Metabolism

by Sophia

WHAT'S COVERED

In this lesson, you will learn how to determine different types of metabolism and the roles they play. Specifically, this lesson will cover:

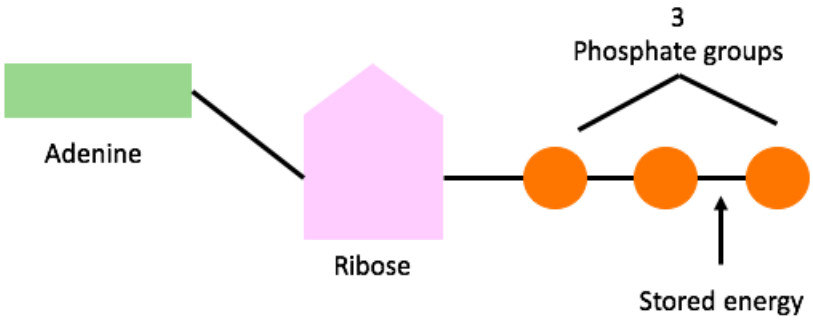
1. The Role of Metabolism

Metabolism describes the chemical reactions that occur in cells.

There are various types of chemical reactions that occur in cells all of the time. These chemical reactions are necessary for cells to function properly and allow us to survive. Some of these reactions use ATP, while some produce ATP.

ATP is an energy storage molecule that stands for adenosine triphosphate. ATP is either produced or used by these reactions. Additionally, ATP is a nucleotide and is made up of a ribose sugar, an adenine (remember, that's one of our nitrogenous bases), and three phosphate groups.

If you think back to previous lessons we had on nucleotides, you'll remember most nucleotides only have one phosphate group. But ATP is different because it has a total of three phosphate groups. ATP is an energy storage molecule; energy is stored in the bond between the phosphate groups.

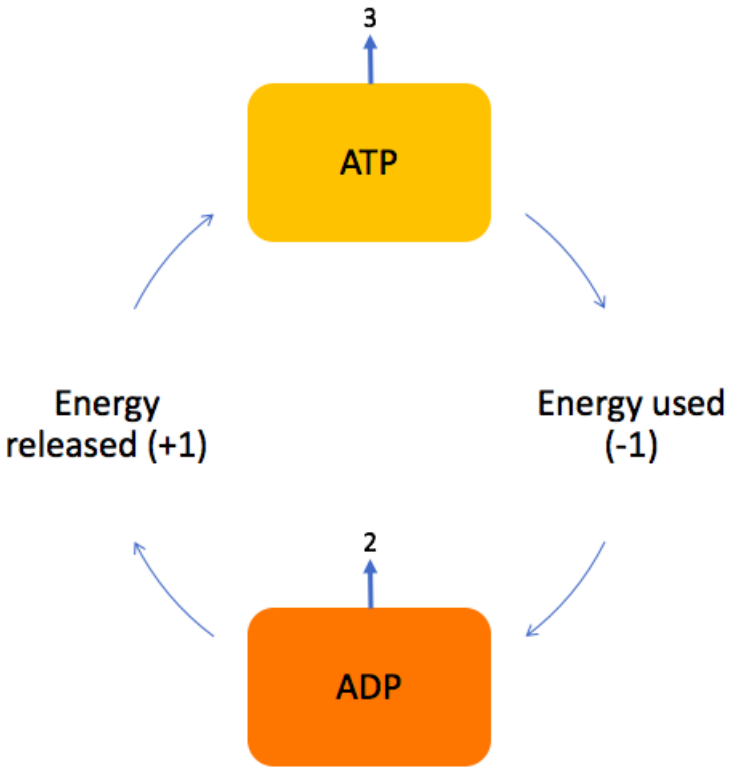


In a reaction, enzymes will be able to break that bond. The third phosphate will be transferred to another molecule, therefore providing stored energy. This is how ATP is different from other nucleotides that you've looked at; it has energy stored in this extra phosphate.

When that bond is broken, energy can be released. Enzymes, which are usually proteins, will take part in

speeding up metabolic reactions in cells. Enzymes can make these reactions happen millions of times faster than they would otherwise. Enzymes are also responsible for helping to break that bond between the second and third phosphate in ATP.

Take a look at the diagram below. This is the kind of cycle that ATP will go through when it's used or produced in chemical reactions.



As mentioned previously, ATP stands for adenosine triphosphate. The prefix *tri* means three, for the three phosphate groups. When ATP takes part in a reaction and energy is used, one of those phosphates is removed and added on to another molecule.

What you end up with then is something called ADP; the D stands for "Di," so it is now called adenine diphosphate. This tells you that it now only has two phosphate groups. One of the three phosphates has been eliminated, then added to another molecule as energy storage. Now our ATP is changed into ADP with only two phosphate groups.

The ADP may then take part in a reaction where energy is released. If energy is released, the ADP can pick up another phosphate to become ATP again. It can go through this cycle of gaining or losing phosphates, becoming an ATP if it has three phosphates or an ADP if it has two.

TERM TO KNOW

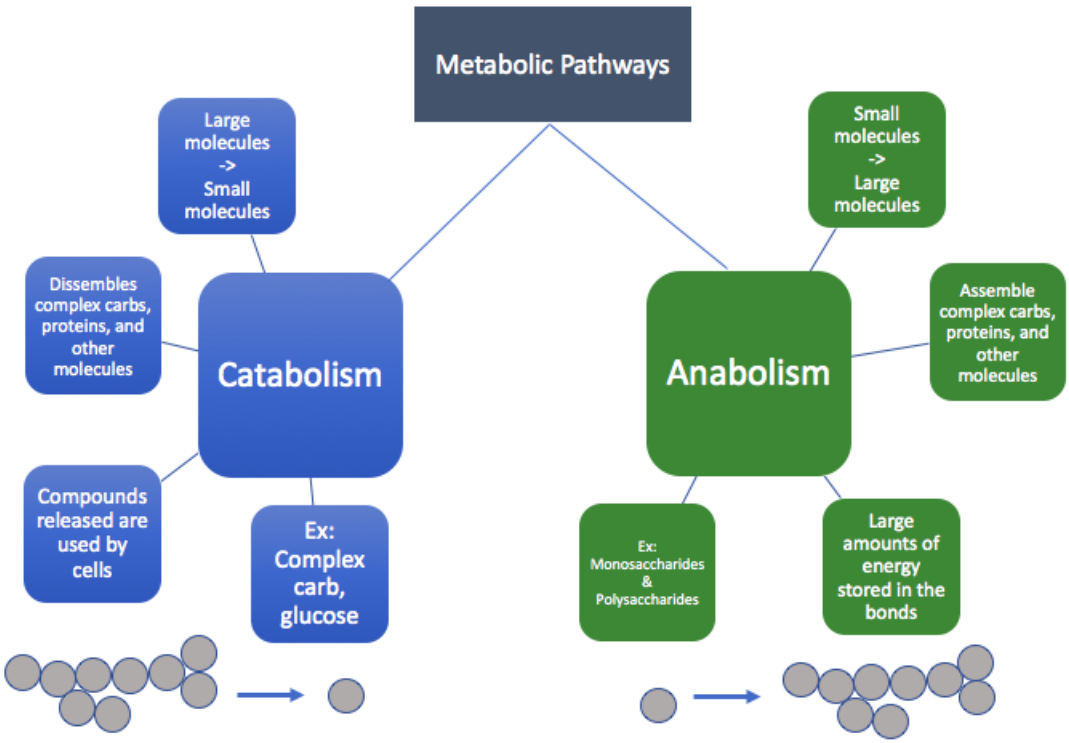
Metabolism

Describes the various chemical reactions that are occurring in cells.

2. Metabolism Pathways

There are two types of metabolic pathways, depending on what is happening with the molecules. As you go

through these two pathways, please refer to the image below.



2a. Anabolism

In one type of metabolic pathway, small molecules are actually combined and turned into larger molecules. This process is called **anabolism**.

This type of metabolic pathway assembles complex carbohydrates, proteins, and other molecules. Smaller molecules are being combined to build a larger molecule.

There are several bonds between all of the smaller molecules that hold them together to form the larger molecule, and these bonds store a lot of energy.

> ↱ EXAMPLE When monosaccharides are built into polysaccharides, you're starting with the building blocks of simple sugars (monosaccharides), and you're putting a whole bunch of them together, held by bonds, and turning them into something called a polysaccharide.

TERM TO KNOW

Anabolism

A type of reaction in cells where small molecules combine to form larger molecules.

2b. Catabolism

The other type of metabolic pathway is **catabolism**.

This is basically just the opposite—large molecules are being broken down into smaller molecules. Rather than assembling, this pathway is disassembling complex carbs, proteins, and other molecules, breaking them down into smaller molecules.

In this case, the cells use the compounds released; these cells are taking the large molecules and breaking them down into something smaller. Then the cells are able to use those smaller molecules for whatever

purpose they need.

↱ EXAMPLE Sometimes you eat complex carbohydrates, and those are broken down into glucose, which your cells can then use for cellular respiration to make ATP. You're starting with a large molecule and then breaking it down into a smaller molecule that cells can use.

TERM TO KNOW

Catabolism

A type of reaction in cells where large molecules are broken down into smaller molecules.

SUMMARY

Today you learned about the **role of metabolism**, as well as the **two metabolic pathways** and the purpose that they have in your body.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND

TERMS TO KNOW

Anabolism

A type of reaction in cells where small molecules combine to form larger molecules.

Catabolism

A type of reaction in cells where large molecules are broken down into smaller molecules.

Metabolism

Describes the various chemical reactions that are occurring in cells.