Enzymes & Cell Metabolism | Topic Notes

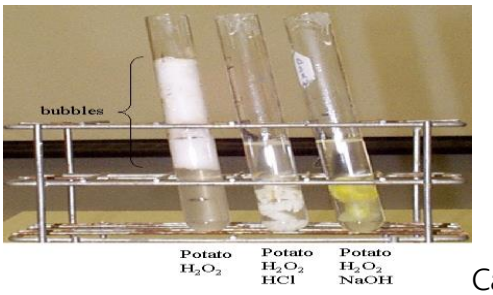
Metabolism is the sum of all the chemical reactions occurring in an organism. It can be:

1. **Anabolic-**forms things (e.g. photosynthesis)
2. **Catabolic-**breaks down things (e.g. digestion)

- **Enzymes** are folded, globular-shaped protein catalysts that speed up reactions without being used up. Examples:
    1. **Amylase**-present in saliva and pancreatic juice, catabolism of starch (polysaccharide) into maltose.
    2. **Pepsin**-present in gastric juice, catabolism of proteins into peptides.
    3. **Catalase**-present in every living cell, catabolism of h2o2 into h2o +o2.
- The **active site** of an enzyme is the area where the substrate enters and is changed into product(s).
- **Specificity** refers to an enzymes ability to react with only one substrate.
- The active site theory of enzyme action involves 2 models:
    1. **The lock and key model** states both **substrate** (what the enzyme acts on) and enzyme have complementary shapes.
    2. **The induced fit model** states that the enzymes active site is flexible and induces to change to the correct shape of the substrate.
- The **optimum** activity of an enzyme is the conditions under which it works best.
- A **denatured enzyme** is an enzyme that has lost its function due to a change in its shape. (enzymes may be denatured by incorrect temperature or PH)
- **Hydrogen peroxide → water +oxygen**

  $2H_2O_2$ (CATALASE) $2H_2O + O_2$
- **Bioprocessing** is the use of biological enzymes in a controlled reaction to make a product. (e.g. antibiotics, alcohol, cheese and sugar)
- **Immobilised enzymes** are enzymes that are trapped in an inert insoluble material.
- **Uses of immobilised enzymes:**
    1. Lactase to produce lactose-free milk or tablets, for people with lactose intolerance.
    2. Rennin to coagulate proteins in milk for the production of cheese.
    3. Making glucose testing strips for diabetics.

- **Advantages of immobilised enzymes:**
    1. Enzymes can be used over and over again.
    2. The enzyme doesn't contaminate the product.
    3. More stable (so less required)
- **A bioreactor** is a vessel in which a product is formed by a cell or cell component, such as an enzyme.

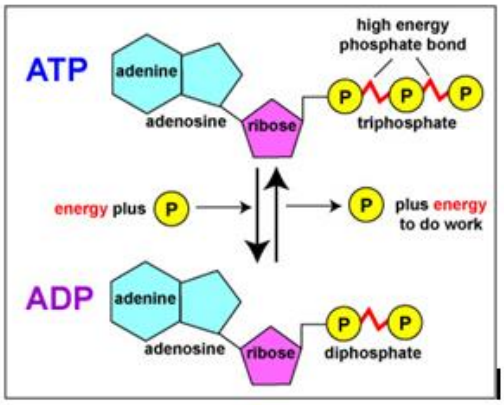


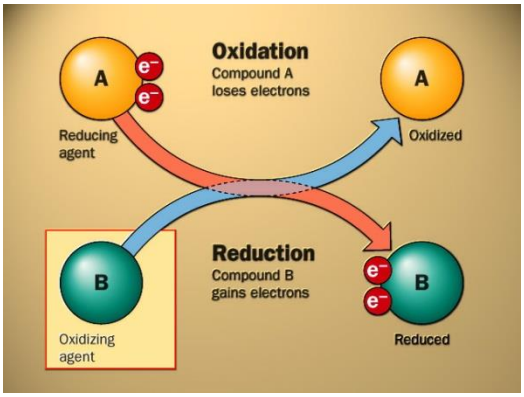
Catalase's optimum conditions are ph. 7 & 37°C in humans.

Cell Metabolism

ATP: Adenosine Tri Phosphate

- **NAD:** Nicotinamide Adenine Dinucleotide
- **NADP:** Nicotinamide Adenine Dinucleotide Phosphate





- ***Reduction of NAD^+ in RESPIRATION:***

$$NAD^+ + 2e^- + H^+ \rightarrow NADH$$

- ***Reduction of $NADP^+$ in PHOTOSYNTHESIS:***

$$NADP^+ + 2E^- + H^+ \rightarrow NADPH$$