**Topic 5. Enzymes**

**Define the term *catalyst***

A catalyst is a substance that increases the rate of a chemical reaction and is not changed by the reaction

**Define *enzymes***

Enzymes are proteins that function as biological catalysts

**Describe why enzymes are important in all living organisms in terms of reaction speed necessary to sustain life**

**Describe enzyme action with reference to the complementary shape of an enzyme and its substrate and the formation of a product**

**Explain enzyme action with reference to the active site, enzyme-substrate complex, substrate and product**

**Explain the specificity of enzymes in terms of the complementary shape and fit of the active site with the substrate**

Their action relies on their shape, as their substrate molecule (s) fit into their active site as in the lock & key hypothesis:



**Investigate and describe the effect of changes in temperature and pH on enzyme activity**

**Explain the effect of changes in temperature on enzyme activity in terms of kinetic energy, shape and fit, frequency of effective collisions and denaturation**

***Effect of temperature on enzymes***



* As temperature increases, the chance of chance of substrate molecules and enzymes colliding also increases, so the rate of reaction goes up.
* This continues to an optimum (best) temperature for an enzyme. For most human enzymes the optimum temperature is 37oC (body temperature).
* Above this temperature, the bonds holding the enzyme together start to break so it changes shape
* This deforms the active site, so enzyme and substrate cannot fit together – the enzyme has been denatured. Most enzymes **denature** above 50oC.

**Explain the effect of changes in pH on enzyme activity in terms of shape and fit and denaturation**

***Effect of pH on enzymes***



* The pH of a solution is how acidic or alkaline it is.
* Most human enzymes have an optimum pH of 7 (neutral). Some exceptions:

Pepsin, a protease in the stomach has an acidic optimum (pH2);

Lipase in the duodenum has an alkaline optimum (pH 9)

Salivary amylase in the mouth prefers a slightly-acidic pH of 6.8.

* Extreme of pH affect the shape of enzymes, denaturing them.