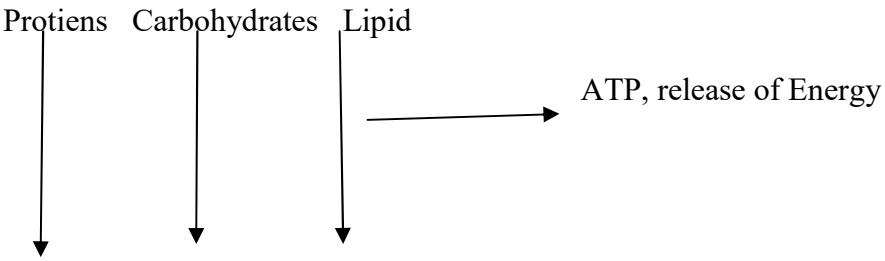
Paper- 4034 - Overview of Metabolism



1. Catabolism or Catabolic reactions:
   Large complex ⟶ Small /Simple complex (Release Energy)
2. Anabolism or Anabolic reactions

   Small simple ⟶ Large Complex (Requires energy)
   Amino acids ⟶ Keratin
   Glycogen or starch ⟶ Glucose

Metabolism (derived from Greek: *metabolē*, "change") is the set of life-sustaining chemical reactions in organisms. The three main purposes of metabolism are: the conversion of food to energy to run cellular processes; the conversion of food/fuel to building blocks for proteins, lipids, nucleic acids, and some carbohydrates; and the elimination of metabolic wastes. These enzyme-catalyzed reactions allow organisms to grow and reproduce, maintain their structures, and respond to their environments. The word metabolism can also refer to the sum of all chemical reactions that occur in living organisms, including digestion and the transport of substances into and between different cells.

Metabolic reactions may be categorized as *catabolic* – the *breaking down* of compounds (for example, the breaking down of glucose to pyruvate by cellular respiration); or *anabolic* – the *building up* (synthesis) of compounds (such as proteins, carbohydrates, lipids, and nucleic acids). Usually, catabolism releases energy, and anabolism consumes energy.

The chemical reactions of metabolism are organized into metabolic pathways, in which one chemical is transformed through a series of steps into another chemical, each step being facilitated by a specific enzyme. Enzymes are crucial to metabolism because they allow organisms to drive desirable reactions that require energy that will not occur by them, by coupling them to spontaneous reactions that release energy. Enzymes act as catalysts – they allow a reaction to proceed more rapidly – and they also allow the regulation of the rate of a metabolic reaction, for example in response to changes in the cell's environment or to signals from other cells.

Catabolism is referred to as a series of metabolic pathways that are involved in the conversion of macromolecules into simpler molecules or monomers. Complex molecules are disintegrated

into simpler molecules that can be utilized as building blocks for other molecules that are required by cells to function such as glycogen, proteins, and triglycerides. Few of these molecules are simply broken down into waste products which are an alternate way to obtain usable energy. Some of the catabolic processes are:

- Citric acid cycle
- Glycolysis
- Lipolysis
- Oxidative deamination
- Muscle tissue breakdown

Anabolism is the sequence of enzyme-catalyzed reactions in which nutrients are used to form comparatively complex molecules in the living cells with moderately simpler structures. The process of anabolism is also referred to as biosynthesis. The process includes the production of components of cells such as proteins, carbohydrates, lipids, which require energy in the form of ATP (adenosine triphosphate) which is energy-rich compounds. These compounds are synthesized during the breakdown processes such as catabolism. Anabolic processes in growing cells control catabolic processes. The balance exists between both in non-growing cells.

Catabolic and Anabolic processes are required for the proper functioning of the body. Catabolism, at its core, involves breaking down of complex molecules and releasing energy for the body to use. The anabolic process is the complete opposite of catabolism as it involves creating bigger, complex molecules from smaller, simpler molecules. These are usually stored by the body for future use.

Difference between Catabolism and Anabolism

1. Catabolism breaks down big complex molecules into smaller, easier to absorb molecules	1. Anabolism builds molecules required for the body's functionality.
2. The process of catabolism releases energy.	2. Anabolic processes require energy
3. Hormones involved in the processes are adrenaline, cytokine, glucagon, and cortisol	3. Hormones involved in the process are estrogen, testosterone, growth hormones and insulin
4. Examples of catabolic processes are proteins becoming amino acids, glycogen breaking down into glucose and triglycerides breaking up into fatty acids.	4. Examples include the formation of polypeptides from amino acids, glucose forming glycogen and fatty acids forming triglycerides
5. In catabolism, potential energy is changed into kinetic energy.	5. In anabolism, kinetic energy is converted into potential energy.
6. It is required to perform different activities in living entities.	6. It is required for maintenance, growth, and storage.