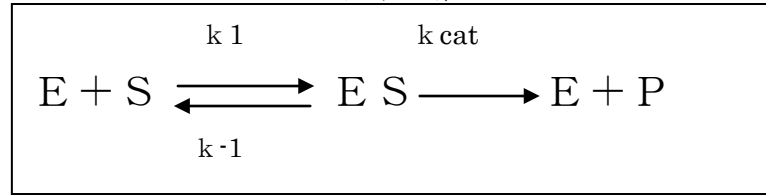


理数生物プリント タンパク質3

●酵素の反応速度の考え方

酵素の反応速度と親和性

ミカエリス・メンテン式の簡単な解説



k_1 は E (酵素) + S (基質) が ES (酵素基質複合体) になる速度
 k_{-1} は ES が E + S に戻る速度
 k_{cat} は ES が E と P (生成物) になる速度

反応速度 V は $V = k_{cat} [ES]$ であらわされる

$$k_{-1} [ES] + k_{cat} [ES] = k_1 [E] [S]$$

$$[ES] = \frac{k_1}{k_{-1} + k_{cat}} [E] [S] = \frac{k_1}{k_{-1} + k_{cat}} ([E_0] - [ES]) [S]$$

$$[E] = [E_0] - [ES]$$

$E + S \rightleftharpoons ES$ の反応が平衡に達しているとする

$$k_m = \frac{[E] [S]}{[ES]}$$

これを酵素の親和性という

$$k_{cat} = \frac{k_1}{k_{-1} + k_{cat}}$$

これを k_m で表すと

$$k_m = \frac{k_{-1} + k_{cat}}{k_1}$$

$$[ES] = \frac{[E_0] [S]}{k_m + [S]}$$

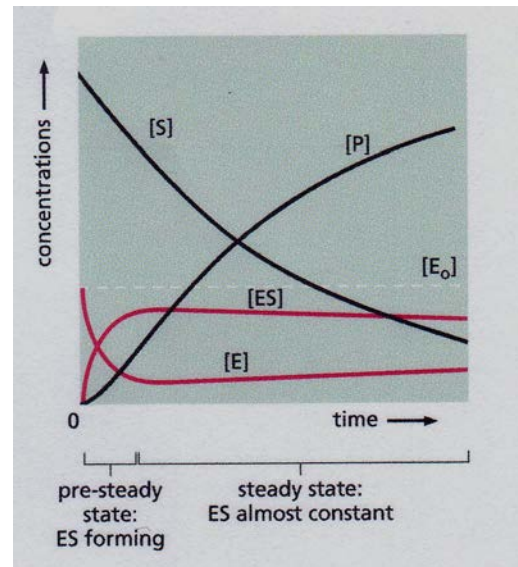
$$V = k_{cat} [ES]$$

ミカエリス・メンテン式

$$V = \frac{k_{cat} [E_0] [S]}{k_m + [S]}$$

酵素の最大反応速度 $V_{max} = k_{cat} [E_0]$

$$V = \frac{V_{max} [S]}{k_m + [S]}$$



代謝とタンパク質

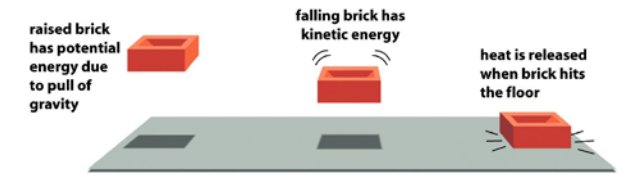
●代謝とエネルギー

エネルギーの種類と変換

代謝 metabolism

anabolism =

catabolism =



potential energy due to position → kinetic energy → heat energy

Figure 2-39 part 1 of 4 Molecular Biology of the Cell 5/e (© Garland Science 2008)



chemical bond energy in H₂ and O₂ → rapid molecular motions in H₂O → heat energy

Figure 2-39 part 2 of 4 Molecular Biology of the Cell 5/e (© Garland Science 2008)

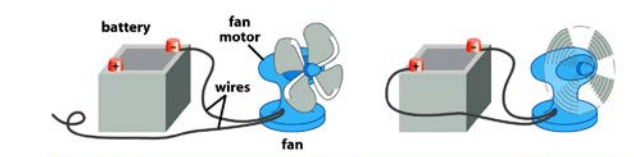


Figure 2-39 part 3 of 4 Molecular Biology of the Cell 5/e (© Garland Science 2008)

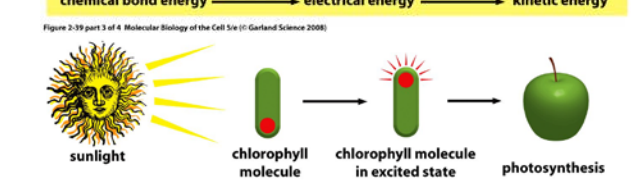


Figure 2-39 part 4 of 4 Molecular Biology of the Cell 5/e (© Garland Science 2008)

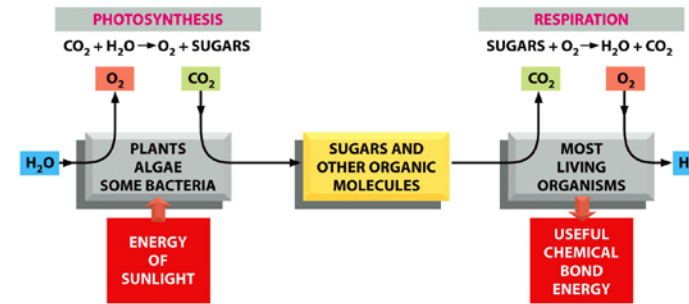


Figure 2-41 Molecular Biology of the Cell 5/e (© Garland Science 2008)

autotrophism =

heterotrophism =

ATP

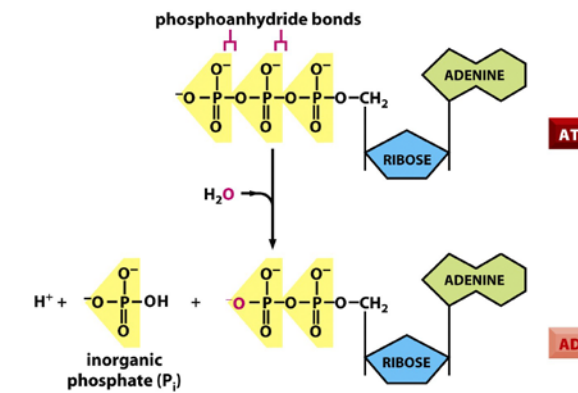


Figure 2-57 Molecular Biology of the Cell 5/e (© Garland Science 2008)

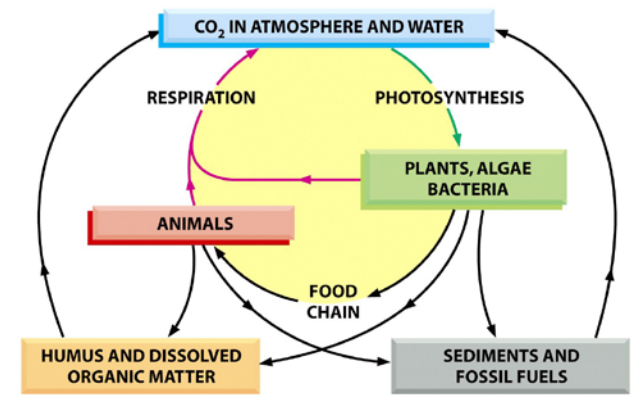


Figure 2-42 Molecular Biology of the Cell 5/e (© Garland Science 2008)