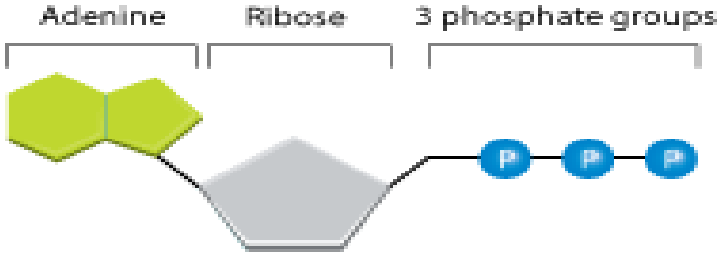
PHOTOSYNTHESIS

Chapter 8.1: Energy & Life

Chemical Energy and ATP

Short for "***adenosine triphosphate***". Considered the most important energy related compound for living organisms.

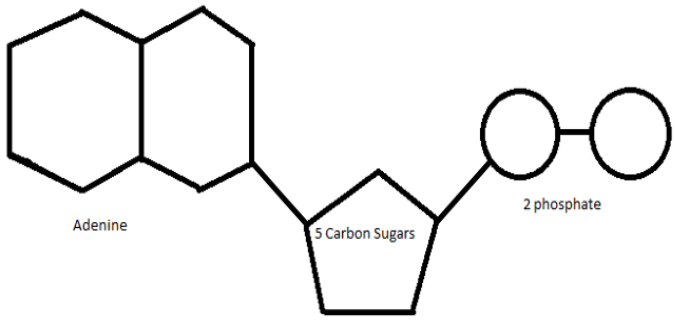
Consists of:



Storing Energy:

ATP is the "stored" energy form, which can release energy by breaking a chemical bond between the last two (2) phosphate groups, thus becoming ADP. Cells can store only **small** amounts of ATP at any time.

ADP the "rechargeable" energy form can be restored to ATP by adding one (1) more phosphate group to the 2 existing phosphates. This adds "extra" energy in the chemical bond, which holds the second and third phosphates together.

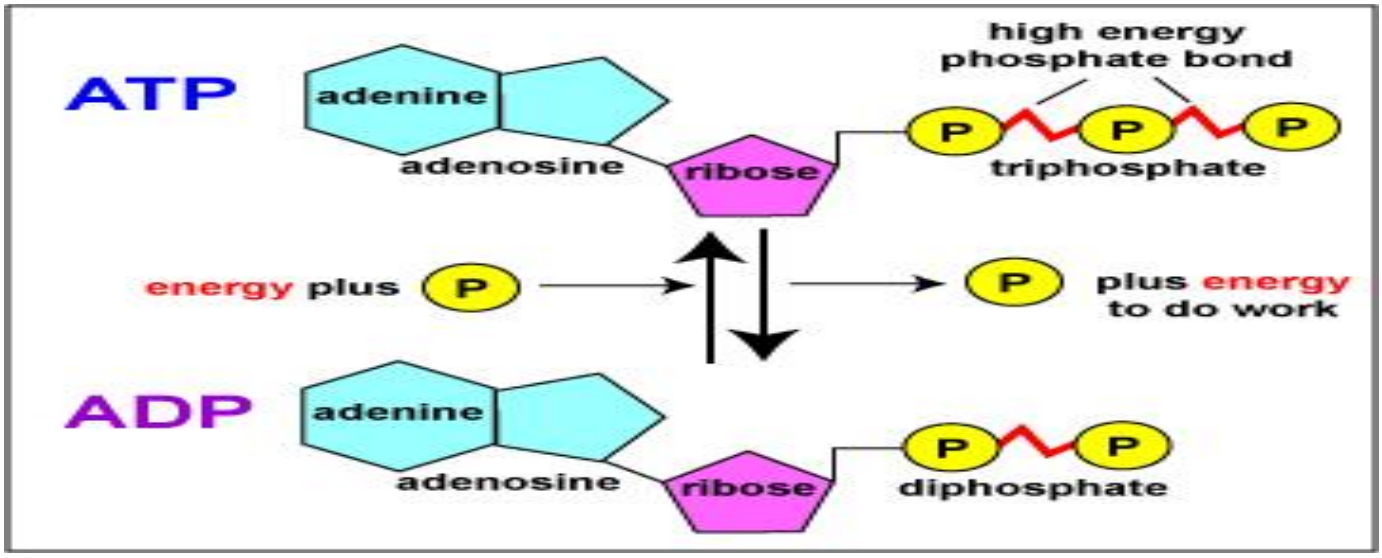


Releasing Energy:

Cells can release energy in a set of controlled reactions, making the release very efficient. This process simply breaks the bonds between phosphate groups and chemical energy is released.

Mr. ATP !!!!

Example:
ATP is used to power protein pumps in the cell membrane to help keep the correct balance of molecules in either side of the cell membrane (active transport).



Using Biochemical Energy:

Cells require ATP for many activities. Fill in the box →

List of Cellular Activities that require ATP

Cells need tons of energy, however **CANNOT** store large amounts at any given time. Therefore cells need to have a way to make energy very quickly and easily. This is the case when cells use food energy to convert ADP back into ATP.

Heterotrophs & Autotrophs

- You know these words. Read page 228 as a quick refresher ☺

PHOTOSYNTHESIS

Cells rely upon ATP as an energy source for all of their activities. The energy being put into the bonds of ATP has to come from somewhere. The ultimate source of this energy is the sun. Photosynthesis is the process which converts light energy to chemical bond energy in the form of glucose. Glucose is then used/consumed by organisms to synthesize ATP.

CONCEPT: Homeostasis (Ch7.4) requires MANY processes to occur simultaneously and constantly. Nearly all of these processes require energy in the form of ATP.

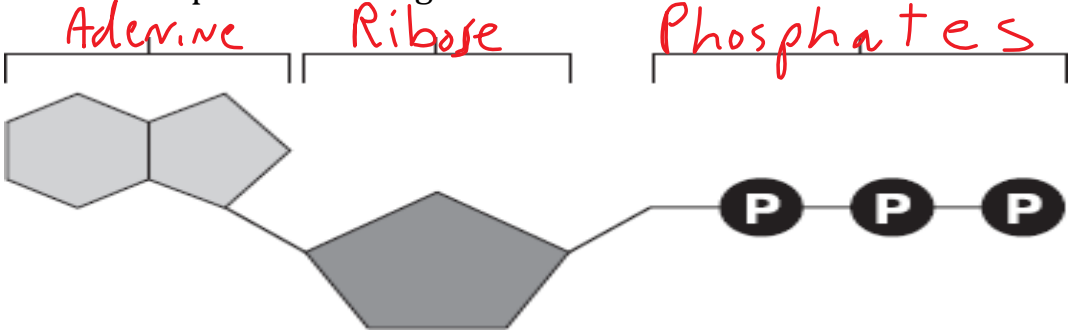
Photosynthesis is the ultimate source of energy that allows organisms to be able to produce ATP, and as a result use it to maintain homeostasis

Chapter 8.1 Practice

For Questions 1–6, complete each statement by writing the correct word or words.

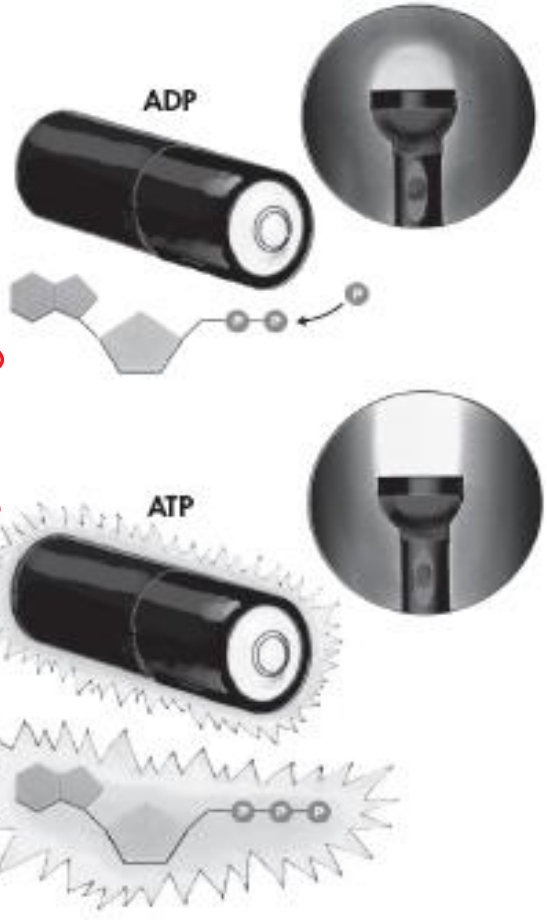
1. Energy is the ability to do work.
2. The main chemical compound cells use for energy is Adenosine triphosphate (ATP).
3. Ribose is a 5-carbon sugar molecule that is part of an ATP molecule.
4. The bonds of ATP are the key to its ability to store and supply energy.
5. ATP releases energy when it breaks bonds between its phosphate groups.
6. Most cells only store enough ATP for a few seconds of activity.

7. Label each part of the diagram of an ATP molecule below.



For Questions 8–10, refer to the Visual Analogy comparing ATP to a charged battery.

8. In the visual analogy, what chemical is represented by the low battery? ADP



9. What are two ways in which the diagram shows an increase in energy?

Add 3rd P

Brighter light

10. Describe the concepts shown in the diagram.

ATP can be re-charged like a battery

11. What are two ways in which cells use the energy temporarily stored in ATP?

Life activities: • Muscle movement, active transport
• Building molecules, Cell division

12. Energy is needed to add a third phosphate group to ADP to make ATP. What is a cell's source of this energy? Food -or- Glucose

Heterotrophs and Autotrophs

For Questions 13–17, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

I **13.** All heterotrophs must <u>eat food</u> to get energy.
T **14.** <u>Autotrophs</u> do not need to eat food because they make food.
Sun **15.** The energy in food originally came from <u>ATP</u>.
building **16.** The term photosynthesis means "<u>pulling apart</u> with light" in Greek.
T **17.** The energy of sunlight is stored in the chemical bonds of <u>carbohydrates</u>.

18. Complete the table comparing two types of organisms.

Autotrophs and Heterotrophs

Type	Description	Examples
Autotrophs	make their own food	Grass, algae, some bacteria
Heterotrophs	eat other organisms	Cheetahs, Mushrooms, Rabbits, Bacteria

Cow ← Plants ← Sun

19. Suppose that you ate a <u>hamburger</u> on a <u>wheat roll</u> with <u>lettuce</u>, <u>tomatoes</u>, and <u>onions</u> for lunch. As you ate, you took in food molecules from plants and animals. Explain why all the energy in the food molecules of this hamburger could be traced back to <u>the sun</u>.