

# Cells and Cell Processes

## Basic Biological Principles

*Definition: The scientific study of life.*

### Essential questions

- **How is DNA passed down**
- **How are cells made**

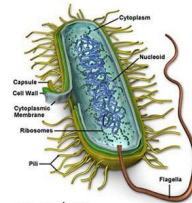
*Objectives:*

The basic biological principles are the characteristics that all living organisms have. All living things are made of cells that are made from other cells dividing and multiplying. There are two main types of cells Prokaryotic which do not have a nucleus and are smaller and Eukaryotic cells which contain a nucleus and are larger inside the cell there are many organelles the section

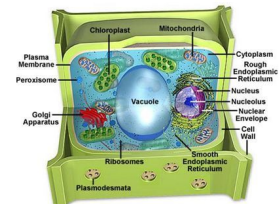
of the cell that makes up the outside border is called the cell membrane. The cell membrane is essentially the bouncer for the cell it only allows certain things to pass in and out through the cell. When the cell is affected by a foreign disease the cell will enter in a state called homeostasis.

Through homeostasis the cell will come to an equilibrium keeping an internal balanced environment changing the temperature and concentration of certain elements. All living organisms will pass characteristics such as hair color, nose shape, and skin color to their offspring. Not all of the parents' characteristics will appear in the offspring since we get our DNA from both parents. There are other traits that an organism can acquire as a response to its environment for example a chameleon with blend in with its environment through camouflage.

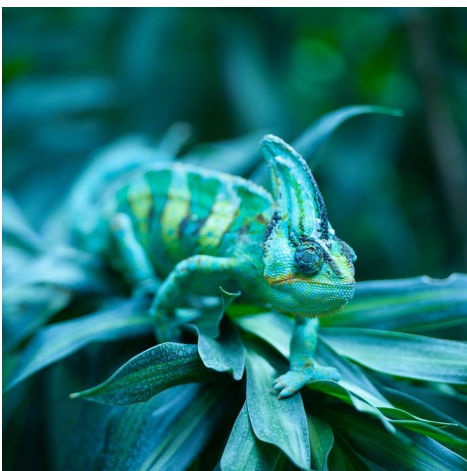
### Prokaryotic vs. Eukaryotic



- no nucleus
- no membrane enclosed organelles
- single chromosome
- no streaming in the cytoplasm
- cell division without mitosis
- simple flagella
- smaller ribosomes
- simple cytoskeleton
- no cellulose in cell walls
- no histone proteins



- nucleus
- membrane enclosed organelle
- chromosomes in pairs
- streaming in the cytoplasm
- cell division by mitosis
- complex flagella
- larger ribosomes
- complex cytoskeleton
- cellulose in cell walls
- DNA bound to histone proteins



## Key Terms

- responsiveness to the environment;
- growth and change;
- ability to reproduce;
- have a metabolism and breathe;
- maintain homeostasis;
- being made of cells; and.
- passing traits onto offspring.

Prokaryotic cells do not contain a nucleus or any other membrane-bound organelle

Eukaryotic cells contain membrane-bound organelles, including a nucleus

cells work together to create tissues, tissues work together to create organs, organs work together to create organ systems, and organ systems work together to create

multicellular organisms

## Practice Questions

**1. Which is present only in plant cells?**

- A. Cell membrane
- B. Cell wall
- C. Plasma membrane
- D. Cytoplasm

**1. A cell from what organism will be the smallest**

- A. Tree
- B. Bug
- C. Bacteria
- D. Elephant

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**1. All DNA comes from the father?**

- A. True
- B. False

*Answer the following*

**1. Describe the difference between Prokaryotic and Eukaryotic cells.**

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## 2. Describe the cell membrane is used for .

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### **The Chemical Basis for Life**

*Definition:* The chemical basis is why we are able to live, it dictates what causes our body's to work and how.

*Objectives:* Understand why and how concepts of chemistry relate to biology and why life exists through those concepts

Water allows for life to be sustained by doing things such as retaining heat at levels that keep organisms closer to their desired temperatures through “specific heat”, using cohesion and adhesion to allow it to move to places that different organisms need and to keep its molecules together, and by being able to form polar bonds. Carbon on the other hand allows for macromolecules due to it being able to create lots of covalent bonds and be formed into so many unique structure that are also known as molecules. A monomer is a singular molecule that can be formed into more complex macromolecules. Carbohydrates are made up of monomers called saccharides that when multiple are put together become polysaccharides. The use of Carbohydrates is to provide a quick and easy energy to fuel the body. Lipids are made of monomers called fatty acids that are linked together in a chain and are primarily a long-term storage system. Nucleic acids are what code for the body and to make proteins, they are made of monomers called nucleotides. Lastly, Proteins are the molecules that make up the structure of the body and work as enzymes as well. These proteins are made of amino acids which are also arranged into chains.

An enzyme is a structure that binds to a substrate that matches with it to catalyse or speed up a reaction where the enzyme either deconstructs or reconstructs the substrate. These enzymes can be affected by things like pH levels, temperature, and concentration of both substrates and enzymes. The enzymes have particular circumstances in which it has the fastest rate of reaction.

### **Key Knowledge**

- Why water supports life on earth?
- Why carbon is suited for macromolecules?
- Why macromonomers are formed by macromolecules?
- Structures and functions of carbs, lipids, proteins, and nucleic acid
- Role of enzyme as a catalyst
- How pH, temperature, and concentration levels affect enzymes

### **Key Terms**

- Covalent
- Polar
- Carbon
- Macromolecules
- Monomers

- Carbohydrate
- Lipid
- Nucleic Acid
- Amino Acid
- Saccharide
- Polysaccharide
- Protein
- Enzyme
- Catalyst

**Practice Questions**

- 1. Which of the following does not affect rate of an enzyme?**
  - a. Temperature
  - b. pH level
  - c. Concentration
  - d. Distance
- 2. What is the role of a protein?**
  - a. To act as a long-term storage system
  - b. To speed up a reaction
  - c. To bond molecules
  - d. To act as the body's structure
- 3. What is a Carbohydrate made up of?**
  - a. More carbohydrates
  - b. Proteins
  - c. Monomers
  - d. Polysaccharides

*Answer the following*

- 3. Describe the difference between adhesion and cohesion.**

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A: Cohesion is when more than one of the same molecules cling to each other while adhesion is when two different molecules will cling together

- 4. Describe the role of enzymes.**

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A: Enzymes are to catalyze, or speed up, a reaction in the metabolism

**Bioenergetics: Photosynthesis and Cellular Respiration**

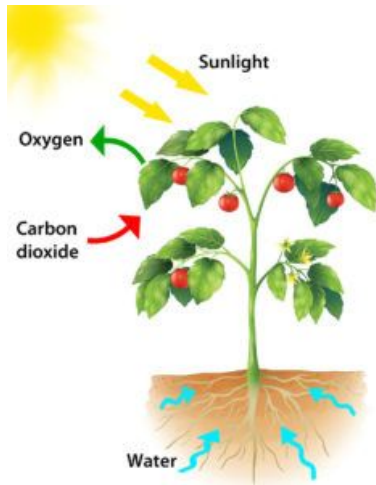
*Definition:* The study of bioenergetics is the transformation of energy in living organisms.

***Essential questions***

- Describe the roles that take place in *photosynthesis* (ex. chloroplast) and the energy transformations
- Demonstrate ATP in biochemical reactions

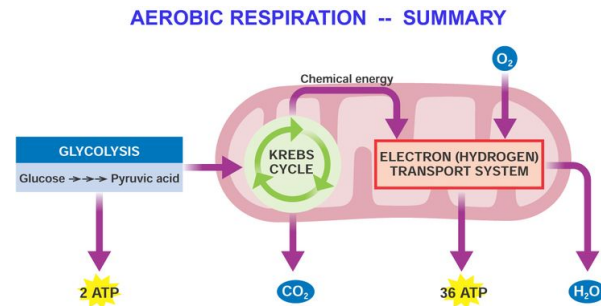
**Objectives:** Identify and describe the cell structures that occur within the processing of energy  
 Identify and describe how organisms secure and transform energy for their life processes

ATP is the action of taking in energy that then takes in lower energy-reactants and transform them into high-reactants. Though atoms remain the same, the energy in the product increases. The products can also do the opposite. The product can release energy. An important energy releasing products includes *adenosine triphosphate(ATP)*. ATP can be broken down by hydrolysis to create *adenosine diphosphate*. ATP is always reproducing and being absorbed



in the cell. It needs to

constantly produced because without it, cells would not be able to function. The energy that produces adenosine triphosphate comes from *cellular respiration*. Cellular respiration can operate with or without oxygen. Without oxygen it's known as anaerobic respiration. One type of this respiration is *fermentation*. During this process *glycolysis* can be carried out. Anaerobic respiration releases less energy in glucose than aerobic respiration. In cellular respiration there is the krebs cycle. It takes place inside of the matrix. The sections are important for the electron transport structure and function. Glycolysis occurs in the cytoplasm of the cell, with the products of glycolysis entering the *mitochondria* to continue cellular respiration.



*Photosynthesis* is the process that turns light energy into

chemical energy and small compounds like *glucose*. Photosynthesis organism who use sunlight to form glucose and *oxygen* from *carbon dioxide* and *water*. The glucose that is made in photosynthesis provides the plant with energy. Plants are able to use chemical energy or store the sugars in *starch*. Along with animal plants also give out cellular respiration. Aerobic respiration and Photosynthesis are opposite of one another. In photosynthesis *eukaryotes* have organelles known as the *chloroplast*. The chloroplast has two membranes located by the *stroma*. Within the stroma are disks known as *thylakoids*. These contain *chlorophyll*, this is pigments that captures energy from sunlight.

### Key Terms

#### *Photosynthesis*

- chloroplast
- Chlorophyll
- Oxygen
- Carbon dioxide
- Sunlight

- Water
- Starch
- Diffusion
- Glucose
- Thylakoid
- Stroma
- Lumen
- Mesophyll cell
- Autotrophs

#### *Cell Respiration*

- Hydrolyze
- Adenosine triphosphate (ATP)
- Oxidized
- Anaerobic
- Aerobic
- ADP
- Fermentation
- Mitochondria
- Glycolysis

### **Practice Questions**

#### **1. ATP molecules are a result of what process?**

- a. *Cellular respiration*
- b. Diffusion
- c. Aerobic respiration
- d. Cellular reproduction

#### **2. When organisms break the bonds of organic compounds, the organisms can...**

- a. Use the smaller molecules to plug the gaps in the cell membrane to slow diffusion
- b. Excrete smaller amounts of solid waste materials during vigorous exercise Energy from organic molecules can be stored in
- c. Use the energy obtained to digest molecules produced by respiration that uses oxygen
- d. *Obtain energy or reassemble the resulting materials to form different compounds*

#### **3. What is the difference between photosynthesis and cellular respiration?**

- a. Photosynthesis can make glucose only with water oxygen
- b. Respiration only taking place in animals, photosynthesis only takes place in plants
- c. Cellular stores, photosynthesis releases
- d. *Cellular takes in oxygen, photosynthesis takes in carbon dioxide*

*Answer the following*

- 1. Describe how energy transformations in photosynthesis are related to energy transformations in cellular respiration**

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A: Photosynthesis is related to cellular respiration because photosynthesis uses energy to convert carbon dioxide and water to create glucose and oxygen. It is a reaction that captures light energy in bonds. Cellular respiration then takes the stored glucose and transforms it into ATP. This glucose comes from photosynthesis, therefore making them related to one another.

**2. Cells have specific organelles that include different structures and functions. Compare the mitochondria and chloroplast in terms of function.**

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A: Both organelles have layers that increase the surface area to create space for reactions to happen. The chloroplast contains a light-absorbing pigment, chlorophyll, and functions that take energy from sunlight. It then converts it in order to store energy inside glucose. The mitochondria functions in order to generate the cell supply of adenosine triphosphate (ATP).

**Homeostasis and transport**

*Definition: The process of maintaining a stable internal environment*

**Essential Questions**

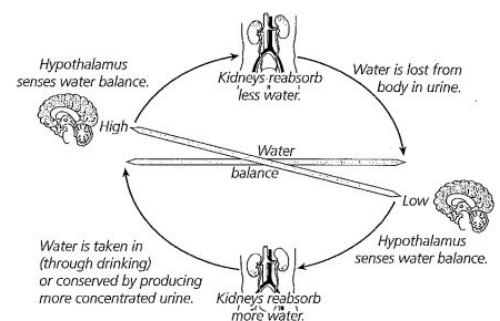
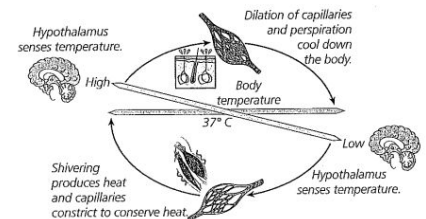
- What happens to keep the human body in order?

The process that returns a person's body temperature to its normal state when it gets overheated or too cold. There are 4 homeostatic mechanisms, Thermoregulation, Osmoregulation, gas exchange, and blood glucose levels.

Thermoregulation is the process of keeping a person's body heat at a certain temperature which is, 37° C. The way this happens is when the body gets too high then the body begins to sweat to cool down the body, but when the body gets too cold, the body begins to shiver to heat the body back up.

The next process is Osmoregulation. This is the water balance in a person's body. When the body's water level gets too high the body releases urine to get excess body water out. When the body's water is too low water is taken in by drinking water and the kidneys absorb water to make sure the body never gets dehydrated.

Gas exchange is the next process. This is to make sure that the body always has oxygen to flow through the body to make respiration happen. When there is too much carbon dioxide

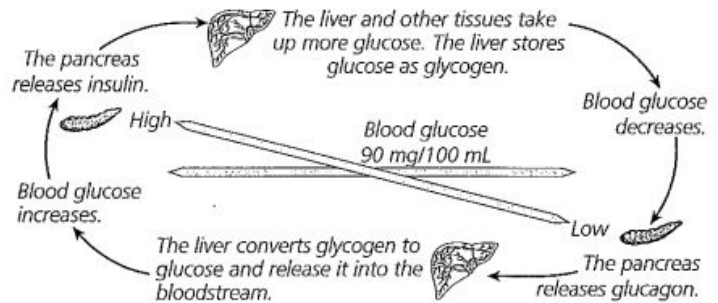


and not enough oxygen, the carbon dioxide in the capillaries cross the alveoli, which are air sacs in the lungs, and this allows more air to come inside.

Last we have blood and glucose levels. This process is to make sure there is always a certain level of blood in the human body. This is done by the pancreas storing blood glucose for a time when that gets too low. When that happens the pancreas releases what is called glucagon which then the liver transforms that glucagon into glucose. The blood glucose rises again and the pancreas puts out insulin and the process starts over again.

### Key terms

- Diabetes
- Glycogen
- Homeostasis
- Homeostatic
- Hypothermia
- Insulin
- Thermoregulation
- Gas exchange
- Osmoregulation
- Positive feedback
- Active transport
- Passive transport
- Glucagon
- Hyperthermia



### Practice Questions

- 1. What will happen to the body if it becomes too cold?**
  - A. Shiver
  - B. Sweat
  - C. Release water
  - D. Make glycogen
- 2. If there is too much water in a body what should happen?**
  - A. Drinking water
  - B. Urination
  - C. Shivering
  - D. Release insulin
- 3. If the blood level goes too low what happens in the body?**
  - A. Pancreas releases glucagon
  - B. Pancreas releases glucose
  - C. Pancreas releases insulin
  - D. All of the above



Answer the following

**1. What does the body do when it begins to overheat and why?**

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A: When the body begins to overheat it will begin to sweat in attempt to cool the body down.

**2. Why do diabetics take insulin for their blood glucose?**

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A: They take insulin to make sure the blood glucose doesn't go to high.

Links

<https://www.britannica.com/science/homeostasis>

[https://drive.google.com/file/d/oB\\_Lwf-1Ep\\_cTbkgGQlJDbXNzYnM/view?usp=sharing](https://drive.google.com/file/d/oB_Lwf-1Ep_cTbkgGQlJDbXNzYnM/view?usp=sharing)

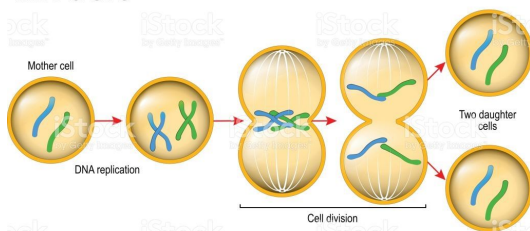
<https://drive.google.com/file/d/oBwnzDzjNUjLFC24zNop6WTdPOGxWTDhrRoJZYmRHX2doRnFr/view?usp=sharing>

**Cell growth and Reproduction**

**Definition:** The stage that cell are preparing for the next division

**Essential Questions:** How do cells grow in the human body?

**MITOSIS**



Cell growth, otherwise known as “Interphase” is the growth of multiple cells by the splitting of one mother cell into daughter cells and that repetition. There are 46 chromosomes and 23 pairs in each human’s body. These chromosomes are used to help form cells that people need to grow and stay alive. Cells grow over time by doubling.

All organisms start as a single cell known as the Mother cell because it is the first cell, and they expand through the process of mitosis. Mitosis is when daughter cells split and have the same number of chromosomes as each other and the parent cell. Mitosis happens by the single Mother cell splitting up into two other cells known as the daughter cells, then they split into single cells known as the sister cell. From there they will redo the process and this will happen multiple times. People end up with Millions of cells in their body. They reproduce and help people grow.

**Key Terms**

- Anaphase
- Cell cycle
- Cell division
- Cytokinesis

- Homologous
- Interphase
- Metaphase
- Prometaphase
- Meiosis
- Mitosis
- Telophase
- Reproduction
- Mother cell
- Daughter Cell
- Single Cell
- Chromosomes
- Cells

### Practice Questions

**1. How many chromosomes are in a human body?**

- A. 1
- B. 23
- C. 46
- D. 100

**2. Which of the Phases comes first in mitosis?**

- A. Metaphase
- B. *Interphase*
- C. Prometaphase
- D. Telophase

**3. How does Cell growth start?**

- A. *Mother cell*
- B. Sister cell
- C. Daughter cell
- D. No cell

*Answer the following*

**1. Explain the process of mitosis**

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A: Mitosis happens by the single Mother cell splitting up into two other cells known as the daughter cells, then they split into single cells known as the sister cell.

**2. Explain how One single cell turns into millions of other cells**

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A: They turn into millions of cells by the Single cell creating daughter cells through mitosis and them splitting into sister cells then the process keep restarting.

[https://drive.google.com/file/d/oB\\_Lwf-1Ep\\_cTbKpGQlJDbXNzYnM/view?usp=sharing](https://drive.google.com/file/d/oB_Lwf-1Ep_cTbKpGQlJDbXNzYnM/view?usp=sharing)  
<https://www.nature.com/subjects/cell-growth>

## Theory of Evolution (Exceeding)

*Definition:*

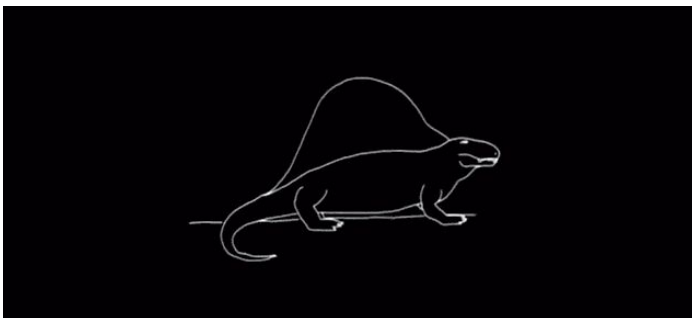
### **Essential Questions**

- How do hereditary changes and recombination of qualities amid meiosis empower development to happen?

The theory of evolution is the theory that living things have characteristics from prior living things. Organism over time will adapt to their environment. In the water organism that in the past had hand and individual finger will adapt webbed finger and then into fins to better navigate through the water. Animals that's ancestors would climb on trees with then adapt their fingers into wings like bats. There are other traits that adapt though selection of mates in peacocks the males with the most colorful feathers gets to mate with the females and has the highest change of his genes to be past on. A species is a group of individuals that actually or potentially interbreed in nature. species as a group of interbreeding individuals cannot be easily applied to organisms that reproduce only or mainly asexually. The classification of living things includes 7 levels: kingdom,



phylum, classes, order, families, genus, and species . The most basic classification of living things is kingdoms. Currently there are eight kingdoms. the eight kingdoms became: Eubacteria, Archaeobacteria, Archezoa, Protozoa, Chromista, Plantae, Fungi, and Animalia. Humans are primates. Physical and genetic similarities show that the modern human species, *Homo sapiens*, has a very close



relationship to another group of primate species, the apes.

<https://youtu.be/G5ukxKXsP6Y>

### **key Terms**

- Adaptation

- Artificial selection
- Evolution
- Interbreed
- Mutation
- Natural selection
- Phylogeny
- Species
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**Practice Questions**

**Which two organisms would have the fewest similar nucleotide sequences?**

- A. Horse/Zebra
- B. Dog/Cat
- C. apple tree/Mouse

**How do organisms evolve?**

- A. Mates
- B. Environment
- C. Food
- D. All of the above

**What does it mean to say that two species are closely related?**

- A. They have similar diets.
- B. They live in the same habitat.
- C. They have the same parents.
- D. They have a common evolutionary ancestor.

*Answer the following*

**2. Why did animals adapt to fins**

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**3. Why did animals adapt wings**

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## Work Cited

### **Bioenergetics: Photosynthesis and Cellular Respiration**

KEYSTONE BIOENERGETICS.PDF

In-text: ("Keystone Bioenergetics.Pdf")

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### **Chemical Basis for Life**

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### **Mitosis**

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*Nature News*, Nature Publishing Group, [www.nature.com/subjects/cell-growth](http://www.nature.com/subjects/cell-growth).

### **Homeostasis**

The Editors of Encyclopædia Britannica. "Homeostasis." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., 29 June 2017, [www.britannica.com/science/homeostasis](http://www.britannica.com/science/homeostasis).

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