Name Period Date

SECTION 4.1

CHEMICAL ENERGY AND ATP

Reinforcement

KEY CONCEPT All cells need chemical energy.

All cells need chemical energy for their functions. The energy that your cells need comes indirectly from the food you eat. The chemical energy used by all cells is carried by a molecule called adenosine triphosphate, or ATP. **ATP** is a molecule that transfers energy from the breakdown of molecules in food to cell processes.

A molecule of ATP has three phosphate groups. The energy carried by ATP is released when the third phosphate group is removed from the molecule by a chemical reaction. When the phosphate group is removed and energy is released, ATP is converted into a molecule called adenosine diphosphate, or ADP. **ADP** is a lower-energy molecule that can be changed back into ATP by the addition of another phosphate group.

Different types of carbon-based molecules (carbohydrates, lipids, and proteins) can be broken down to produce ATP. The breakdown of the different molecules produces different amounts of ATP. Carbohydrates, especially the simple sugar glucose, are most commonly broken down to make ATP. The breakdown of a lipid produces many more ATP molecules than does the breakdown of a sugar. Proteins are the molecules least likely to be broken down, but they store about the same amount of energy as carbohydrates.

Many organisms must eat other organisms to get the carbon-based molecules they need to make ATP. Some organisms, such as plants, use a process called photosynthesis to make their own food molecules. Other organisms that survive without light can make their own food molecules through a process called **chemosynthesis.**

1. What is the function of ATP?

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2. What is ADP?

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3. Which types of carbon-based molecules can be broken down to make ATP?

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