Enzymes (3.6)

Define the following terms (3.6.1 / 3.6.4)

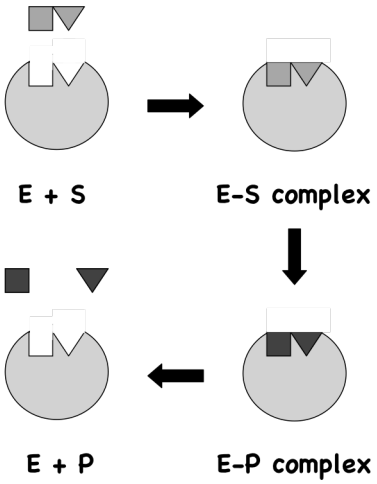
Enzyme: A biological catalyst which speeds up the rate of a chemical reaction by lowering the activation energy

Active Site: The region on an enzyme's surface to which the substrate binds

Denaturation: A structural change in a protein that results in a loss of biological properties

Explain enzyme-substrate specificity (3.6.2)

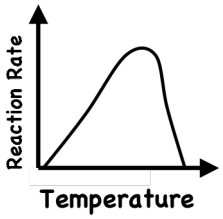
- Enzymes and substrates share specificity in that an enzyme will only react with a specific substrate
- This is because the active site is complementary in both shape and charge to a given substrate
- The model by which this is known is 'lock and key' as the substrate is a precise structural fit for the enzyme, much like a lock and key
- When the enzyme and substrate bind, they form an enzyme-substrate complex, before the substrate is catalytically converted into a product



Explain the effect of certain factors on enzyme activity (3.6.3)

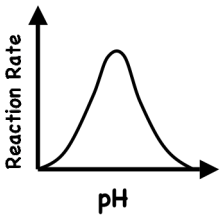
Temperature:

- Increasing temperature increases the kinetic energy of enzyme and substrate, leading to more frequent collisions and a higher rate of activity
- At a certain temperature an optimum rate of reaction is achieved
- Above this temperature the enzyme starts to denature and the rate of activity decreases



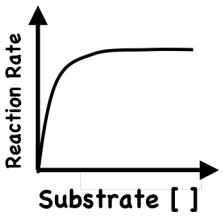
pH:

- Enzymes have an optimal pH for activity
- At a higher or lower pH enzyme activity will decrease
- This is because changing pH can alter the charge, shape and solubility of the protein molecule, abrogating its function



Substrate Concentration:

- Increasing substrate concentration increases the frequency of enzyme-substrate collisions, resulting in a higher rate of enzyme activity
- When all enzymes in solution are reacting (i.e. substrate saturation), increasing substrate concentration will have no further effect and rate of reaction will plateau



Explain the use of lactase in the production of lactose-free milk (3.6.5)

- Lactase converts lactose into glucose and galactose
- Lactose-free milk can be made by pumping milk through immobilised lactase (in beads) or via transgenics
- Lactose-free products are useful for lactose-intolerant individuals and limit the need for artificial sweeteners
- Lactose-free milk also prevents crystallisation of ice-cream