

## Section 9.1

# The Need for Energy

**North Carolina Objectives** Objective 2.03 Investigate the cell as a living system including: Energy use and release in biochemical reactions

## ► Before You Read

This section tells about the need our bodies have for energy. Think about the many ways your body uses energy. When do you need energy? Write a list of these times. After you read this section, add any other times that you learned about.

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## ► Read to Learn

### Cell Energy

We need energy to live. In fact, all living organisms need energy to live. Plants and other green organisms are able to make energy from sunlight and store it to use later. Some organisms, like animals, cannot make their own energy. They must eat other organisms to get the energy they need.

Many of the things our bodies do, called cell processes, need energy. Some cell processes are muscles contracting during exercise, your heart pumping, and cell division. Your brain also needs energy to do its work.

### How do our cells get energy?

After exercising, your body needs a quick source of energy. Perhaps you eat a granola bar to satisfy the need. The cells in our bodies often need a quick source of energy. There is a molecule in your cells called **adenosine triphosphate** (uh DEH nuh seen • tri FAHS fayt), or **ATP** for short which provides quick energy for cells when they need it. ☞

### Forming and Breaking Down ATP

ATP has an adenosine molecule, a ribose sugar, and three phosphate groups held together by chemical bonds. When one of the chemical bonds is broken, one of the phosphate groups is released. Energy is also released. This quick release of energy is then available for a cell to use.

### STUDY COACH

**Create a Quiz** After you have read this section, create a five-question quiz based on what you have learned. After you have written the questions, be sure to answer them.

### ✓ Reading Check

1. What does ATP do?

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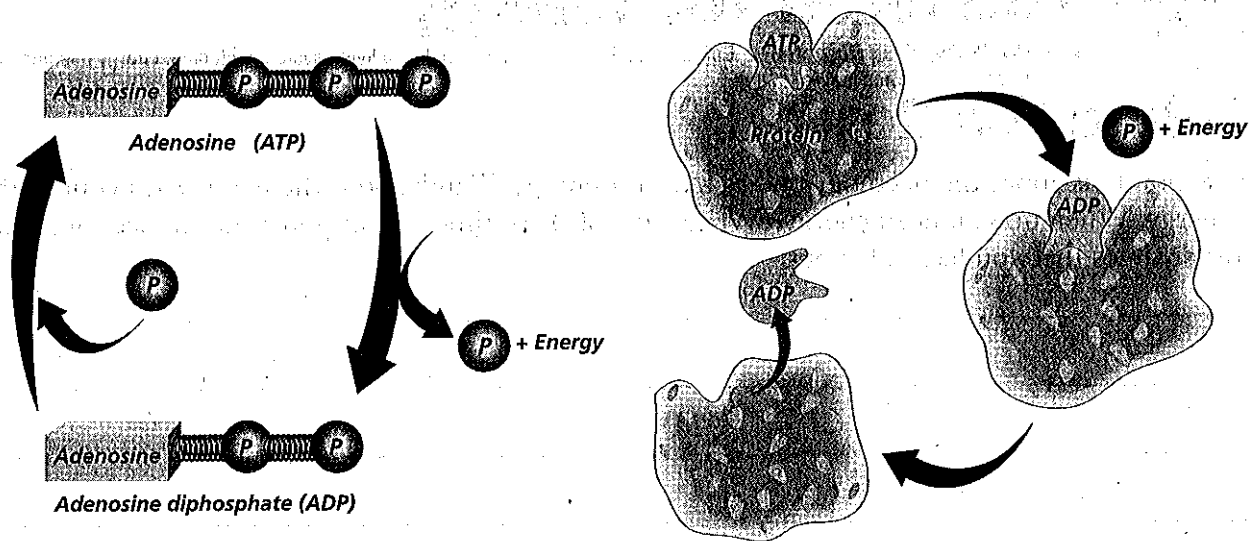
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**A** When ATP releases a phosphate group and energy it becomes ADP. ADP can then add another phosphate group and become ATP. This cycle is repeated.

**B** A protein binds to ATP and breaks the chemical bond, releasing energy and a phosphate group. ATP becomes ADP and is released from the protein. The energy is used by the cell. This cycle is repeated.

When one of the phosphate groups is released, ATP becomes **adenosine diphosphate**, or **ADP**. ADP has only two phosphate groups. ADP can add another phosphate group and become ATP again. The cycle of the formation and breakdown of ATP creates a source of energy. The figure above shows the cycle of ATP.

### How do cells get the energy they need from ATP?

Many proteins have a special place where ATP can bind itself. When ATP releases its energy by breaking the phosphate bond, the cell uses the energy. After releasing the energy, ATP becomes ADP and is released from the protein. As you have learned, at this point ADP can bind with another phosphate group and form ATP again. This cycle is repeated, providing a renewable source of energy for the cell.

### Uses of Cell Energy

Cells use the energy they receive from ATP in many ways. Some cells make new molecules with the energy. Other cells use the energy to build membranes and cell organelles. Some cells use energy to maintain homeostasis, which is the regulation of their internal environment. Kidneys use energy to eliminate wastes from the bloodstream. At the same time the kidneys are eliminating wastes, they are using energy to keep needed substances in the bloodstream.



### Think it Over

**2. Analyze** A cell's internal environment is kept stable through (Circle your choice.)

- ATP.
- homeostasis.
- ADP.

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**The Need for Energy, *continued***

**After You Read**

**Mini Glossary**

**ADP (adenosine diphosphate):** molecule formed from the releasing of a phosphate group from ATP; results in a release of energy that is used for biological reactions

**ATP (adenosine triphosphate):** energy-storing molecule in cells composed of an adenosine molecule, a ribose sugar, and three phosphate groups; energy is stored in the molecule's chemical bonds and can be used quickly and easily by cells

1. On the lines below, tell how the two terms in the Mini Glossary above are related.

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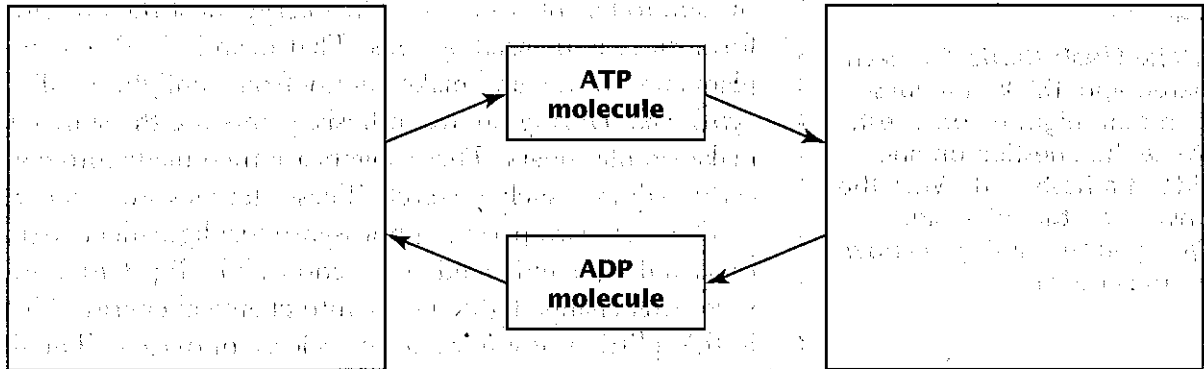


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2. Use the diagram to help you review what you have read. Fill in the boxes to show the complete formation and breakdown cycle of ATP.



3. Fill in the missing number in the statements that describe the formation and breakdown of ATP.

**ATP contains**  
\_\_\_\_\_ **phosphate group(s).**

\_\_\_\_\_ **phosphate group(s) is released.**

**ADP contains**  
\_\_\_\_\_ **phosphate group(s).**

**ADP adds**  
\_\_\_\_\_ **phosphate group(s) to become ATP.**



Visit the Glencoe Science Web site at [science.glencoe.com](http://science.glencoe.com) to find your biology book and learn more about the need for energy.