THEORIES OF MODE OF ACTION

There are two view points by which enzymes are supposed to bring about chemical reaction.

1. **Lock and key theory or Fischer's template theory**
This theory was forwarded by **Emil Fischer** in 1894. According to this hypothesis both enzymes and substrate molecules have specific geometrical shapes. According to this model, the structure or conformation of the enzyme is rigid. The substrate fits to the binding site (now active site) just as a key fits into the proper lock or a hand into the proper glove (Fig. 5.3). Thus the active site of an enzyme is a rigid and pre-shaped template where only a specific substrate can bind. This model does not give any scope for the flexible nature of enzymes, hence the model totally fails to explain many facts of enzymatic reactions.

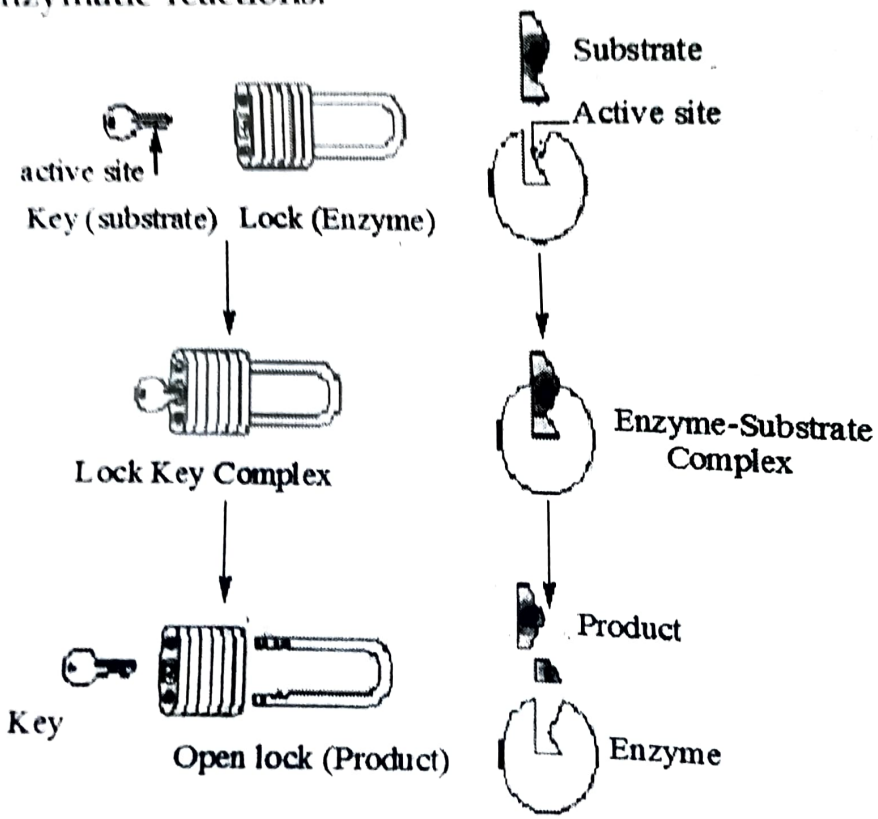

Fig. 5.3: Lock and key theory of Emil Fischer

Induced-Fit theory or Koshland's model

This model of enzyme action was proposed by **Daniel Koshland** in 1959. According to this model the active site is not rigid and pre-shaped. This model indicates that the enzyme is not rigid rather it is flexible. Here the active site of the enzyme molecules changes according to the shape of the substrate molecules (Fig. 5.4). Such a change in the enzyme molecules according to the size of substrate molecule is known as **conformational change**. It can be compared to a **hand-in-glove**, where it may be difficult to insert the first finger into the proper place, but once done, the other fingers go in easily because the glove is now properly aligned. In this case hand is the substrate that inducing a change in the shape of the glove (enzyme).

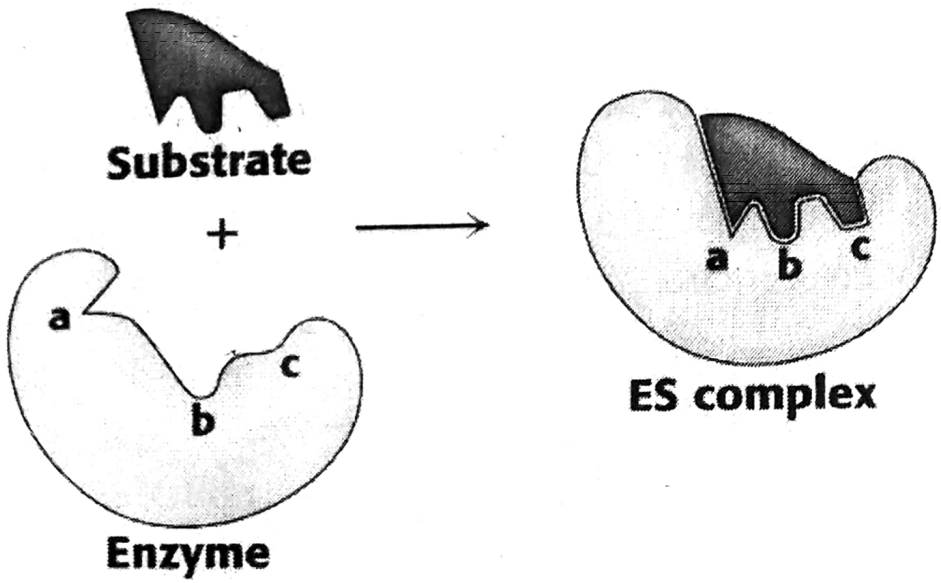

Fig. 5.4: Induced-Fit theory of Daniel Koshland

Substrate strain theory

In this model, the substrate is strained due to the induced conformation change in the enzyme. It is also possible that when a substrate binds to the preformed active site, the enzyme induces a strain to the substrate. The strained substrate leads to the formation of product (Fig. 5.5).

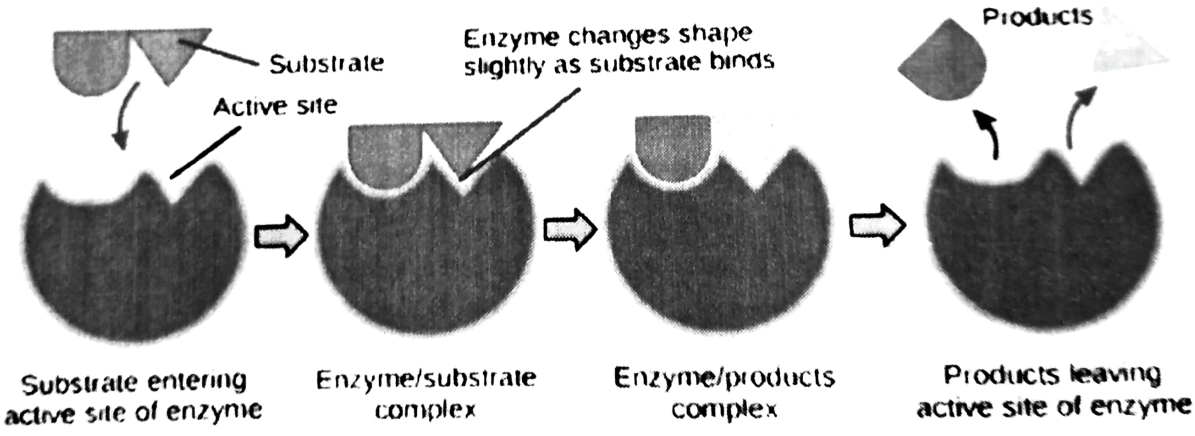

Fig. 5.5: Substrate strain theory