$v = V[S]/(K_m + [S]),$$

where v is the observed initial rate, V is its limiting value at substrate saturation (i.e. $[S] \gg K_m$), and K_m the substrate concentration when $v = V/2$. The definition is experimental, i.e. it applies to any reaction that follows an equation of this general form. The symbols V_{\max} or v_{\max} are sometimes used for V .

The parameters V and K_m (the ‘Michaelis constant’) of the equation can be evaluated from the slope and intercept of a linear plot of v^{-1} vs. $[S]^{-1}$ (a ‘Lineweaver–Burk plot’) or from slope and intercept of a linear plot of v vs. $v/[S]$ (‘Eadie–Hofstee plot’).

A Michaelis–Menten equation is also applicable to the condition where E is present in large excess, in which case the concentration $[E]$ appears in the equation instead of $[S]$.

The term has sometimes been used to describe reactions that proceed according to the scheme:



in which case $K_m = (k_{-1} + k_{\text{cat}})/k_1$ (Briggs–Haldane conditions). It has more usually been applied only to the special case in which $k_{-1} \gg k_{\text{cat}}$ and $K_m = k_{-1}/k_1 = K_s$; in this case K_m is a true dissociation constant (Michaelis–Menten conditions).

See also *rate-determining step*.

1994, 66, 1140; 1996, 68, 172