

8.1 How Organisms Obtain Energy

Inside of your cells molecules are being put together/taken apart, substances are being transported across the plasma membrane, cells are dividing...

All these cellular processes require energy

Energy – the ability to do **work**

(light, chemical, mechanical, heat, etc)

Thermodynamics is the study of the flow and transformation of energy in the universe.

Laws of thermodynamics

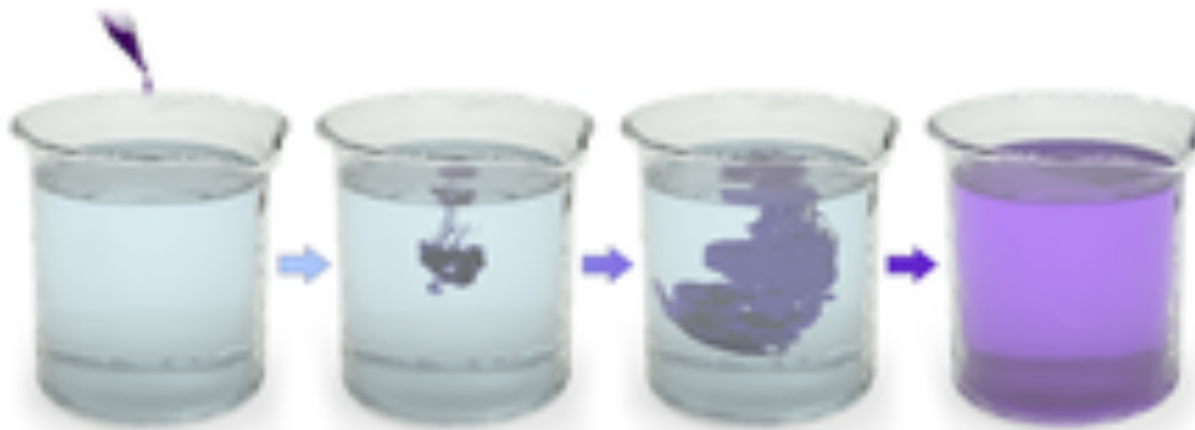
First law—

conservation of energy:

energy cannot be created nor destroyed (but it can be changed from one form to another)

Second law—Entropy increases
energy cannot be converted
without the loss of usable
energy (usually as heat)

entropy—disorder—or unusable energy.



Diffusion

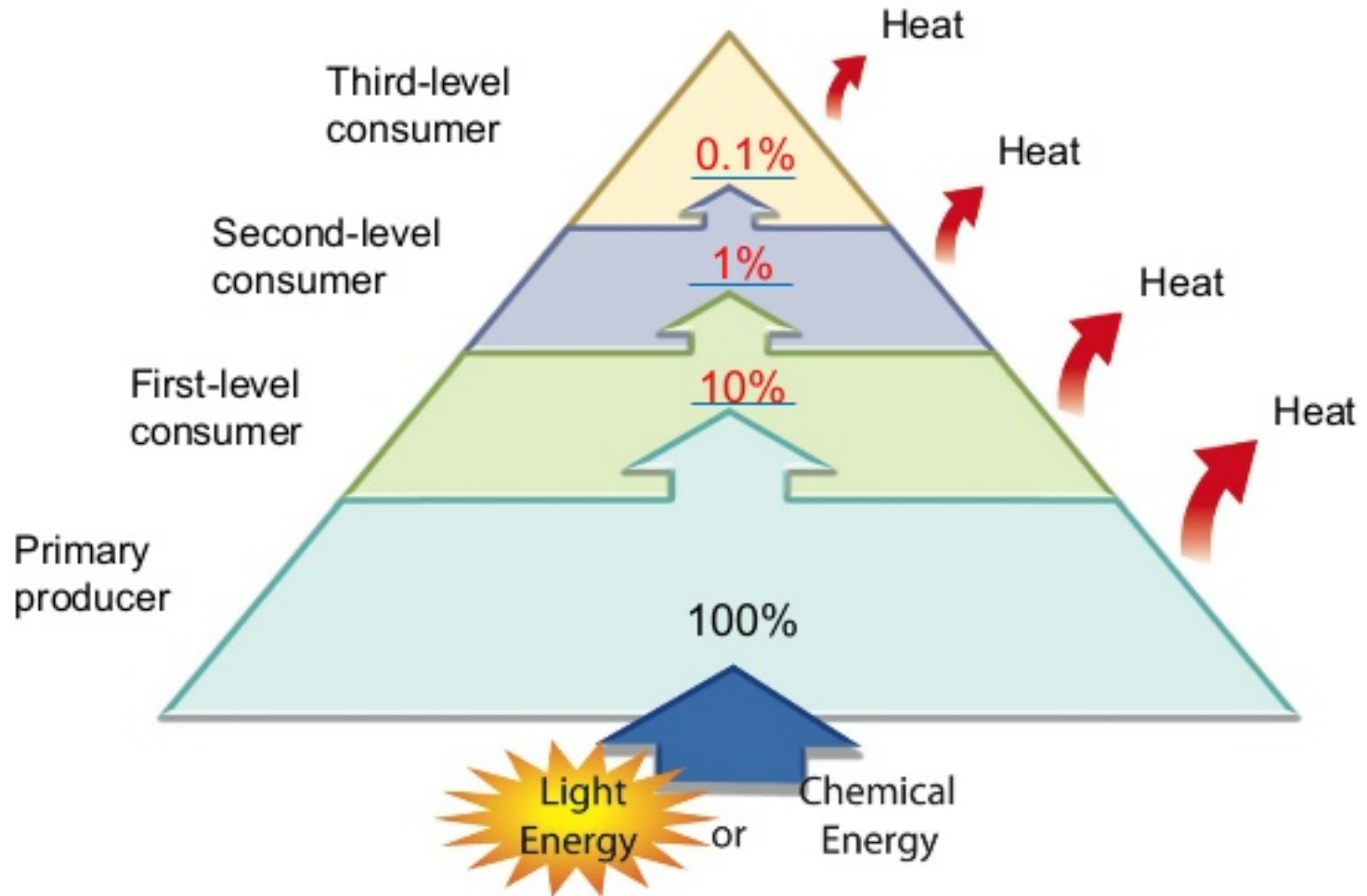
Entropy- disorder- chaos

entropy



NOT entropy

Pyramid of Energy

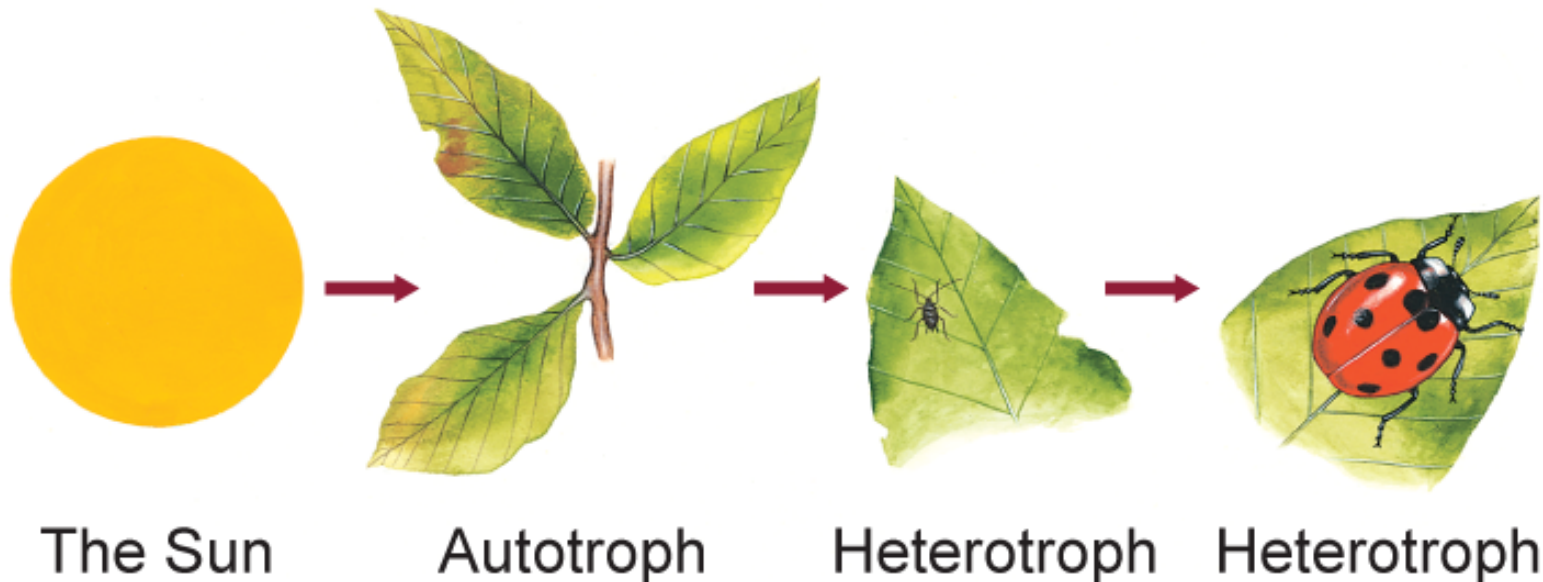


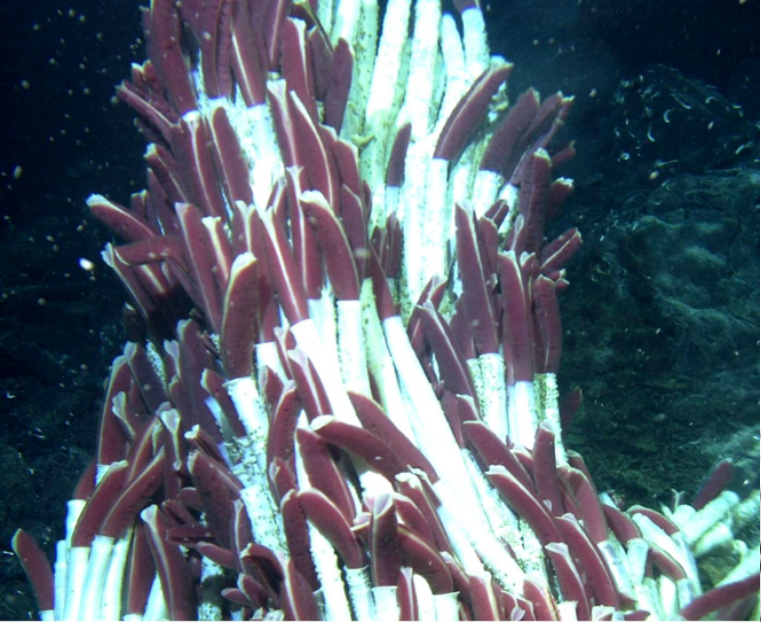
Entropy- "Loss" of energy as we go up the pyramid

Directly or indirectly, nearly **all the energy for life comes from the Sun.**

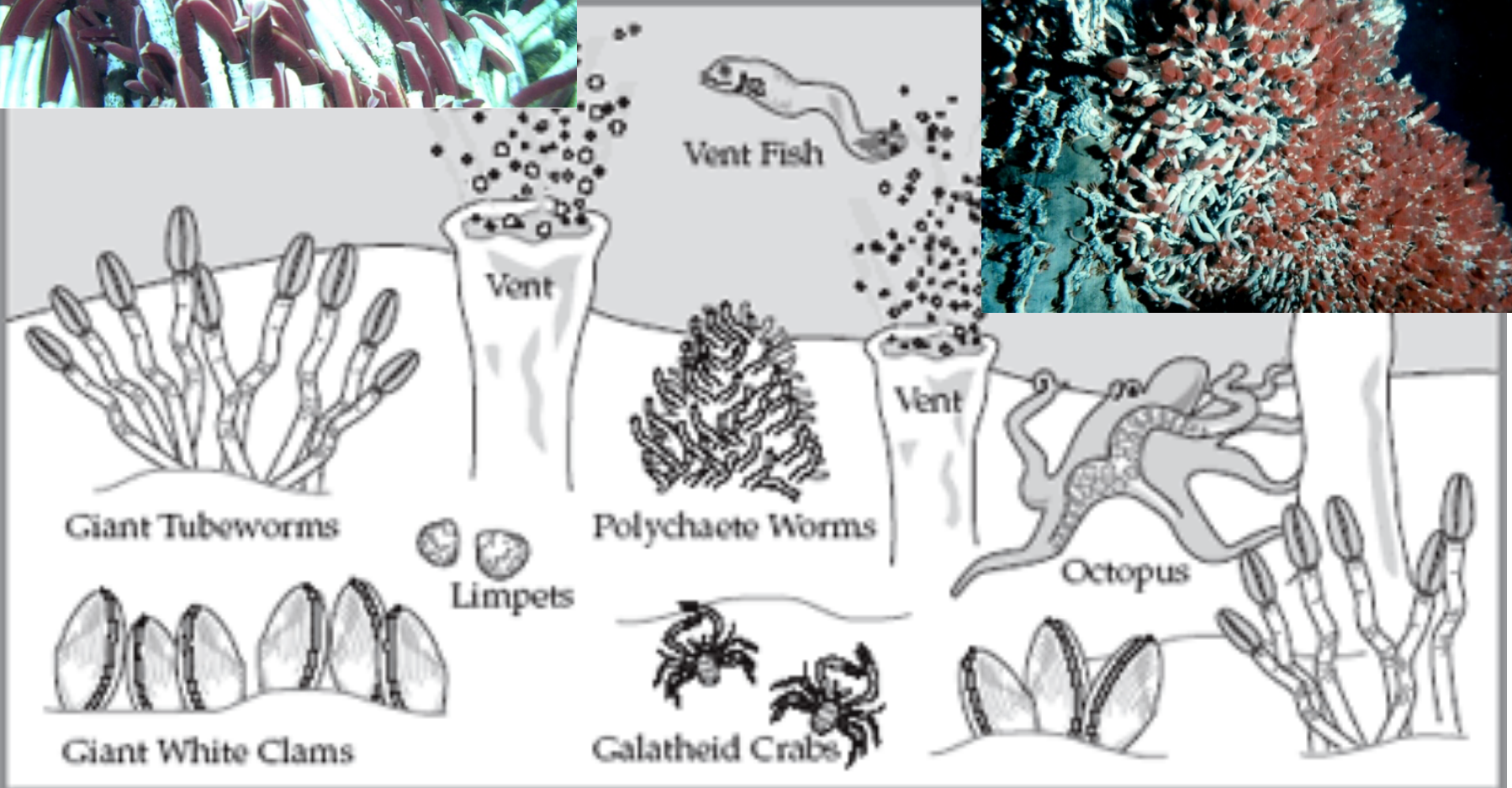
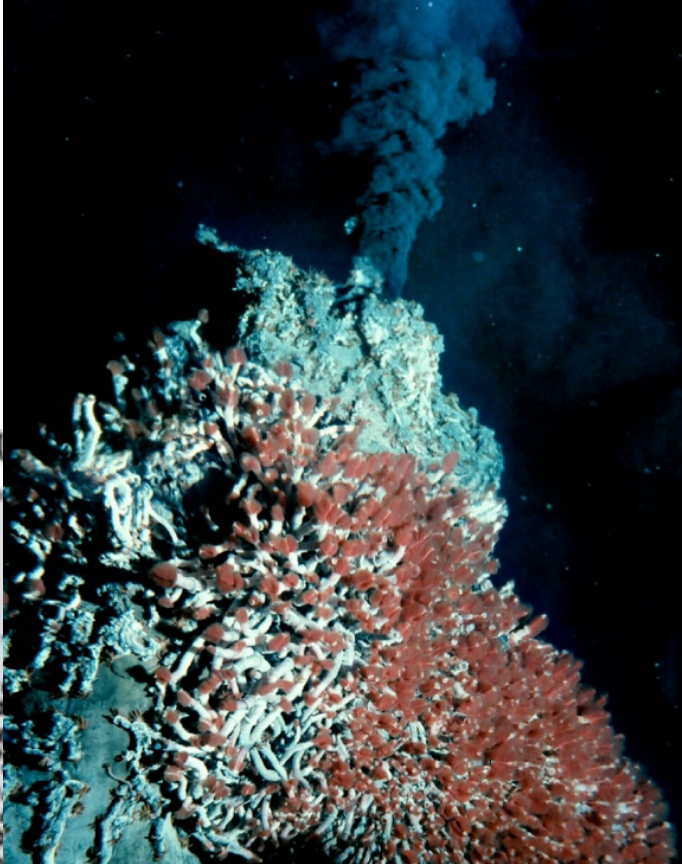
Autotrophs make their own food, either with energy from the sun or from inorganic substances.

Heterotrophs ingest other organisms to obtain energy.





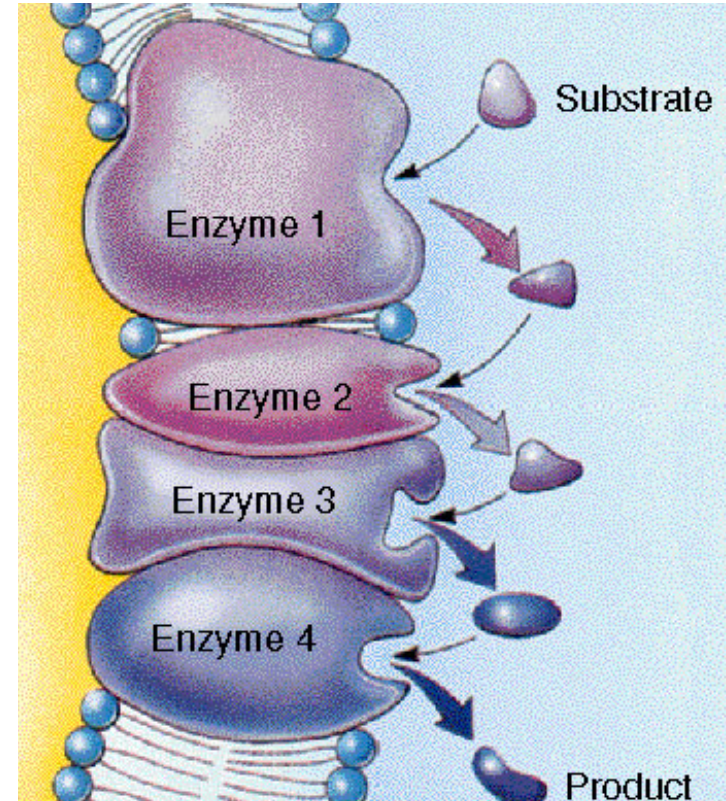
HYDROTHERMAL VENT COMMUNITY



Metabolism- All of the chemical reactions in a cell

Metabolic Pathway-

A series of chemical reactions in which the product of one is the substrate for the next



Catabolic pathways release energy by **breaking down** larger molecules.

Anabolic pathways use energy to **build** larger molecules.

Metabolic pathways

Anabolic: Small molecules are assembled into large ones. *Energy is required.*

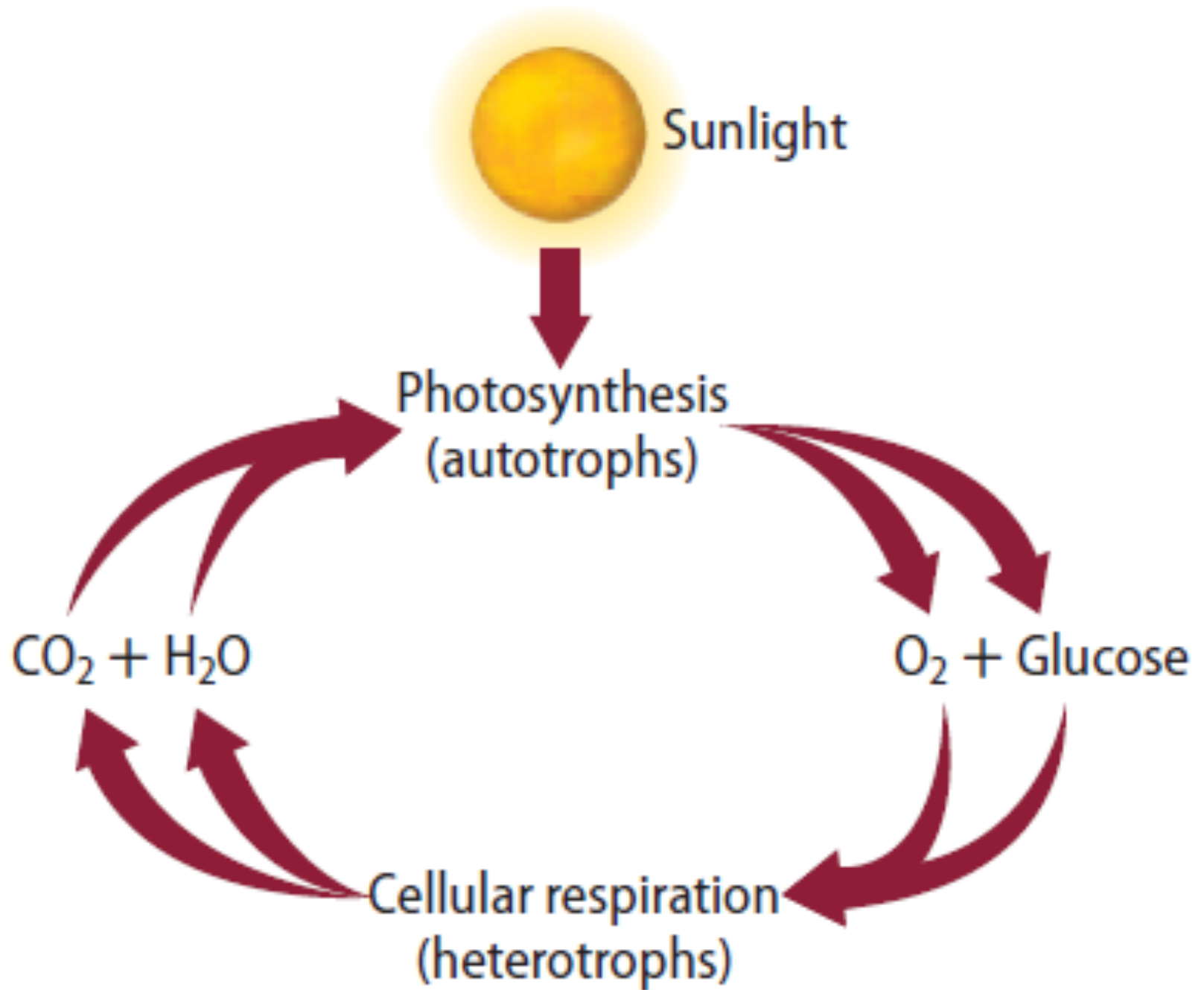


Catabolic: Large molecules are broken down into small ones. *Energy is released.*



Photosynthesis – anabolic
uses light energy to create
carbohydrates (glucose)

Cellular respiration – catabolic
releases energy from organic
molecules (like glucose)

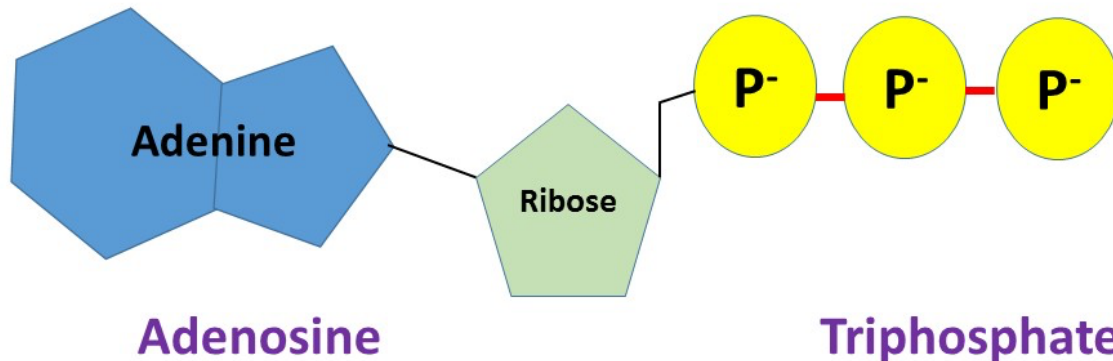


ATP: The Unit of Cellular Energy

- In living things, chemical energy is stored in biological molecules.

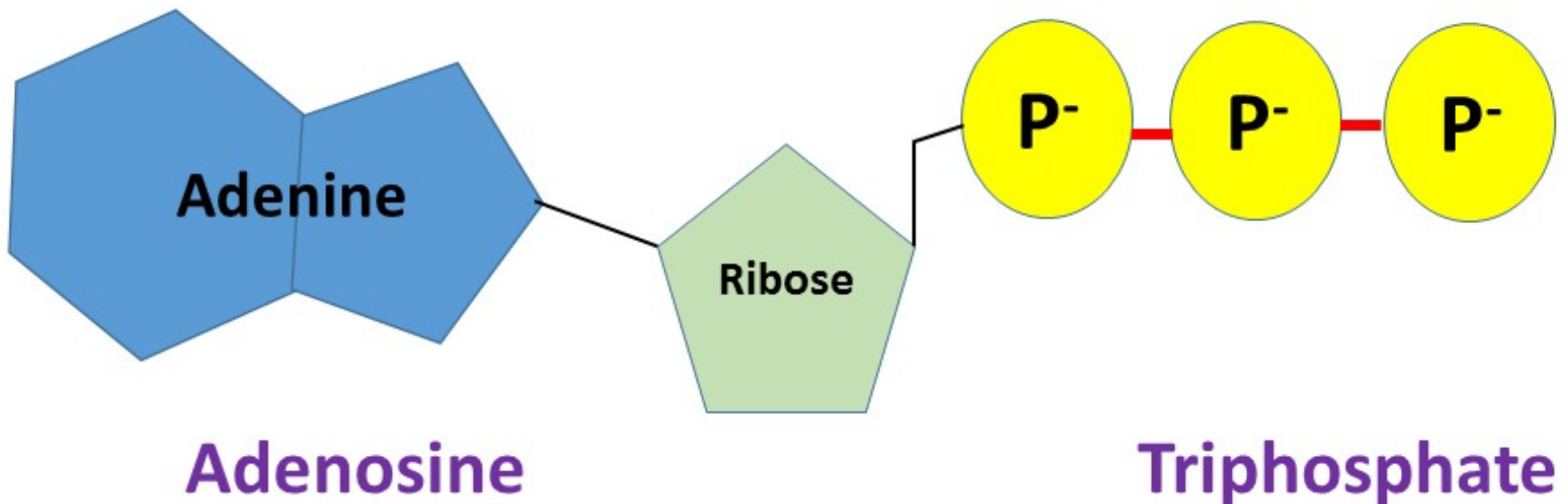
Adenosine triphosphate (ATP)

biological molecule that provides chemical energy for the cell



Most abundant energy-carrier in cells

Nucleotide made of an adenine base, a ribose sugar, and three phosphate groups



Releases energy when a bond is broken- becomes **adenosine diphosphate (ADP)**

