ENZYME AND SUBSTRATE INTERACTION

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ACTIVE SITE OF THE ENZYME

- The region of the enzyme surface which combines with the substrate to form the enzyme-substrate complex and at which the transformtation of the substrate to products occurs is called the active site of the enzyme.
- The exact chemical nature of the active site is not known.
- It has been proposed that the active site is formed by the tertiary folding of the amino acid chains of the enzyme protein and possesses active groups capable of interacting with the specific groups of the substrate.

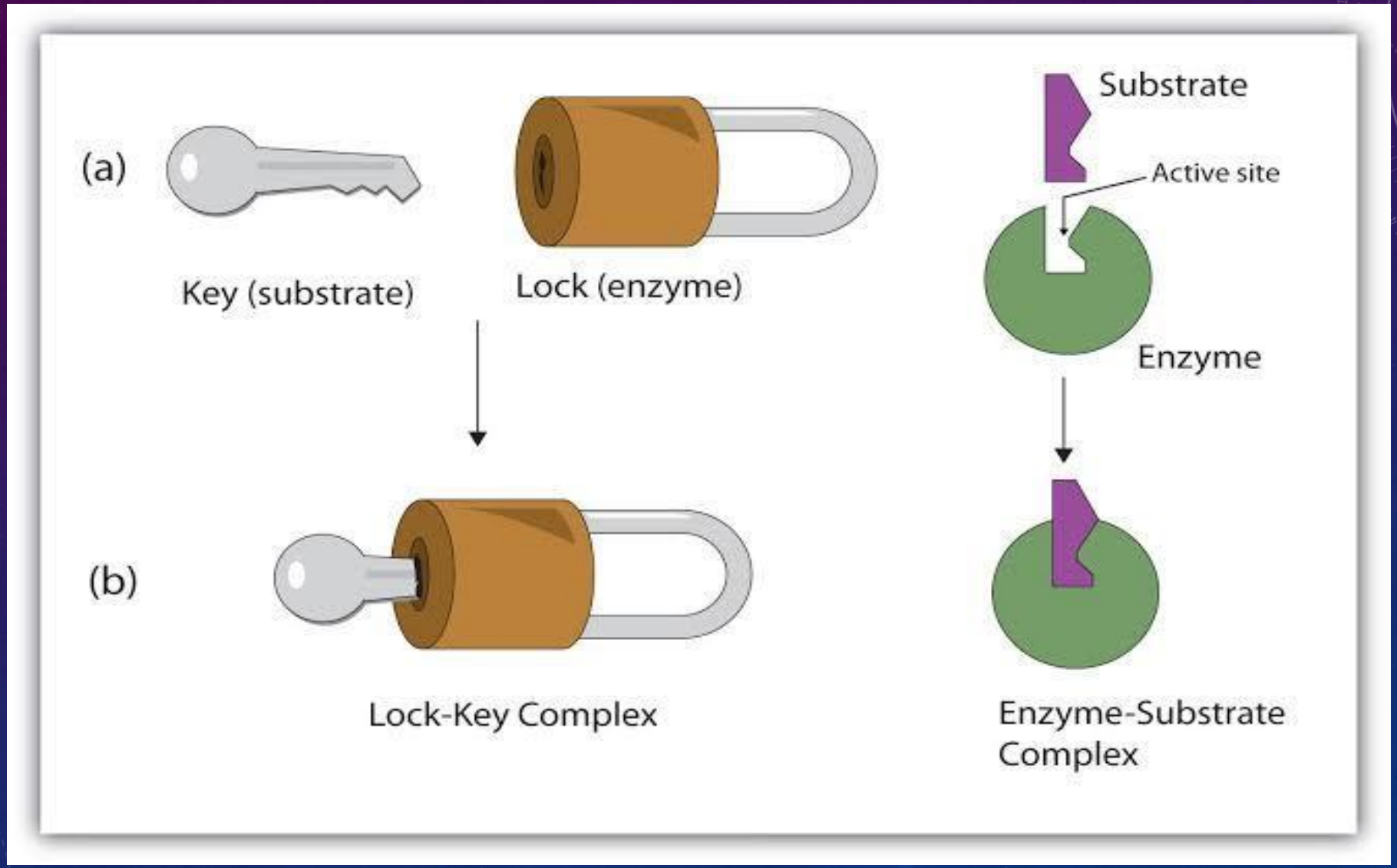
ENZYME-SUBSTRATE INTERACTION IN ENZYME CATALYSIS

- Two hypotheses have been proposed to explain the nature of enzyme-substrate interaction and the role of active site in :
    - **Fischer's lock and key hypothesis**
    - **Koshland's induced fit hypothesis**

FISCHER'S LOCK AND KEY HYPOTHESIS

- According to the lock and key hypothesis, a substrate can fit into the active site of an enzyme only if the site has a conformation complementary to its own, just as a lock can be compatible only with its own key having a complementary groove cutting.
- It is obvious then that enzymes cannot act on all kinds of substrates, but only on those which are compatible with their own active sites,ie, enzyme action is possible only if the substrate has an exactly matching structure which would enable it to fit perfectly into the active site of the the enzyme.

FISCHER'S LOCK AND KEY HYPOTHESIS …….



- It can explain cases of absolute substrate specificity in which an enzyme acts on a specific substrate only.

It cannot explain:

- i) **the cases of relative substrate specificity** in which the same enzyme catalyses different reactions of a related group of substrates. Or
- ii) **the cases of reaction specificity** in which the same enzyme catalyses a specific type of reaction of different substrates.

KOSHLAND'S INDUCED FIT HYPOTHESIS

- According to the induced fit hypothesis,the active site of an enzyme is not rigid and pre-shaped; instead, it is flexible and elastic so that it can be changed or modified suitably if need arises.
- It follows therefore that the active site need not have a configuration exactly complementary to that of the substrate.
- According to the model,the contact with the substrate induces some configurational changes in the active site of the enzyme so that its new configuration is perfectly matching with that of the substrate.

KOSHLAND'S INDUCED FIT HYPOTHESIS.....

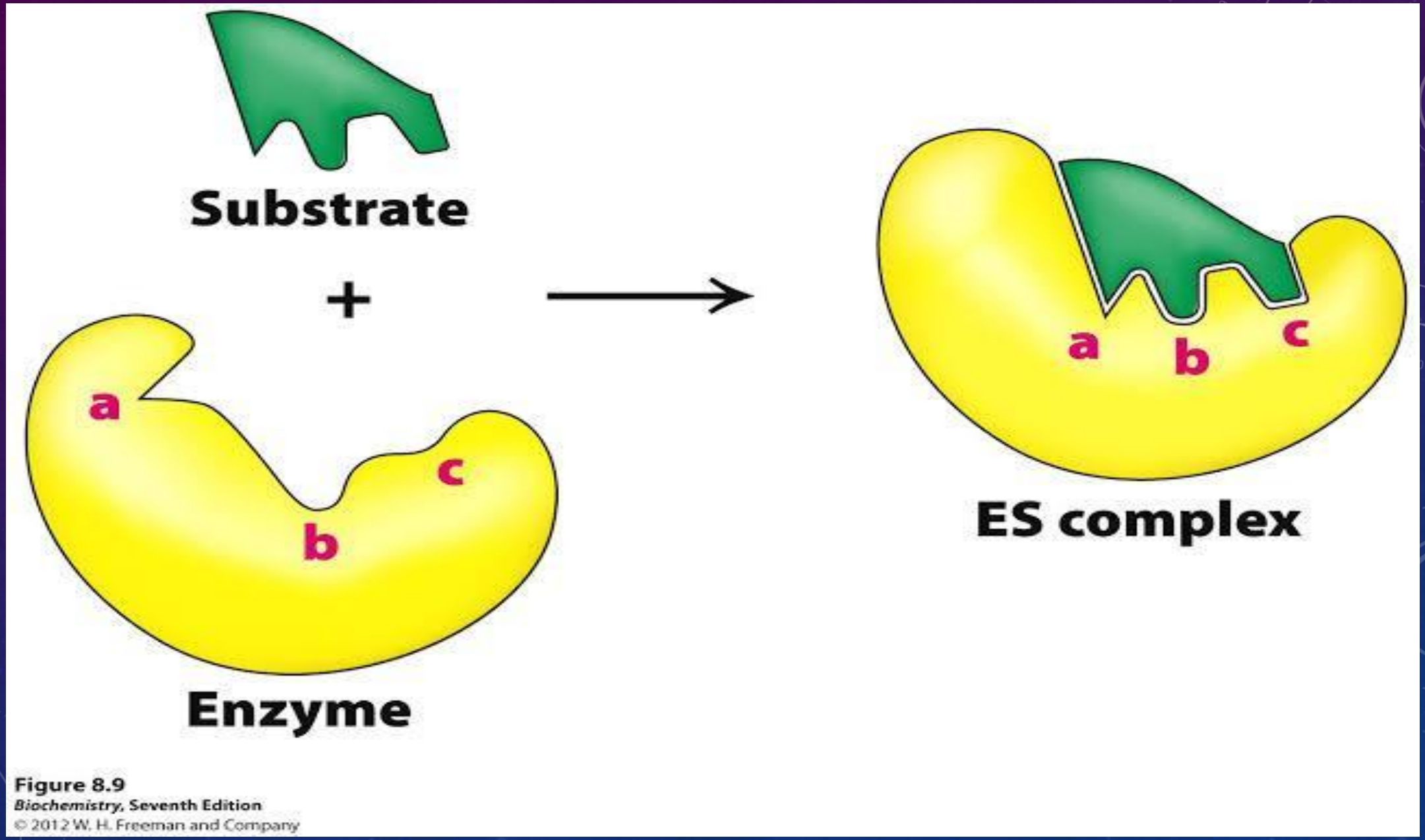


Figure 8.9
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- The substrate can thus fit into the active site perfectly to form the enzyme-substrate complex. Once the products are derived from it, the active site of the enzyme reverts to its original configuration.
- The induced fit model can explain the enzyme specificity better than the lock and key hypothesis.

THANK YOU