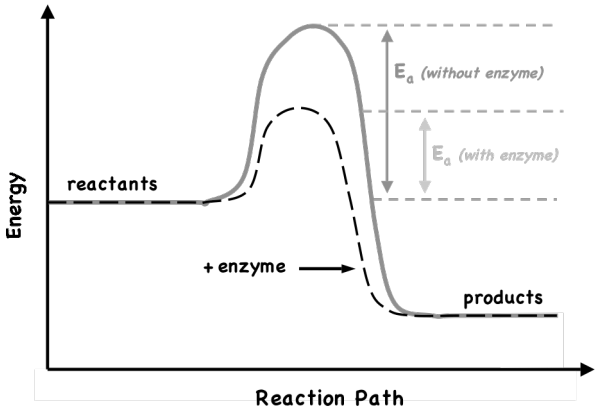
Enzymes (7.6)

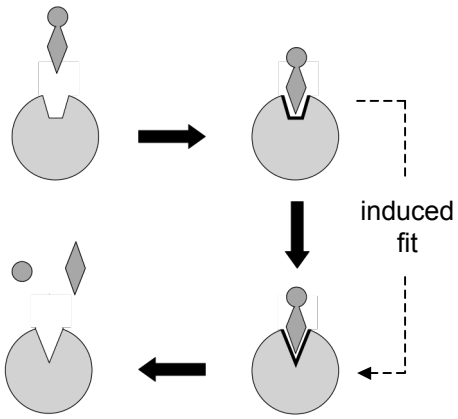
How enzymes work (7.6.3)

- All reactions need a certain amount of energy to proceed (activation energy = E_a)
- Enzymes speed up a chemical reaction by lowering this energy threshold
- Enzymes form a complex with the substrate, weakening the bonds and rearranging atoms in the substrate so products can be formed
- Enzymes are not consumed in the reactions



The induced fit model (7.6.2)

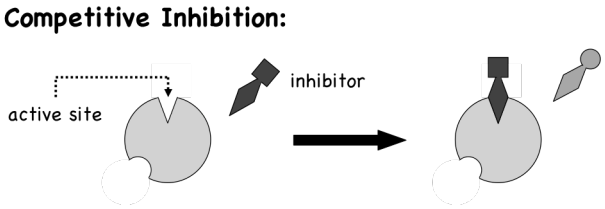
- The enzyme active site is not rigid
- The substrate can induce slight changes in the shape of the active site
- This explains how some enzymes can exhibit broad specificity (e.g. lipase may work on a variety of lipids)
- The conformational change of the active site may be responsible for weakening bonds and rearranging atoms in the substrate



Types of inhibition (7.6.4)

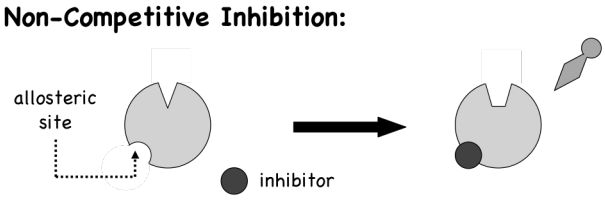
Competitive Inhibition:

- Inhibitor structurally similar to substrate
- Binds to active site and blocks it off
- Increasing substrate concentration helps
- E.g. Relenza *(neuraminidase + haemagglutinin)*



Non-competitive Inhibition:

- Inhibitor binds to an allosteric site
- Conformationally changes active site
- Substrate can no longer bind
- E.g. Cyanide *(cytochrome c oxidase → ETC)*



End-product inhibition (7.6.1 / 7.6.5)

- Metabolic pathways consist of chains and cycles of enzyme-catalysed reactions
- To control the rate of reaction, the product of a series of reactions may inhibit an enzyme from an earlier step, thus preventing the formation of product when in excess
- The product does this by binding to an allosteric site and causing a conformational change to the enzyme's active site (non-competitive inhibition)
- As the product is determining rate, it is called end-product (or feedback) inhibition