Intro to Cells

1. Discovering Cells
2. Looking Inside Cells
3. Chemical Compounds in Cells
4. The Cells in Its Enviornment

The Big Question

What are Cells Made of?

How Are You Like This Creature? Page 162

Untamed Science -Touring Hooke’s Crib!

Lesson 1

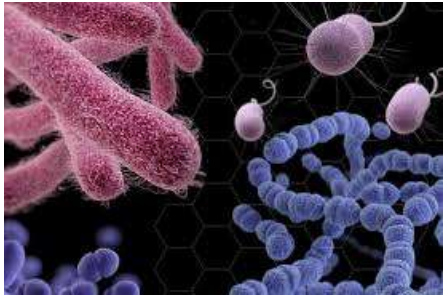
Discovering Cells

1. *What are Cells?*
2. *What Is the Cell Theory?*
3. *How Do Microscopes Work?*

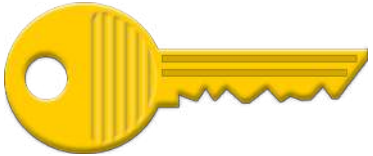
My Planet Diary Life at First Sight Page 166

Why do you think Leeuwenhoek was so excited about what he saw?

What are Cells?



Cells -form the parts of an organism and carry out all of it functions.

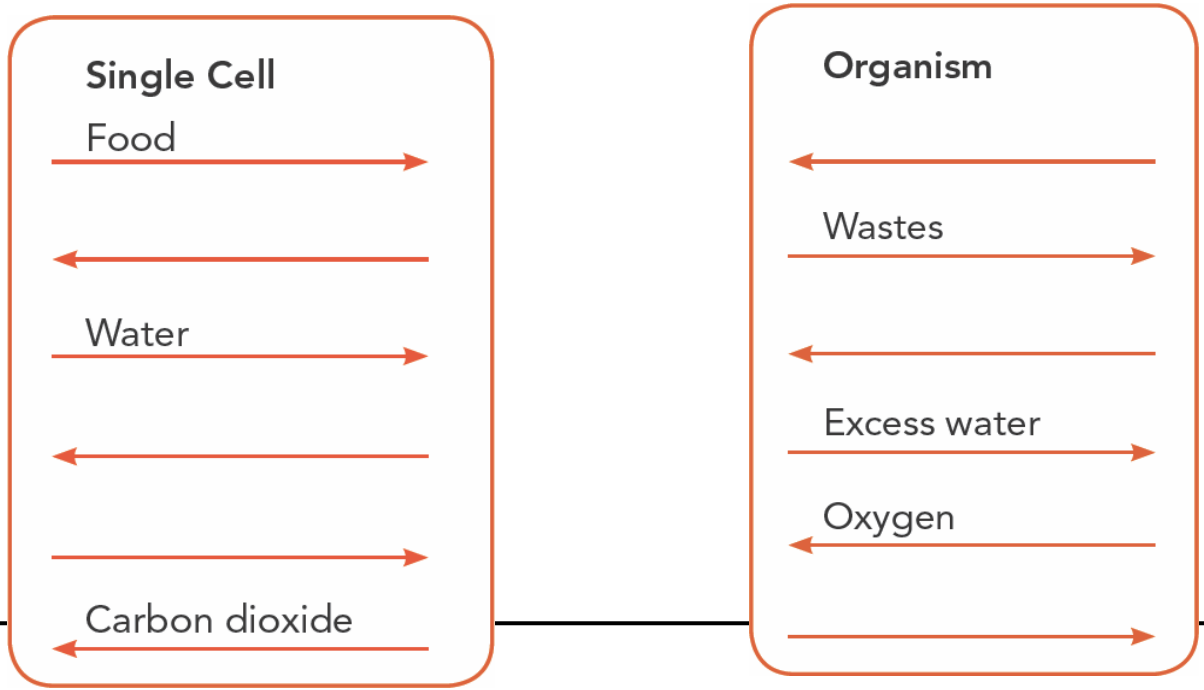


Cells are the basic units of structure and function in living things.

Cells and Function

Needs of Cells Figure 1 Page 167

A single cell has the same needs as an entire organism. What is the name of a material that moves?



What Can You See?

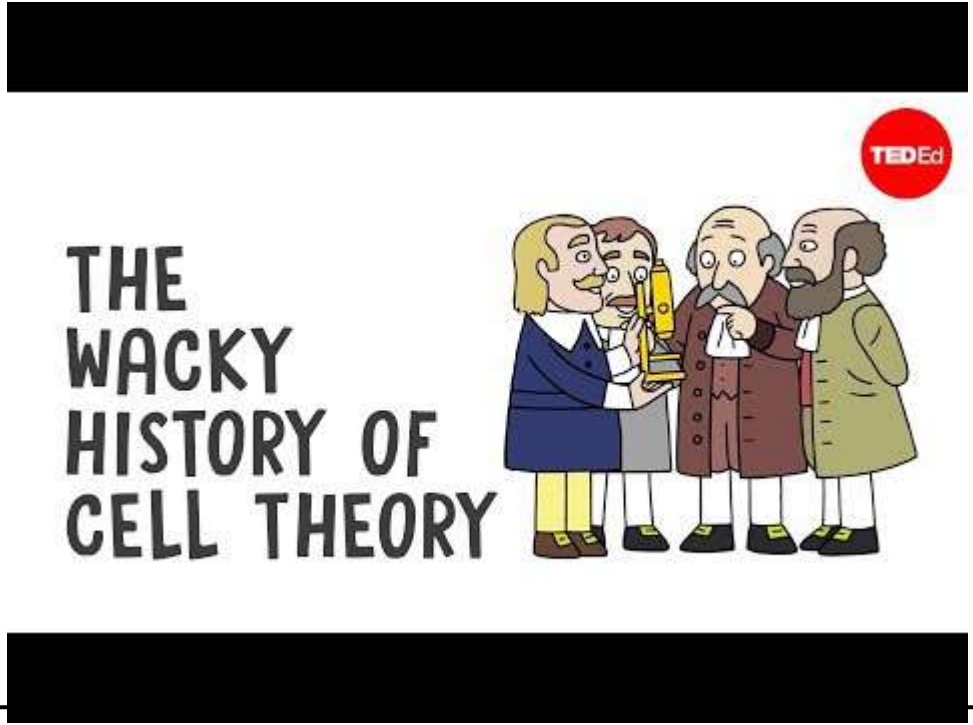
Comparing Cells

How are plant and animal cells the same and different?

- prepared slide of cells, labeled A
- prepared slide of cells, labeled B
- microscope

Background The invention of the microscope allowed scientists to discover that living things are made of cells. As microscopes improved, scientists began to identify the parts of cells and compare the structures of cells from different organisms. In this investigation, you will gather evidence to describe how plant and animal cells are the same and how they are different. This comparison helps explain the different ways that plants and animals live, grow, and function.

What Is the Cell Theory?



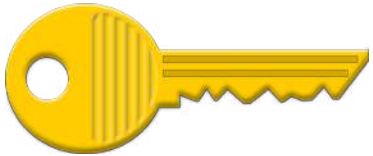
What is the Cell Theory

Microscope - is an instrument that makes small objects look larger.

Cell Theory -is widely accepted explanation of the relationship between cells and living things.

Figure 2 Page 168 Growth of the Cell Theory

What the Cell Theory Says

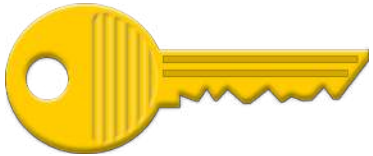


The cell theory states the following:

- All living things are composed of cells.
- Cells are the basic units of structure and function in living things
- All cells are produced from other cells

Assess Your Understanding page 169

How Do Microscopes Work?

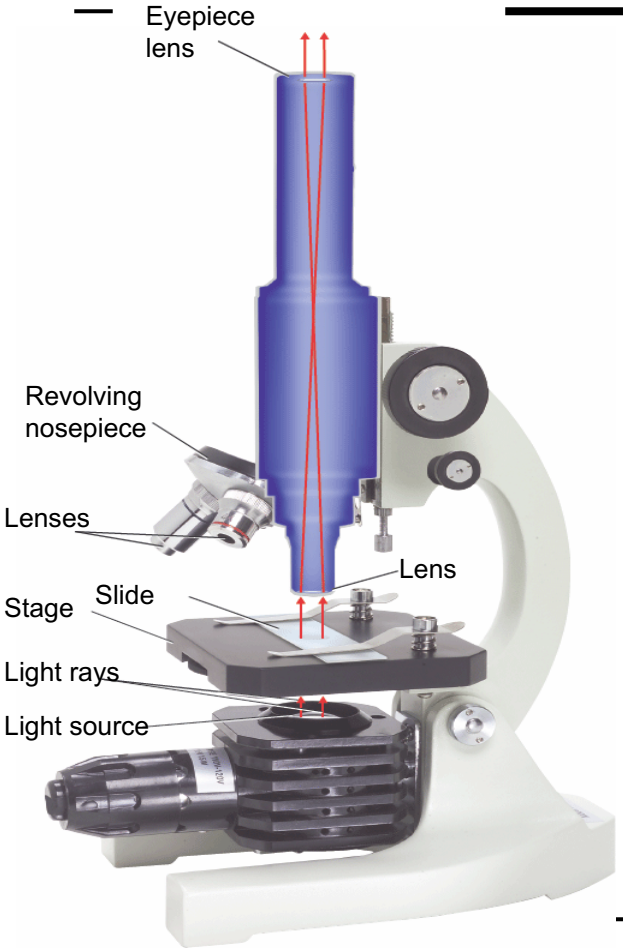


Some microscopes focus light through lenses to produce a magnified image, and other microscopes use beams of electrons.

Magnification is the condition of things appearing larger than they are.

Magnification changes how you can see objects and reveals details you may not have know were there.

Figure 3 Magnification Page 170



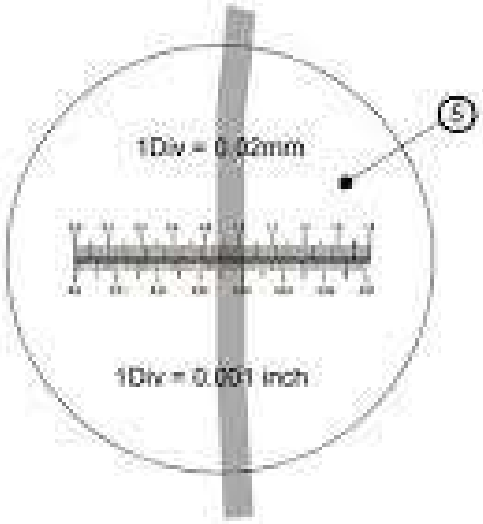
How Do Microscopes Work?

A Compound Microscope

This microscope has a 10x lens in the eyepiece. The revolving nosepiece holds three different lenses: 4x, 10x, and 40x.

How Microscope Works

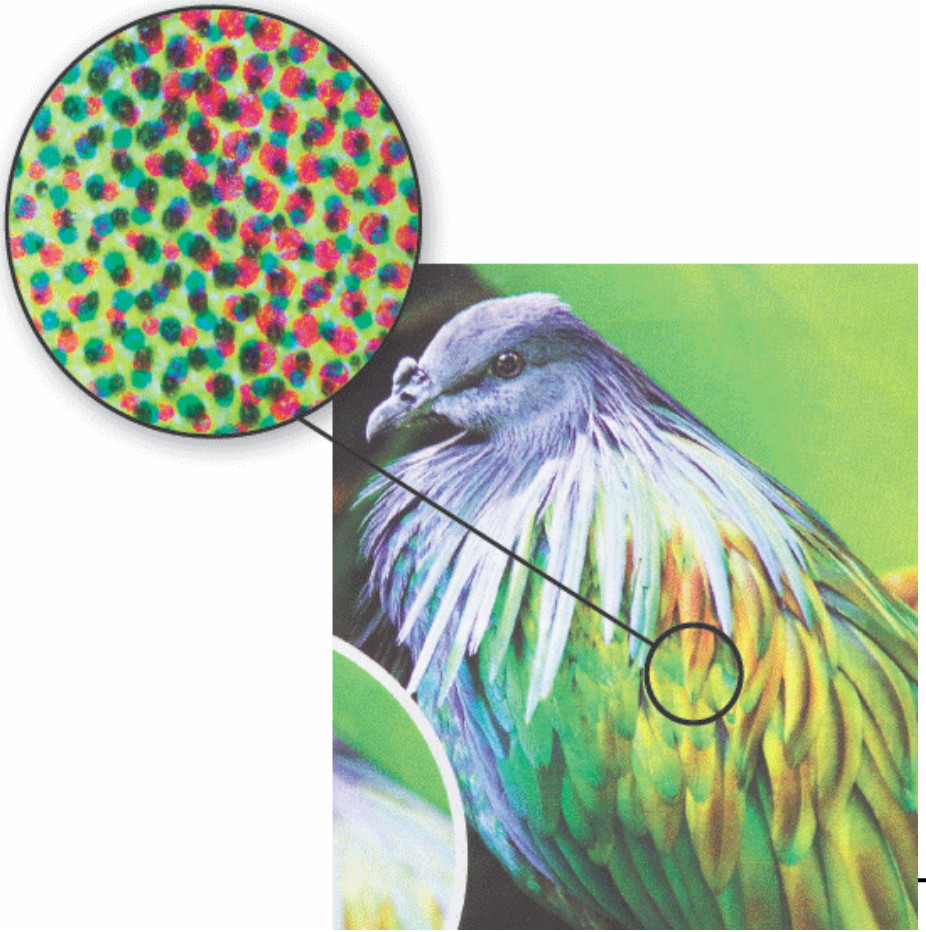
Figure 4 A Compound Microscope Page 171



Measuring Microscopic Objects

When you see objects through a microscope they look larger than they really are. How do you know their true size? One way is to use a metric ruler to measure the size of the circular field in millimeters as you see it through the microscope. Then you can estimate the size of the object you see by comparing it to the width of the field.

Apply it page 172



Resolution

To create a useful image, a microscope must help you see the details of the object's structure cleary. The degree to which two separate structures that are close together can be distinguished is called **resolution.**

Better resolution shows more details and microscope improve resolution.

Figure 5 page 172

Electron Microscope

Electron Microscope - use a beam of electrons instead of light to produce a magnified image.

Electrons are tiny particles that are smaller than atoms. By using electrons microscopes, scientist can obtain pictures of objects that are too small to be seen with light microscopes.

Page 173 A Dust Mite

Page 173 Assess your Understanding

What Can You See?

The observations scientists are able to make often depend on the types of tools available. In this activity, you will make and compare observations of an object using two different tools.

Materials

- black-and-white newspaper photographs
- scissors
- hand lens
- microscope
- flashlight or other light

What observations did you make using only your eyes?

What did you see in the photo with the hand lens that you could not see with only your eyes?

What additional details could you see with the microscope?

___

Observing Cells

Robert Hooke and Anton van Leeuwenhoek were among the first people to use microscopes. In this activity, you will use a microscope to look at objects similar to those of Hooke and Leeuwenhoek.

Materials

prepared slide of cork
blank microscope slide
coverslip
pond water
plastic dropper
microscope

Think It Over

How does your drawing in Step 2 compare to Hooke's description of cells in your student edition?

___

Based on your observations in Step 4, infer why Leeuwenhoek called the organisms he saw "little animals."

Review

Discovering Cells

Fill in the blank to complete each statement.

1. A cell's functions can include obtaining food and water and getting rid of _____wastes

2. Compound microscopes focus light through_____lenses_____ to produce a magnified image.

Review

Discovering Cells

Fill in the blank to complete each statement.

3. A large organism is made up of many millions of _____cells_____

4. A(n) _____convex_____lens has a center that is thicker than its edge.

Review

Discovering Cells

Fill in the blank to complete each statement.

5. The _____ describes how cells are related to living things.

Cell theory

6. The ability to distinguish between two nearby objects is called _____.

resolution

Review

Discovering Cells

7. The scientist who determined that all animals are made out of cells was _____.

A Hooke

B Schleiden

C Schwann

D Virchow

Review

Discovering Cells

8. A compound microscope with a 10× eyepiece and a 40× objective has a magnification of

A 10×

B 40×

C 50×

D 400×

Review

Discovering Cells

9. Which of the following statements is **NOT** part of the cell theory?

A All cells are produced from other cells.

B Cells can absorb food and oxygen.

C All living things are composed of cells.

D Cells are the basic units of structure and function in living things.

Review

Discovering Cells

10. The visible field of a microscope is 10 mm wide. How large is an object that takes up $\frac{1}{4}$ of the field?

A 1 mm

B 2.5 mm

C 4 mm

D 5 mm

Lesson 2

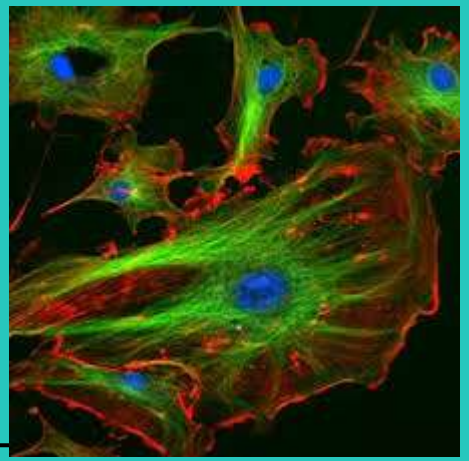
Looking Inside Cells

How do the Parts of a Cell Work?

How do Cells Work Together in an Organism?

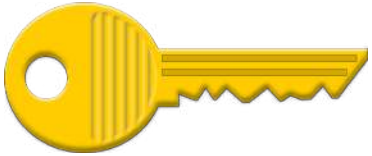
My Planet Diary Glowing Gobs Page 174

How Large Are Cells? QL



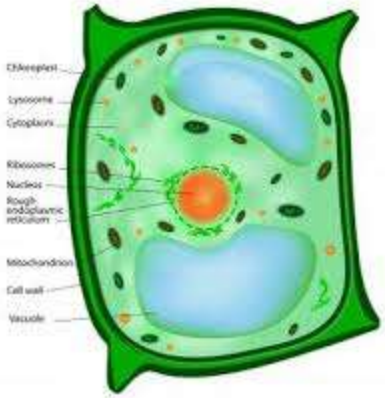
How Large are Cells?

How Do the Parts of a Cell Work?



Each kind of cell structure has a different function within a cell.

Cell Wall, *Cell Membrane*, *Nucleus*, *Chromatin*, *Nucleolus*, *Ribosomes*, *Cytoplasm*, *Mitochondria*, *Endoplasmic Reticulum*, *Golgi apparatus*, *Vacuole*, *Chloroplast*, *Lysosomes*



Cell Wall

Cell Wall-A rigid layer that surrounds the cells of PLANTS and some other organism.

- Animal Cells DO NOT have a cell wall.
- Cell wall help protect and support the cell.
- Made of strong material called cellulose
- Many materials can pass through this wall

Plant 14
Animal 5

Cell Membrane

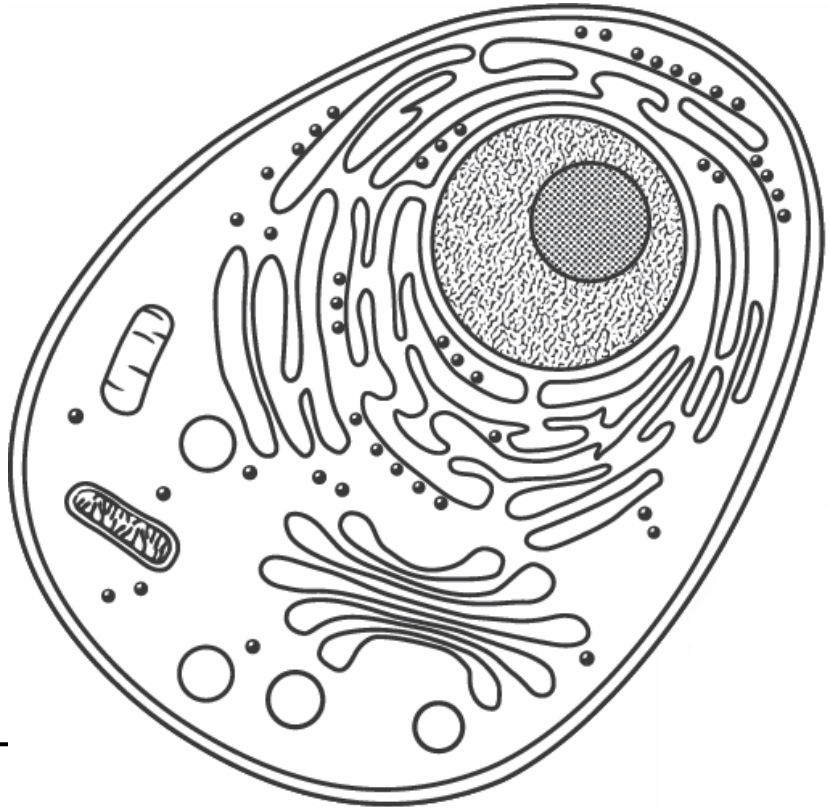
Cell membrane- controls which substances pass into and out of a cell.

- Think of if like a window screen
- Food, water, and oxygen enter
- Waste products leave the same way
- Prevents harmful substances from coming in.
- ALL cells have cell membrane
- Plant cell have them just inside the cell wall and animal cells form the border between the cell and its environment.

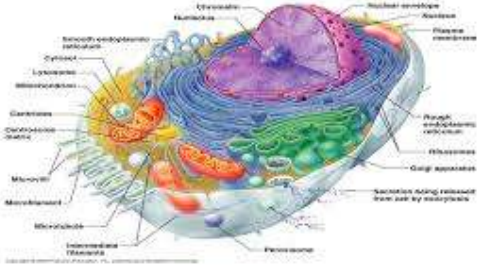
Cell Membrane

Figure 1 page 175

A Typical Animal Cell
Each kind of cell structure has a different function within a cell. Where is the cell membrane?



Cell Organelles



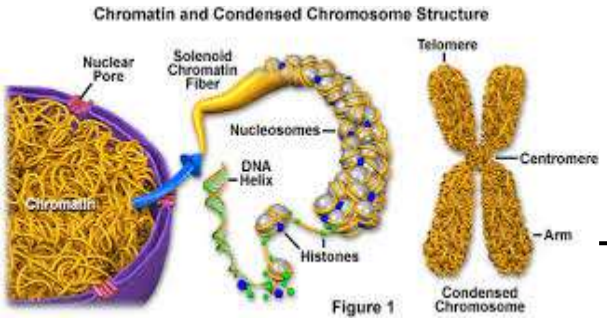
Nucleus

Organelles - tiny cell structures

Nucleus - the cells control center

- Directs all cell activities
- The largest of many tiny cell structures

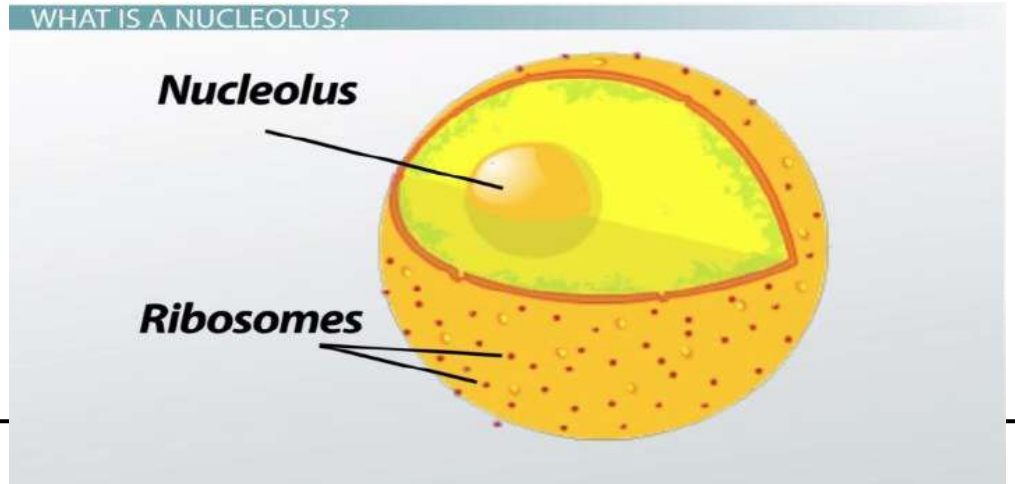
Chromatin - thin strands of material that fills the nucleus, contains information for directing a cells function.



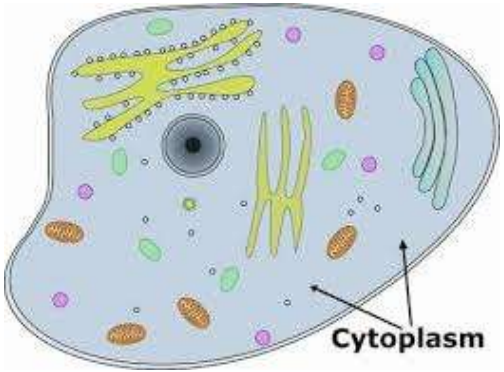
Nucleus

Nucleolus - the small, round structure in the nucleus

Ribosomes - are small grain-shaped organelles that produce proteins



Organelles in the Cytoplasm



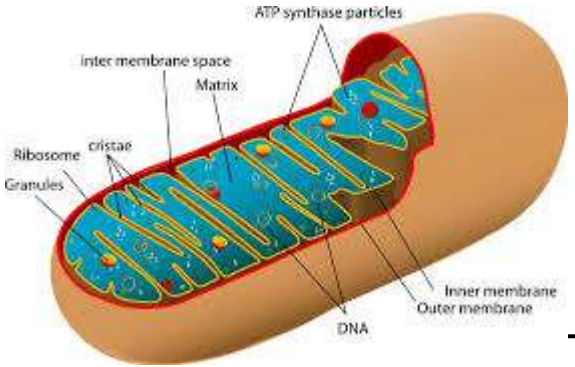
Cytoplasm - fills the region between the cell membrane and the nucleus

- Thick, clear, gel-like fluid
- Moves constantly with a cell
- Carrying along the nucleus and other organelles that have specific jobs.

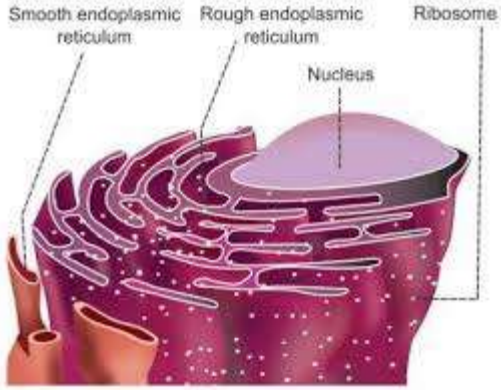
Mitochondria

Mitochondria - convert energy stored in food to energy the cell can use to live and function.

- Powerhouse
- Rod-shaped structure



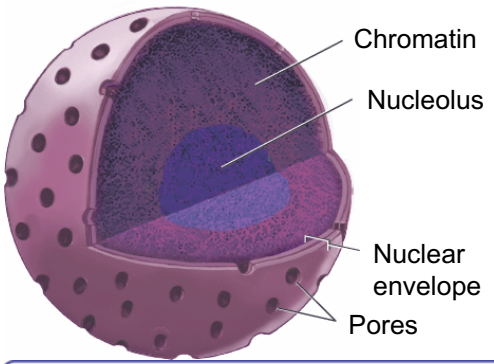
Endoplasmic Reticulum and Ribosomes

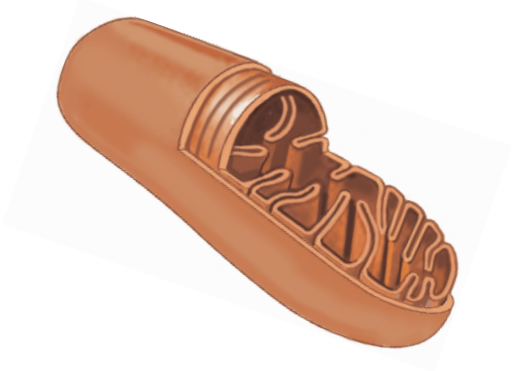


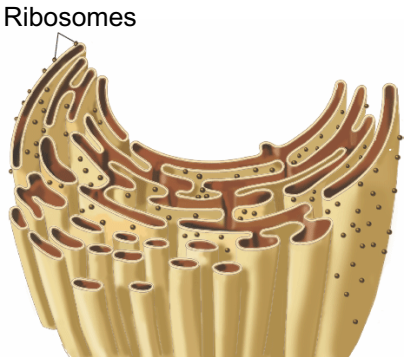
Endoplasmic reticulum (ER) - an organelle with a network of membranes that produce many substances.

- Ribosome dot some parts of the ER, while others float in the cytoplasm.
- The ER helps the attached ribosome make proteins
- The newly made proteins and other substances leave the ER and move to another organelle

Organelles of a Cell







What does the nuclear envelope do?

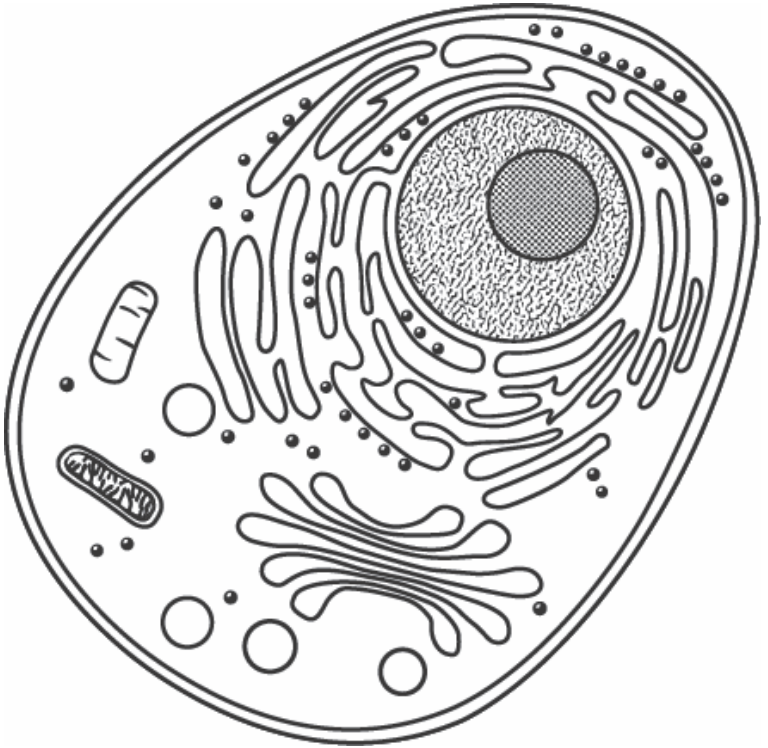
In what types of cells would you expect to find a lot of mitochondria

What do ribosomes do?

Figure 2 page 176

Coloring the Cells

- Nucleus
- Nucleolus
- Cytoplasm
- Mitochondria
- ER
- Ribosomes

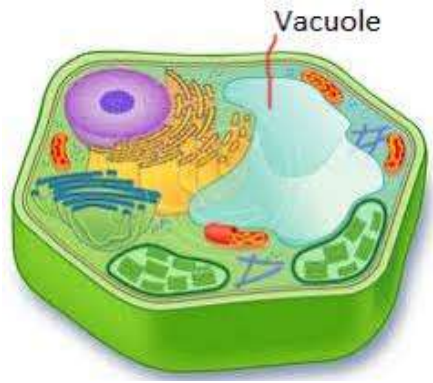


Golgi Apparatus

Golgi apparatus - receives proteins and other newly formed materials from the ER

- Looks like the flattened sacs and tube
- Packages proteins and distributes them to other parts of the cell or to the outside of the cell

Vacuoles



Vacuoles - sac that store water, food, or other materials need by the cell

- Can store waste products until wastes are removed
- Some animals cells do not have vacuoles, while other do.
- Storage tank

Chloroplast

Chloroplast - captures energy from sunlight and changes it to a form of energy cells can use in making food.

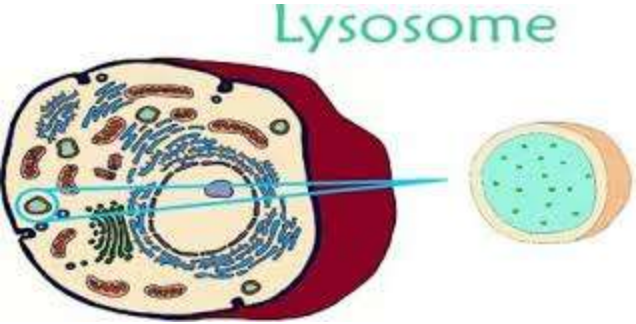
- ONLY in plant cells
- Green structure
- Make leaves green

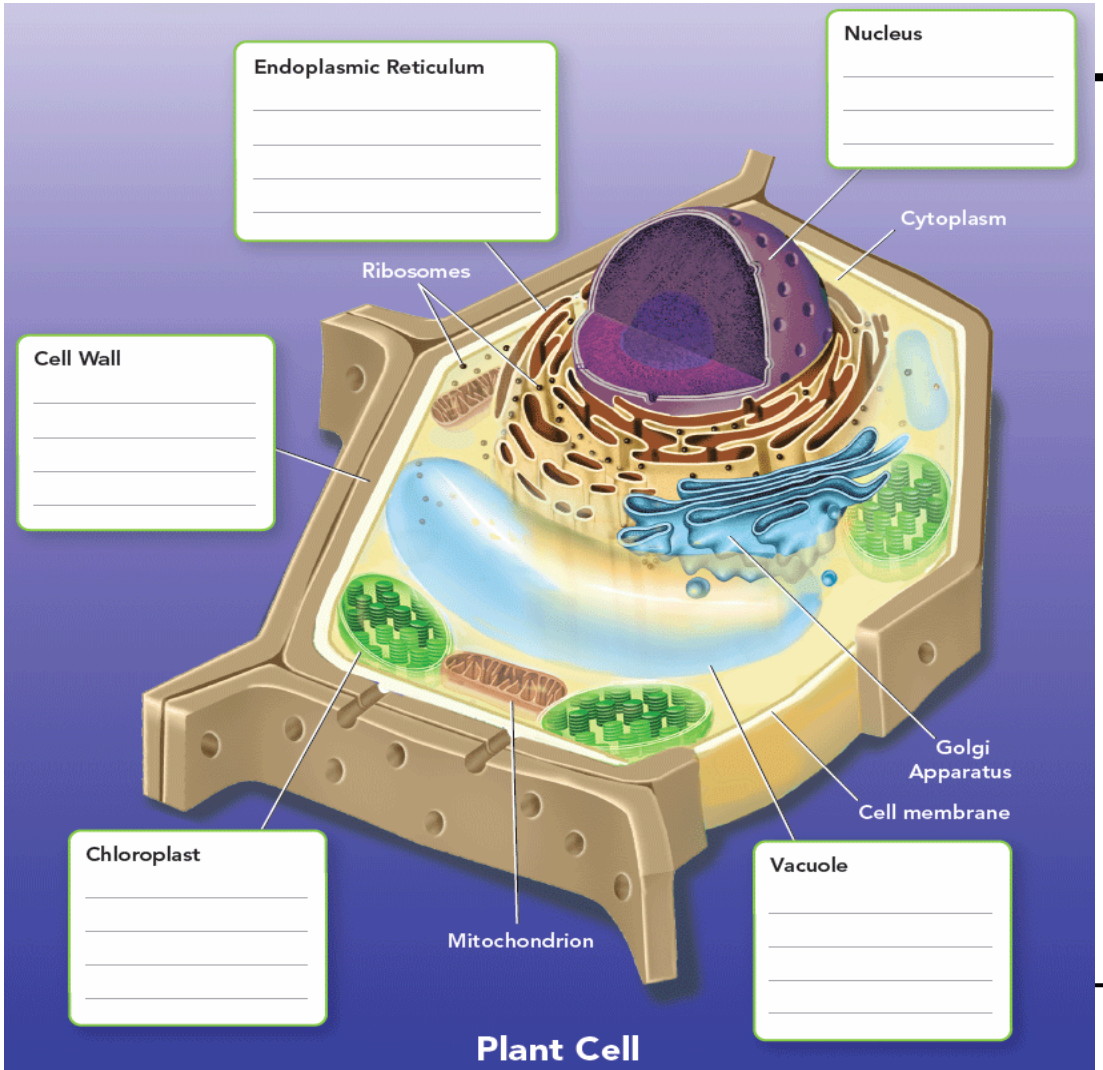
Page 181 Figure 5

Lysosome

Lysosome - saclike organelles which contains substances that break down large food particles into smaller one.

- Break down old cell parts and release the substane so they can be used again
- Recycling center.

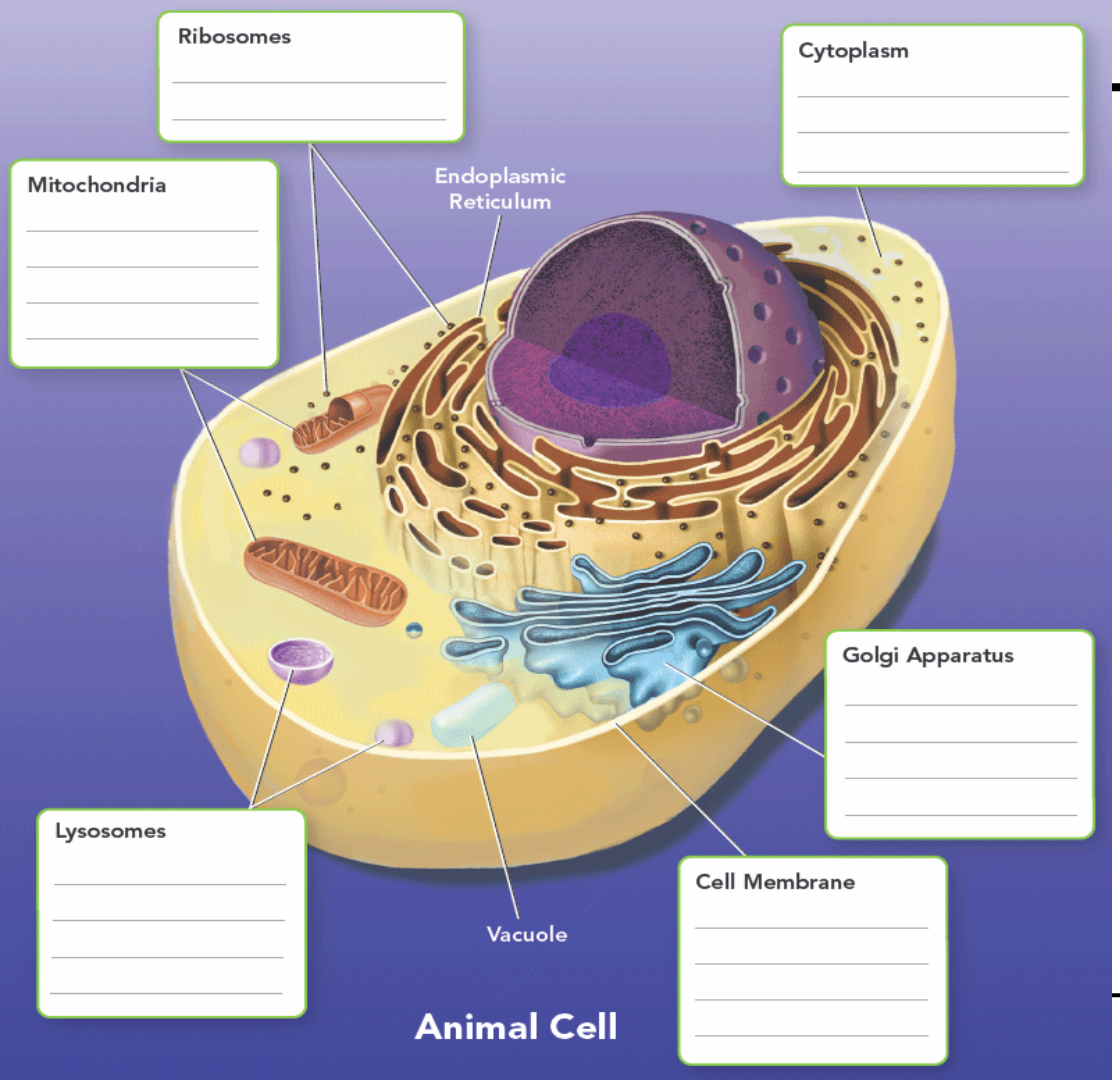




Cells in Living Things

Figure 3 Page 178

Describe the function of each structure in the boxes provided.



Cells in Living Things

Animal Cell

These illustrations show typical structures found in animal cells. What is the function of each structure?

Cells In LIving Things

Check the box for each structure present in plant cells or animal cells.

Structure	Cell wall	Cell membrane	Cytoplasm	Nucleus	Mitochondria	Chloroplasts	Ribosomes	Endoplasmic reticulum	Vacuoles	Golgi apparatus	Lysosomes
Plant cells											
Animal cells											

Organelle Trail!

Grab yer hat and saddle the broncs! It's time to head down the Organelle Trail.

You've just been made a U.S. Marshall!

Your job is to gather all of the information you can about a wanted organelle. At the end of this cybertrail, you will need to whip up a wanted poster to show to the other U.S. Marshalls in your camp (so that they will know to look for your wanted organelle too!)

Organelle Trail

How Do Cells Work Together in an Organism?

Multicellular - made of many cells

Unicellular - single celled

Cells perform specific functions that benefit the entire organism.

One type of cell does one kind of job, while other types of cells do other jobs.

Figure 6 page 182 Thi right cell for the Job

Cells Working Together

In multicellular organism, cells are organized into tissue, organs, and organ systems.

Tissue - a group of similar cells that work together to perform a specific function.

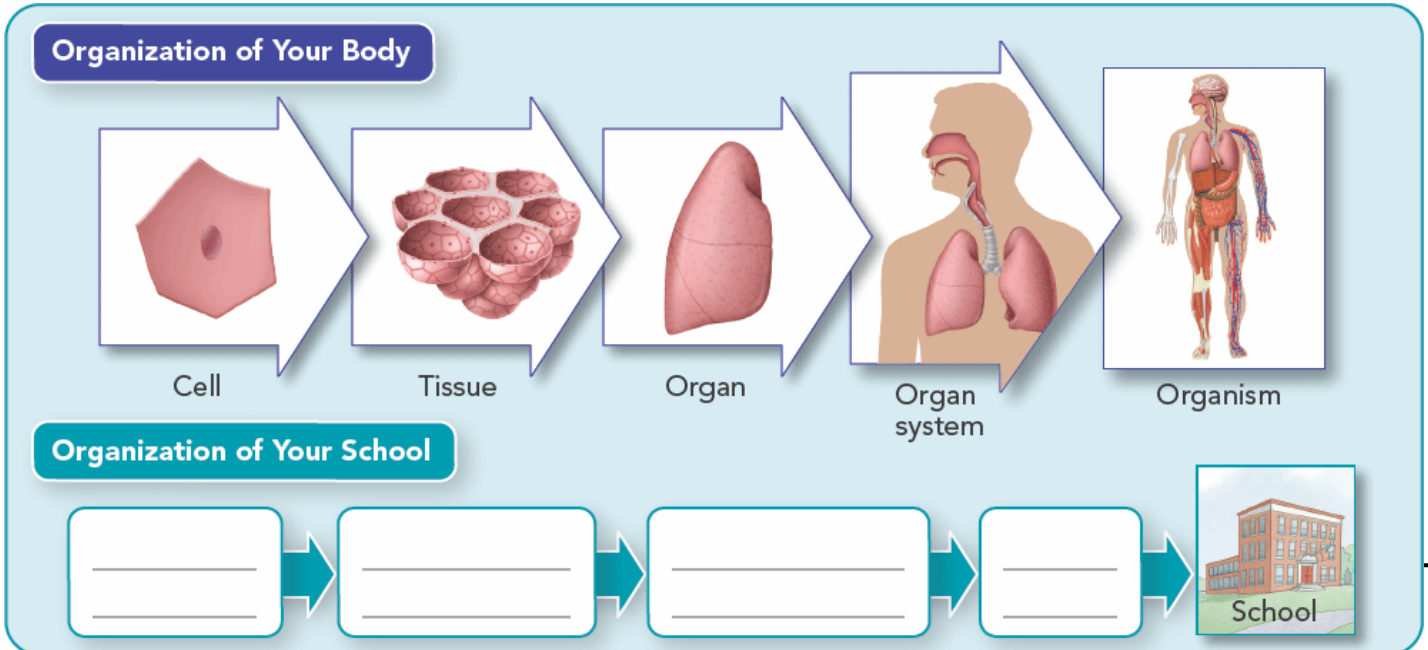
Organ - tissue that function together

Organ system - a group of organs that work together to perform a major function.

Levels of Organization

Levels of Organization

Living things and nonliving things as well are organized in levels of increasing complexity. What are the levels of organization of your school building?



Review

Looking Inside Cells

Fill in the blank to complete each statement.

1. The _____ controls the materials that enter and leave the cell.
   cell membrane
2. Ribosomes make _____.
   proteins
3. The _____ is a large structure that directs the cell's activities.
   nucleus
4. The storage area of a cell is called a(n) _____.
   vacuole

Review

Looking into Cells

5. A group of organs that work together to perform a major function is called a(n) _____ Organ system _____

6. _____ Organelles _____ are tiny cell structures that carry out specific functions in the cell.

Review

Looking Inside Cells

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

7. _____ Plant cells have chloroplasts, but animal cells do not.

8. _____ The cell's nucleus is filled with a substance called protein.

chromatin

Review

Looking into Cells

If the statement is true, write *true.* If the statement is false, change the underlined word or words to make the statement true.

9. Multicellular The specialized cells in a unicellular organism perform specialized jobs.

10. _____Ribosomes are made in a special region of the nucleus called the nucleolus.

Lesson 3

Chemical Compounds in Cells

What Are Elements and Compounds?

What Compounds Do Cells Need?

My Planet Diary - Energy Backpacks Page 184

How do you think the camel might be affected if it didn't have humps?

Detecting Starch

Starch is a substance that provides energy to living things. Starch is made up of a long chain of glucose molecules. When an organism uses starch, it begins by breaking the starch down into glucose, a sugar the cells can use for energy.

Materials

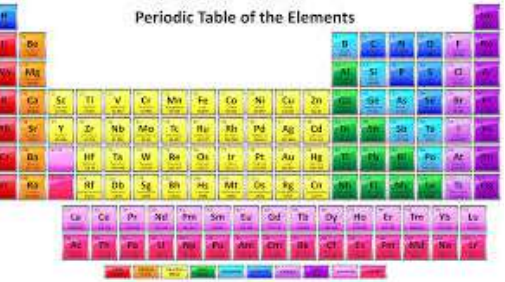
3 plastic cups
soda crackers
bread slices
granulated sugar
iodine solution
dropper

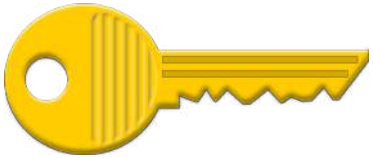
Procedure

1. Place a cracker in one plastic cup, a small piece of bread in a second plastic cup, and a tablespoon of sugar in a third plastic cup.
2. Iodine solution turns black in the presence of starch. Make a prediction about what will happen when you add three drops of iodine to each sample

What did your results tell you about the three samples?

What Are Elements and Compounds?



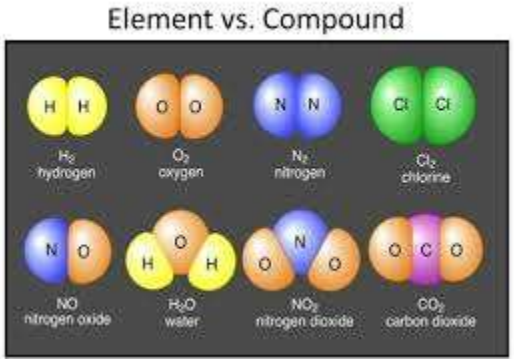


You are made of many substances. These substances supply the raw materials that make up your blood, bones, muscles, and more. They also take part in the processes carried out your cells.

Elements - is any substance that cannot be broken down into simpler substances.

Ex. Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus, Sulfur

What Are Elements and Compounds?

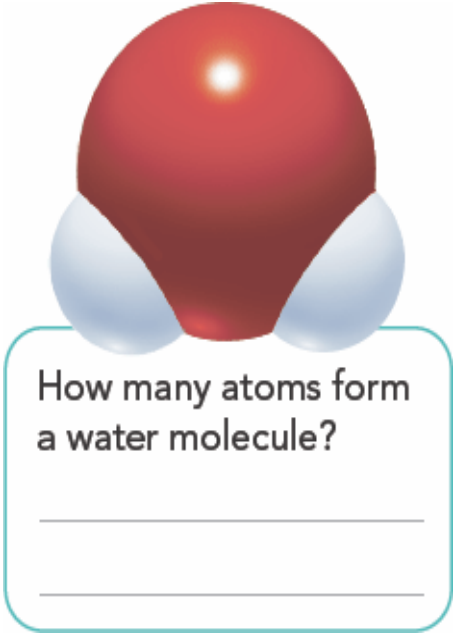


Compounds - form when two or more elements combine chemically

Most elements in living things occur in the form of compounds.

Ex. carbon dioxide, water, sugar

Molecules and Compounds



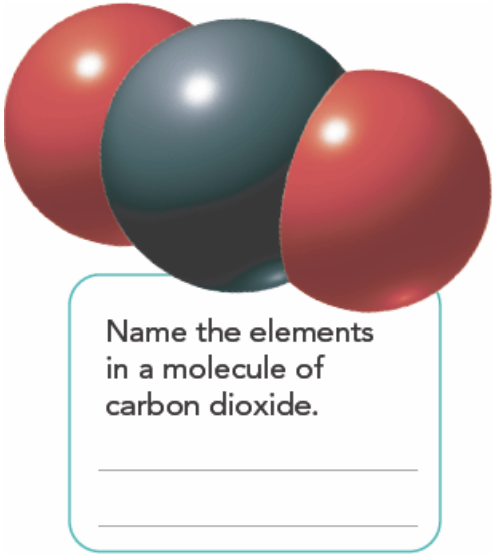


Figure 1 Page 185 Molecules and Compounds

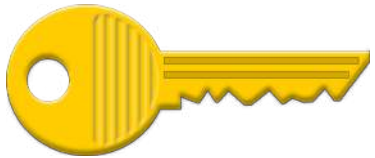
Assess Your Understanding Page 185

What Compounds Do Cells Need?

Many of the compounds in living things contains the elements carbon.

Organic Compounds - compounds that contains carbon

Inorganic Compounds - compounds that don't contain carbon.



Some important groups of organic compounds that living things need are carbohydrates, lipids, proteins and nucleic acids. Water is a necessary inorganic compound.

Figure 2 Energy-Rich Compounds page 186

Carbohydrates

Carbohydrates - energy rich organic compounds made of the elements carbon, hydrogen and oxygen.

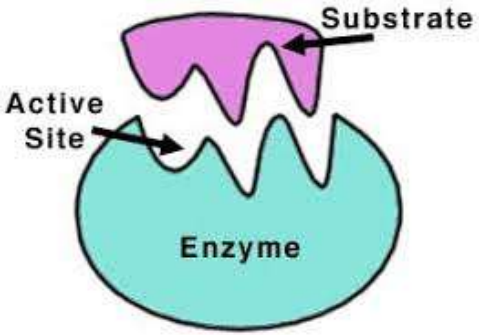
- The food-making process in plants produces sugars
- Fruits and some vegetables ahve a high sugar content
-

Lipids

Lipids - are compounds that are made mostly of carbon and hydrogen and some oxygen.

- Cell membranes consist mainly of lipids
- Fats, oils and waxes are all lipids
- Foods high in fats include whole milk, ice cream and fried foods

Proteins



Proteins - are large organic molecules made of carbon, hydrogen, oxygen, nitrogen and in some cases sulfur.

- Food that are high in proteins include meath, dairy products, fish, nuts, and bean.
- Protein form part of a cell's membrane and make up parts of the organelles with a cell.

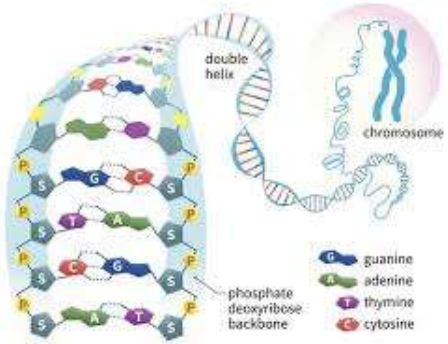
Enzymes - a group of proteins that speed up chemical reactions in living things.

Proteins

Figure 3 Page 187

Type of Compound	Elements	Functions
Carbohydrate		
Lipid		
Protein		

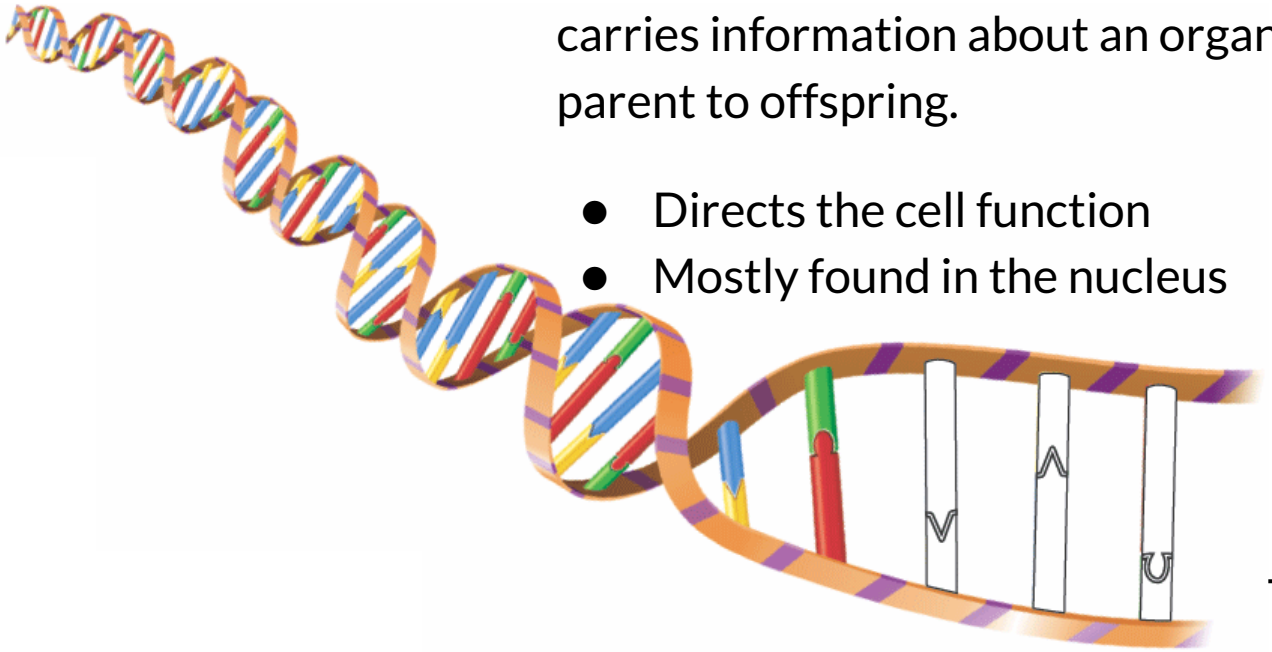
Nucleic Acids



Nucleic Acid- are very long organic molecules.

- The consist of carbon, oxygen, hydrogen, nitrogen and phosphorus
- Contains the instruction that cells need to carry out all the functions of life.
- Foods that are high in nucleic acids are red meat, shelfish, mushrooms and peas.

DNA



DNA - (deoxyribonucleic acid) - is the genetic material that carries information about an organism and is passed from parent to offspring.

- Directs the cell function
- Mostly found in the nucleus

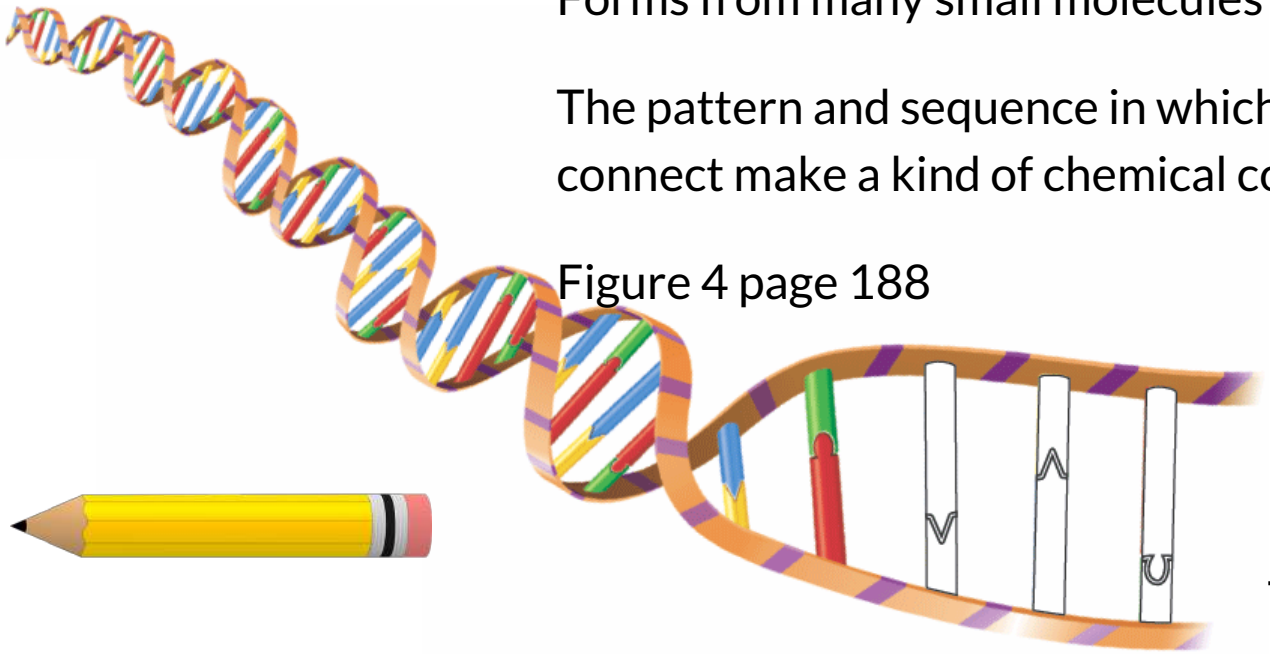
DNA

Double Helix - the shape of a DNA molecule

Forms from many small molecules connected together.

The pattern and sequence in which these molecules connect make a kind of chemical code the cell can “read”

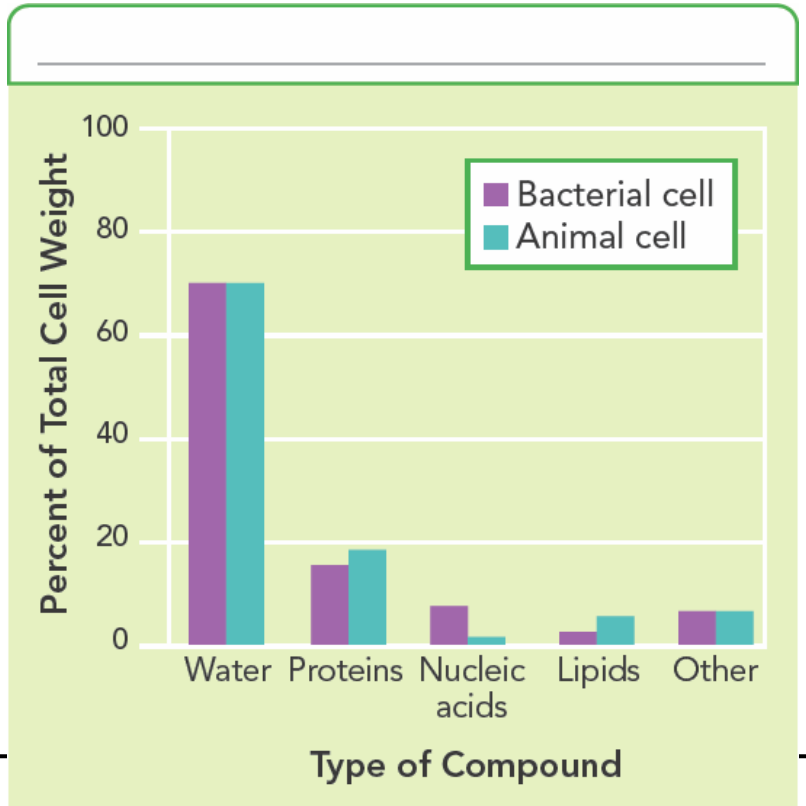
Figure 4 page 188



Smaller molecules connect in specific patterns and sequences, forming DNA. What would be the pattern of colors in the missing area?

Do the Math page 188

The graph compares the percentages of some compounds found in a bacterial cell and in an animal cell. What would be a good title for the graph?



Water and Living Things

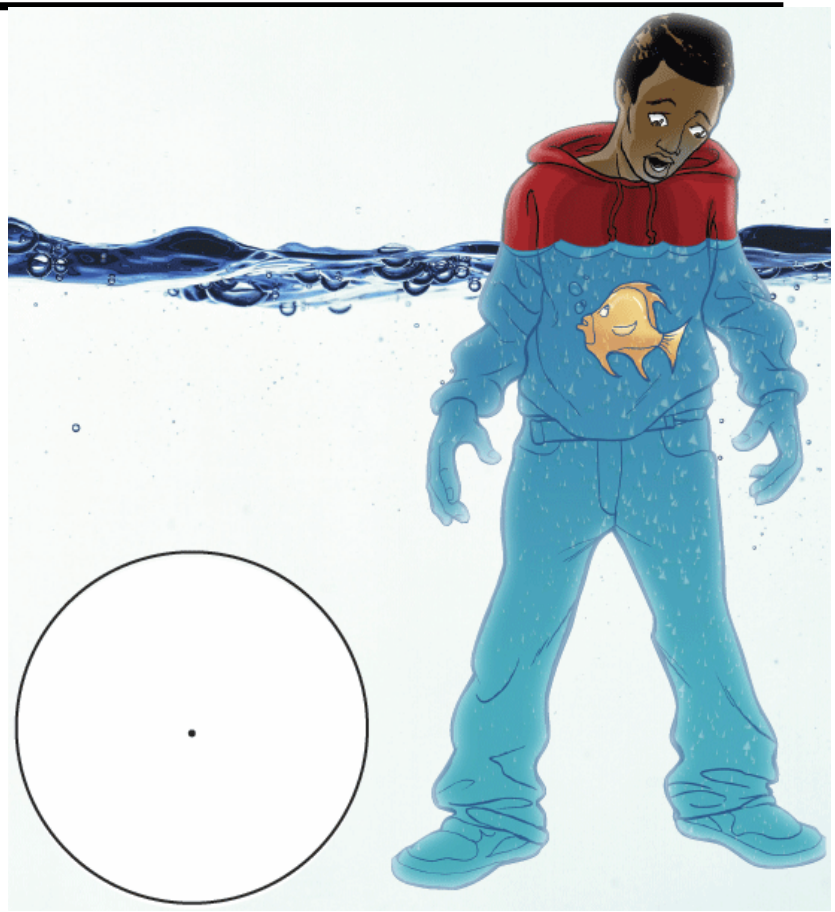
Water plays many important roles in cells.

- Most chemical reaction in cells depend on substances that must be dissolved in water to react.
- Water itself takes part in many chemical reactions in cells
- Water also helps cells keep their shape
- Water changes temperature slowly, so it helps keep the temperature of cells from changing rapidly
- Water also plays a key role in carrying substance into and out of cell.

Mostly Water

Figure 5 page 189
About two thirds of the human body is water. Complete the circle
graph to show the percentage of water in your body.

Assess Your Understanding
page 189



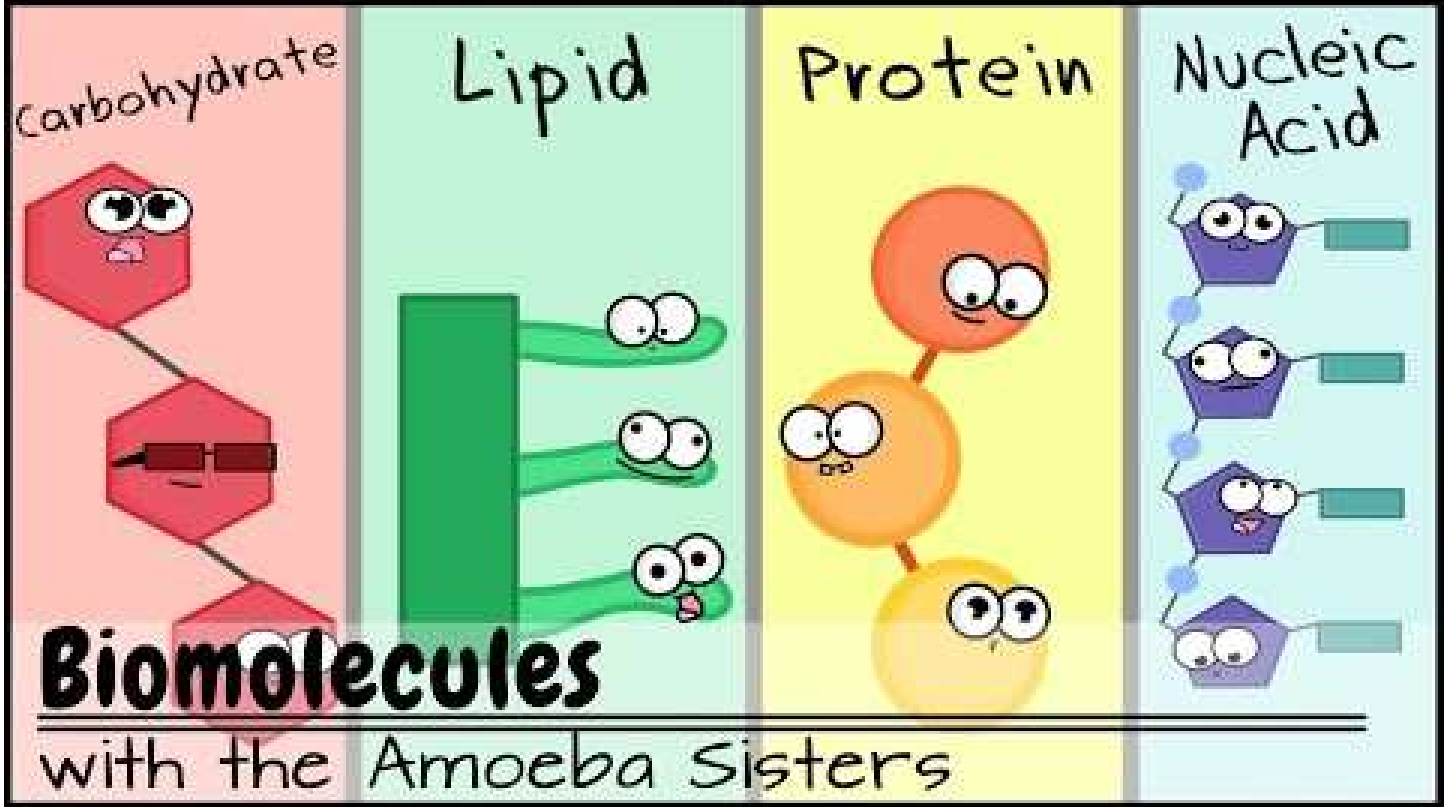
What's that Taste?

An enzyme is a special type of protein that speeds up chemical reactions occurring in living things. In this activity, you will investigate the important role that enzymes play in your body.

Materials

Unsalted soda crackers

1. Make sure you are not allergic to the ingredients in the crackers before you do the activity. Put an unsalted soda cracker in your mouth. Chew it, but do not swallow. Note what the cracker tastes like.
2. Continue to chew the cracker for a few minutes, mixing it well with your saliva. Note how the taste of the cracker changes.


Carbohydrate
Lipid
Protein
Nucleic Acid
Biomolecules
with the Amoeba Sisters

Review

Chemical Compounds in Cells

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

1. C ____ carbohydrate

2. D ____ carbon

3. A ____ water

4. B ____ oxygen

a. inorganic compound

b. element found in water

c. energy-rich organic compound

d. element that is part of most organic compounds

Review

Chemical Compounds in Cells

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

5. Carbohydrates Sugars and starches are examples of lipids.

6. Lipids Proteins are part of cell membranes and store energy.

7. _____ A(n) enzyme helps speed a chemical reaction.

Review

Chemical Compounds in Cells

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

8. Nucleic Acids Carbohydrates direct cell functions.

9. Two-thirds Water makes up one-third of the human body.

10. _____ Meat, dairy products, fish, nuts, and beans are all foods that are high in protein.

Lesson 4

The Cell in Its Environment

How Do Materials Move Into and Out of Cells?

My Planet Diary Something Good in the Air Page 190

Diffusion in Action

Diffusion refers to the intermingling of substances by the natural movement of their particles. In this activity, you will see how diffusion works by observing water and food coloring.

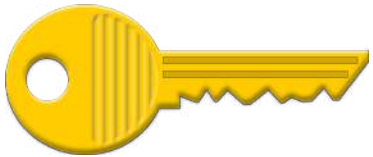
Materials

clear plastic cup
food coloring
cold water
plastic dropper
clock or watch

Procedure

1. Fill the clear plastic cup with cold water. Place the cup on the table and allow it to sit until there is no movement in the water.
2. Wear a lab apron to protect your clothes and gloves to protect your hands. Use a plastic dropper to add one large drop of food coloring to the water.
3. Check the time. Observe the water every minute. Record any changes that take place at the beginning of each minute. Continue to observe until you can no longer see any changes.

How Do Materials Move Into and Out of Cells?

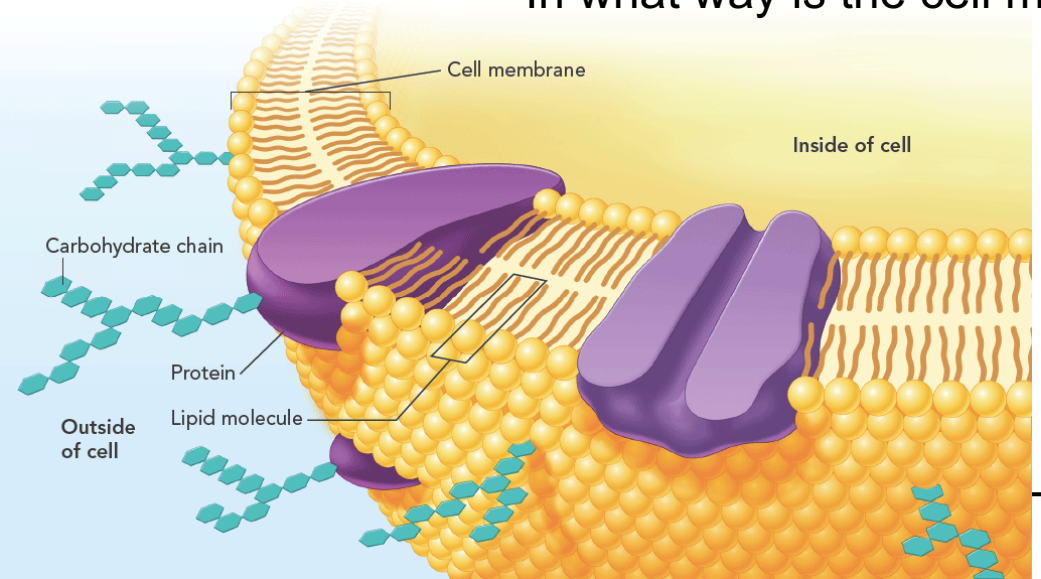


- Cells have structures that protect their contents form the world outside the cell.
- Cells must let certain materials enter and leave.
- Oxygen, water, and food must be able to move into a cell
- Carbon dioxide and other waste materials must move out.
- Gatekeeper?

Importance of Cell Membrane

Every Cell is surrounded by a cell membrane

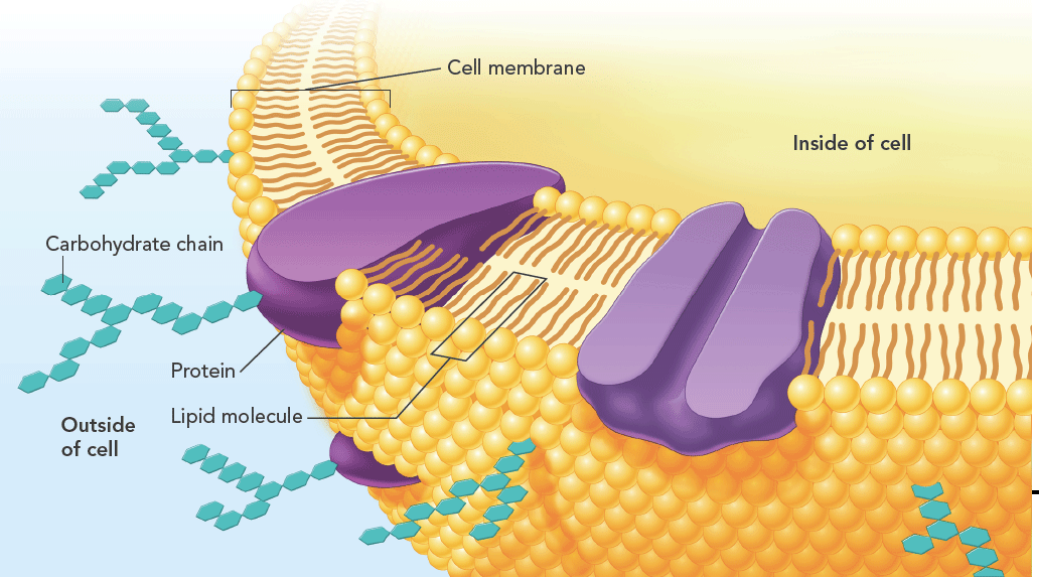
A Selective Barrier Figure 1 page 191
In what way is the cell membrane like a gatekeeper?



The cell membrane consist of a double layer of lipid are molecules lined up side by side. Here and there in the double layer of lipid molecules, you can see proteins, some with chains of carbohydrates attached.

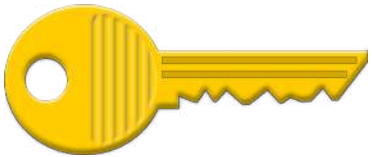
Importance of Cell Membrane

Other carbohydrates chains sit on the surface of the membrane. All these molecules play important roles in helping materials move through the cell membrane.



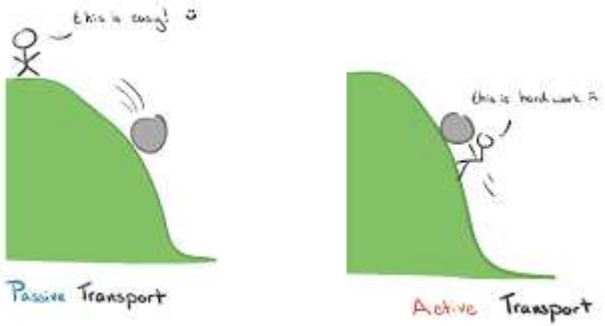
Selectively Permeable - some substances can cross the membrane while others cannot.

Diffusion and Osmosis: Forms of Passive Transport



Substances that can move into and out of a cell do so by means of one of two process:

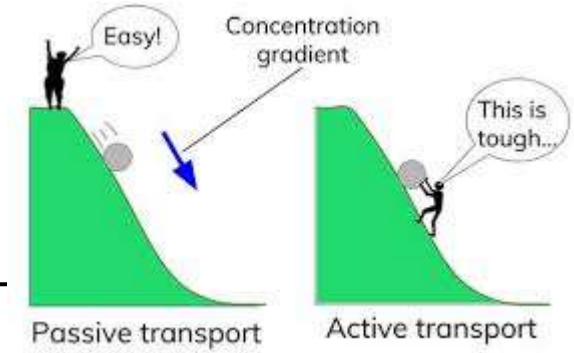
1. *Passive Transport*
2. *Active Transport*



Diffusion and Osmosis: Forms of Passive Transport

Moving materials across the cell membrane sometimes requires the cell to use its own energy. At other times, the cell uses no energy.

Passive Transport- The movement of dissolved materials across a cell membrane without using the cells energy.



Diffusion and Osmosis: Forms of Passive Transport

Molecule are always moving.

The more molecules there are in a space, the more the are said to be concentrated in that space.

So they collide more often, eventually they spread evenly throughout the space

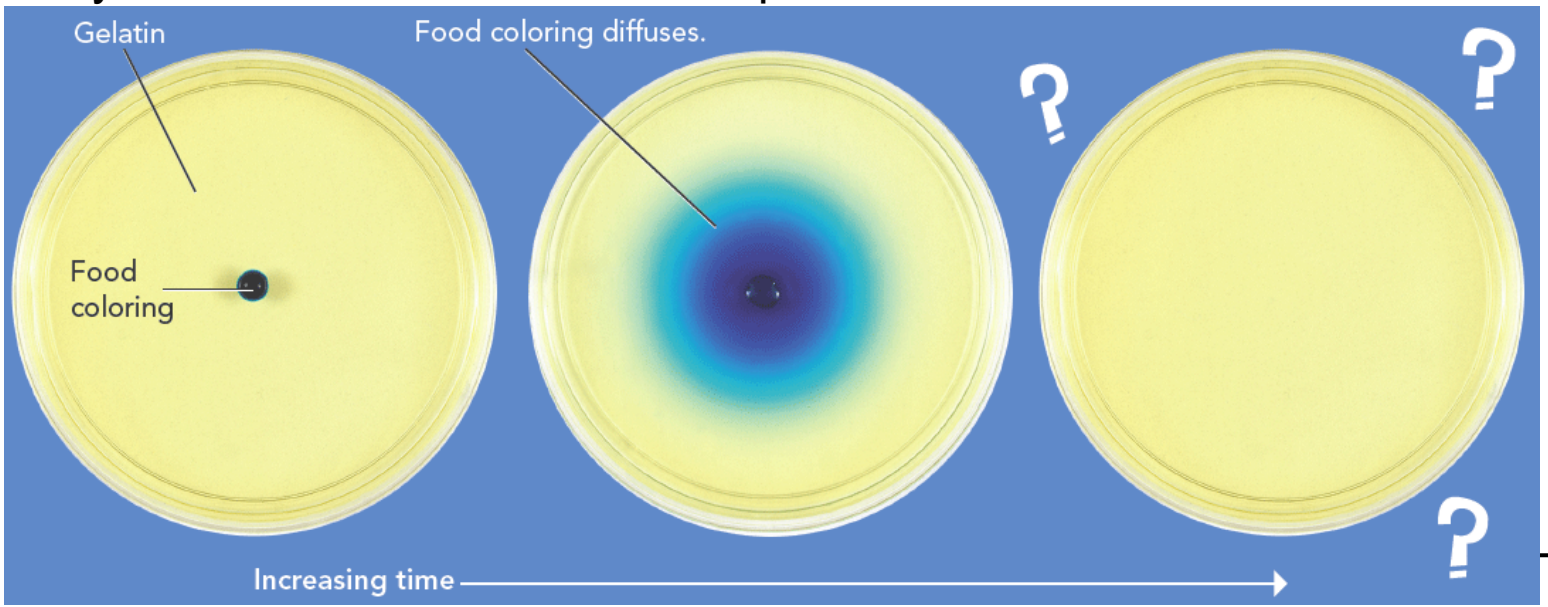
Diffusion- is the process by which molecules move from an area of higher concentration to an area of lower concentration.

Relate Cause and Effect Page 192

Figure 2 Diffusion Page 192

Diffusion

A drop of food coloring in a plate of gelatin gradually spreads as molecules of the dye diffuse. How would the third plate look if diffusion continues?



Osmosis

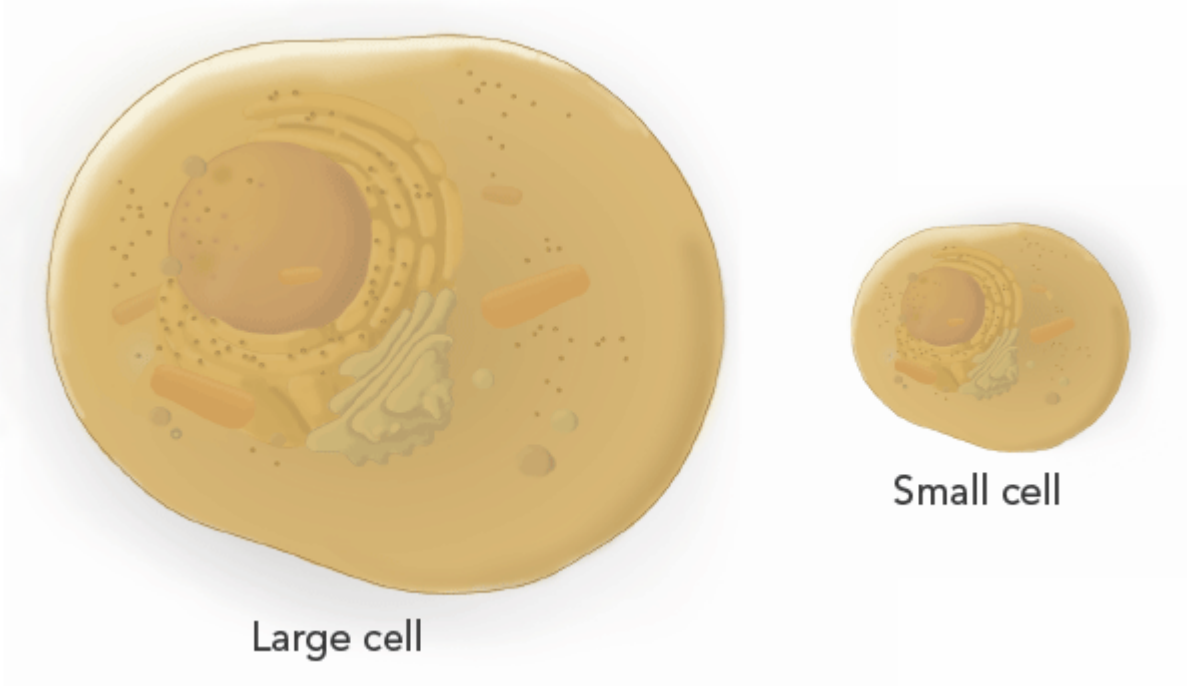
Osmosis - is the diffusion of water molecules across a selectively permeable membrane.

- It a form of passive transport
- Osmosis can have important effects on cells and entire organism.
- Under certain conditions, osmosis can cause water to move out of the cells more quickly than it moves in.
- The cytoplasm shrinks and the cell membrane pulls away from the cell wall. The cell can die

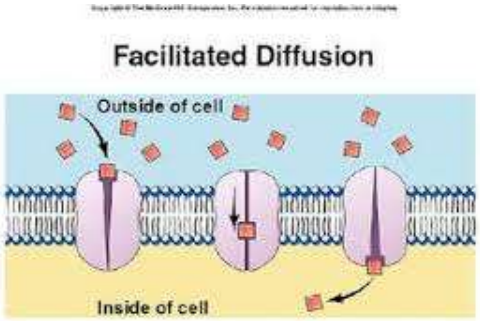
Figure 3 page 193

Apply It Page 193

Large Cell and Small Cell
How does the difference in the size of cells affect their processes?



Facilitated Diffusion

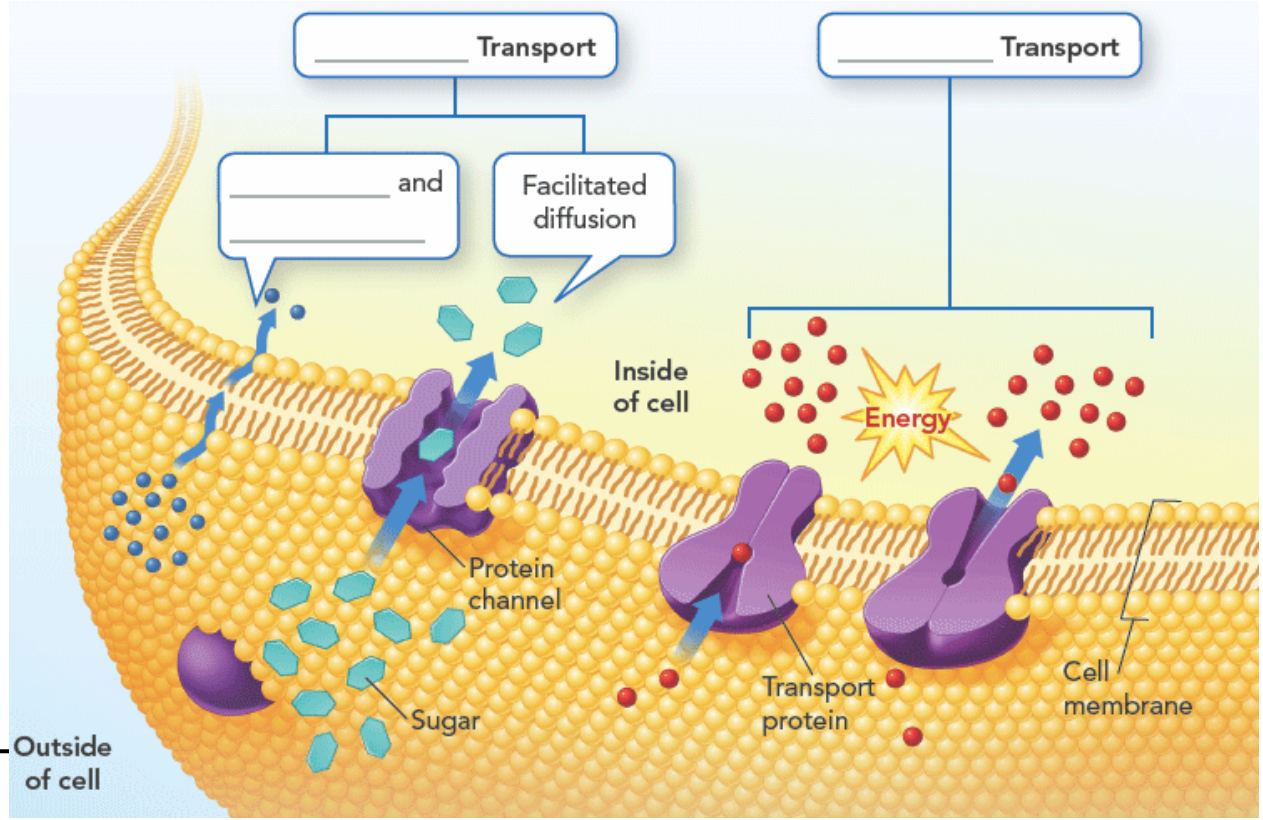


- Oxygen and carbon dioxide diffuse freely across a cell membrane.
- Others molecules, such as sugar , do not.
- Sugar cannot cross easily through the membrane's lipid molecules.
- Facilitate "to make easier"
- Proteins provide a pathway for the sugars to diffuse
- Another form of Passive Transport

Crossing the Cell Membrane

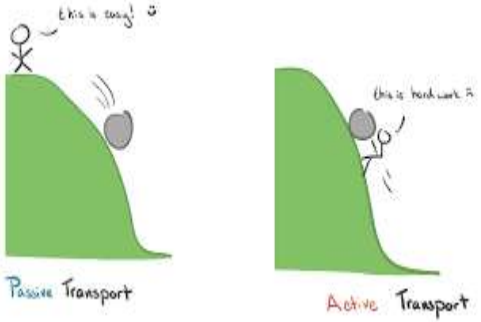
Crossing the Cell Membrane

Molecules move into and out of a cell by means of passive or active transport. Complete the boxes, and describe where the concentration of each substance is high or low.



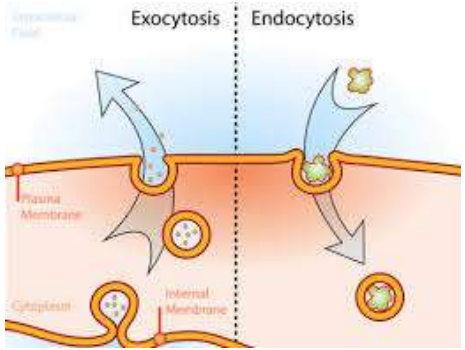
Active Transport

Active Transport - is the movement of materials across a cell membrane using cellular energy



- Molecules in cells must often move in the opposite direction from the way they would naturally move due to diffusion.
- Move from a place of lower concentration to a place of higher concentration
- Cells have to supply the energy to do this work
- Pick up specific molecules and carry them across the membrane. (Calcium, postassium, and sodium)

Moving Large Particles



Endocytosis - the cell membrane changes shape and engulfs the particle.

Exocytosis - allows large particles to leave a cell.

Figure 5 Page 195

Assess Your Understanding

Review

The Cell in Its Environment

Fill in the blank to complete each statement.

1. Water diffusing through a semipermeable membrane is called _____osmosis_____.

2. _____Endocytosis_____occurs when a cell engulfs large food particles.

Review

The Cell in Its Environment

Fill in the blank to complete each statement.

3. The cell membrane is built of a double layer of ~~Lipid~~ .

4. Facilitated diffusion moves large molecules through ~~Protein channels~~.

Review

The Cell in Its Environment

Fill in the blank to complete each statement.

5. The _____ controls the materials that move into and out of a cell.

Cell membrane

6. The _____ use energy to pick up specific molecules and carry them across the cell membrane.

Transports proteins

Review

The Cell in Its Environment

7. Glucose enters a liver cell through a protein channel.

A diffusion
B facilitated diffusion
C osmosis
D active transport

Review

The Cell in Its Environment

8. Oxygen moves into a contracting heart muscle cell.

A diffusion
B facilitated diffusion
C osmosis
D active transport

Review

The Cell in Its Environment

9. A nerve cell uses energy to pump sodium out of its cytoplasm into a sodium-rich environment.

A diffusion

B facilitated diffusion

C osmosis

D active transport

Review

The Cell in Its Environment

10. Water moves out of the skin cells of a person swimming in a freshwater pond.

A diffusion
B facilitated diffusion
C osmosis
D active transport