#### **Structures and Functions of Living Organisms**

#### **Structures and Functions of Living Organisms**

## 7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.

7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including: • Euglena • Amoeba • Paramecium • Volvox

7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).

7.L.1.3 Summarize the hierarchical organization of multicellular organisms from cells to tissues to organs to systems to organisms.

7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life.

# Share and Share Alike What characteristics do living things share?

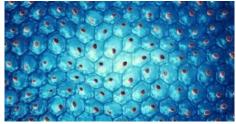
•Living things that exist on Earth may seem very different, but they are alike in several ways.

•There are five characteristics that all living things share.

•All living things are made of one or more cells.

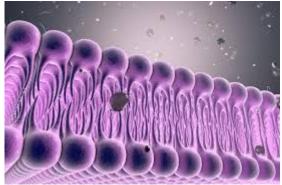
•A **cell** is a membrane-covered structure that contains all of the materials necessary for life.

•Cells are the smallest unit of life, which means they are the smallest structures that can perform life functions.



•Most cells are so small they cannot be seen without a microscope.

•The membrane that surrounds a cell separates the cell's contents from its environment.



•Unicellular organisms are made up of only one cell.

•Multicellular organisms are made up of more than one cell.

•Some multicellular organisms have trillions of cells that usually perform specialized functions.



•All living things have the ability to sense change in their environment and to respond to that change.

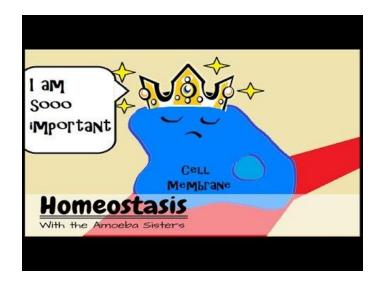
•A change that affects the activity of an organism is called a **<u>stimulus</u>**.

•A stimulus can be gravity, light, sound, a chemical, hunger, or anything else that causes an organism to respond in some way.

•Conditions inside an organism's body must stay relatively constant.

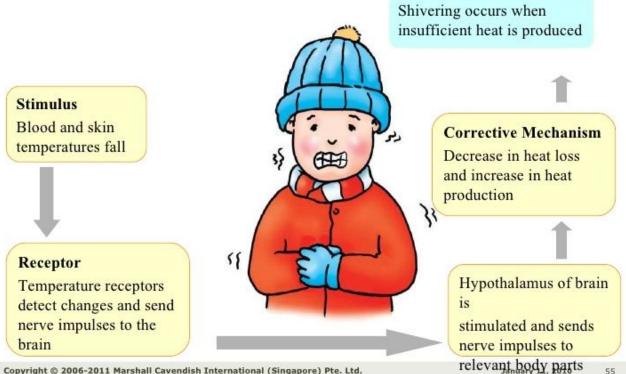
•Chemical reactions keep an organism alive and can happen only when conditions are exactly right.

•An organism must maintain stable internal conditions to survive. This maintenance is called <u>homeostasis</u>.



#### **Regulating Body Temperature - on a Cold Day**

Marshall Cavendish



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•Organisms make other organisms through the process of reproduction.

•When organisms reproduce, they pass copies of all or part of their DNA to their offspring.

•DNA, or deoxyribonucleic acid, is the genetic material that controls the structure and function of cells.

•DNA is found in the cells of all living things.

•Offspring share characteristics with their parents because they receive DNA from their parents.

•Living things reproduce using sexual reproduction or asexual reproduction.

•Two parents produce offspring that share the characteristics of both parents through the process of **sexual reproduction**.

•Each offspring receives part of its DNA from each parent.

•Most animals and plants reproduce using sexual reproduction.

•A single parent produces offspring that are identical to the parent through the process of **asexual reproduction**.

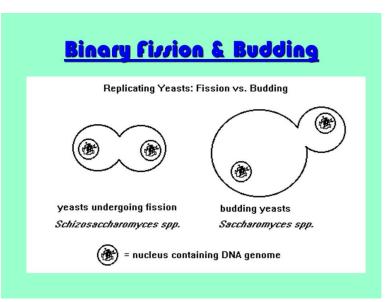
•Each offspring receives an exact copy of the parent's DNA.

•Most unicellular organisms and some plants and animals reproduce using asexual reproduction.

•Two methods of asexual reproduction are binary fission and budding.

•A unicellular organism splits into two parts during binary fission.

•During budding, a new organism grows on the parent organism until it is ready to separate.



•Living things need energy to carry out the activities of life.



•Energy allows organisms to make or break down food, move materials into and out of cells, and build cells.

•Energy also allows organisms to move and to interact with each other.

•Plants convert energy from the sun into food, which they store in their cells until they need to use it.

•Organisms that cannot make their own food must eat other organisms to gain energy. Some eat plants; others eat animals.

•Organisms such as fungi break down decaying material to gain energy.

•All living things grow during some period of their lives.

•When a unicellular organism grows, it gets larger and then divides, forming two cells.

•When a multicellular organism grows, the number of cells in its body increases, and the organism gets bigger.



#### •How does a bird develop and change as it grows?



# Stayin' Alive

### What do living things need to survive?

•Almost all organisms need water, air, food, and a place to live in order to survive.

•Water is essential for life.



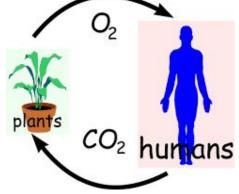
•Cells are mostly made of water, and most chemical reactions in cells require water.

### What do living things need to survive?

•Air contains gases that organisms need to survive.

•Cells use oxygen in air to release energy from food.

•Organisms such as plants use the carbon dioxide in air to make food.



### What do living things need to survive?

•Food provides organisms with the energy and nutrients that they need to survive.

•A place to live protects organisms from harm and contains the other necessities of life.

•Organisms often compete for food, water, and the best place to live.



#### How do living things get food?

•Food gives living things the energy and nutrients they need to perform life processes.

•Nutrients include carbohydrates, lipids, and proteins.

•Fruits, vegetables, and grains provide carbohydrates. Nuts and fats provide lipids. Meats, nuts, and vegetables provide proteins.

### How do living things get food?

•Producers, such as plants and algae, make their own food. Plants and algae use energy from the sun to make

food.



•Consumers, such as deer, mice, and eagles, eat other organisms.



### How do living things get food?

•Decomposers, such as worms and fungi, break down dead organisms or wastes to get food. They return nutrients that plants can use to the soil.



## On the Move!

## What are some characteristics of protists?

•The kingdom **Protista** is a group of eukaryotic organisms that cannot be classified as fungi, plants, or animals.

•Members of the kingdom Protista are called protists, which are a very diverse group of organisms.

•Many members are not closely related or are more closely related to members of other kingdoms, so classification of protists is likely to change.



•Most protists are single-celled organisms that cannot be seen without a microscope.

•Diatoms are single-celled protists that have cell walls with unusual shapes.

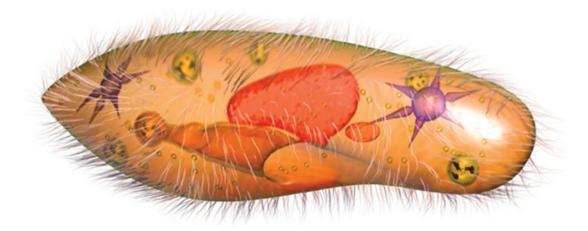
 Some have many cells, and some live in colonies. Volvox, a kind of green algae, has cells that form spherical colonies.

•Protists have membrane-bound organelles, which are structures that carry out jobs inside a cell.

•Many protists have contractile vacuoles that remove excess water from the cell.

•Some protists have structures for movement. Most protists that move do so in order to find food.

•Some protists move by using <u>cilia</u> or hairlike structures that beat rapidly back and forth.



•Other protists use a flagellum, a whiplike structure that propels the cell forward, to move.

•Amoebas move by stretching their bodies, forming a *pseudopod* or "false foot." When cytoplasm flows into the pseudopod, the rest of the cell follows.



## **Protist Production**

#### How can protists reproduce?

•Most protists can reproduce asexually, when the offspring come from just one parent.

•Every organism can produce offspring that are genetically identical to the parent.

#### How can protists reproduce?

•Protists can reproduce asexually by binary fission and fragmentation.

•During binary fission, a single-celled protist copies its DNA. The protist then divides into two cells, each of which has a copy of the DNA.

•In fragmentation, a piece breaks off an organism and develops into a new individual. Many multicellular protists reproduce this way.

#### How can protists reproduce?

•Some protists reproduce sexually, when two cells, called **gametes**, join together.

•Each gamete contains a single copy of the genes for the organism. A cell with one copy of genetic material is *haploid*; a cell with two copies is *diploid*.

•Each gamete comes from a different parent. When the haploid gametes join, the diploid offspring has a unique combination of genetic material.

#### How can protists reproduce?

•In some protists, generations alternate between using sexual and asexual reproduction.

•Haploid generation adults are called *gametophytes*. Diploid generation adults are called *sporophytes*.

•Dipolid adults undergo meiosis to make haploid spores.

•**Spores** are reproductive cells that are resistant to stressful environmental conditions.

## A Diverse Group

#### What are different kinds of protists?

•Animal-like protists cannot make their own food.

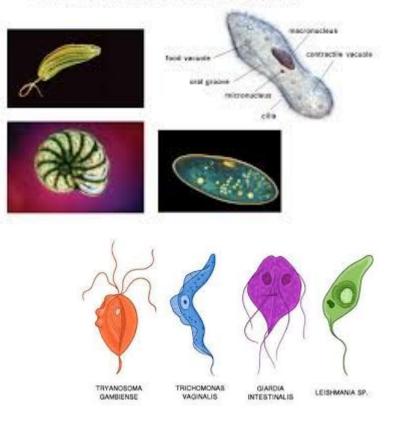
•They get nutrients by ingesting other organisms. Many eat small organisms such as bacteria, yeast, or other protists.

 Most animal-like protists can move, allowing them to search for food.

#### 19.2 Animal-like Protists

#### Animal-like protists move in various ways.

· Animal-like protists are often called protozoa.



#### What are different kinds of protists?

•Fungus-like protists absorb nutrients from the environment. Many absorb nutrients from living or dead organisms.

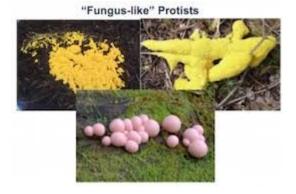
•Fungus-like protists produce spores that are used in reproduction.

•Protists release spores into the environment. The spores can survive through periods of harsh conditions.

#### **Funguslike Protists**



- · Like animals they are heterotrophs
- · Like plants they have cell walls
- Reproduce by spores (tiny cells that can grow into a new organism)
- Not in fungi kingdom because they can move at one point in their lives.
- An example is mildew.



### What are different kinds of protists?

•Plant-like protists are producers, which means they use the sun's energy to make food through photosynthesis.

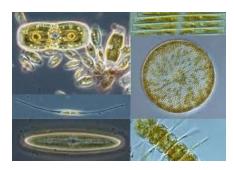
•Single-celled, free-floating, plant-like protists are a main part of the ocean's phytoplankton.

•Phytoplankton—tiny, floating organisms—provide food for larger organisms. They also produce much of the world's oxygen.

#### **Plant-like Protists**

- Example: algae, giant kelp
- Autotrophs
- Size: microscopic unicellular to very large multicellular
- Like plants cell walls made of cellulose (sugar)
- Contain different pigments so they come in different colors.
- Euglena: special type of algae -when there is no sunlight they become heterotrophic.









### What are different kinds of protists?

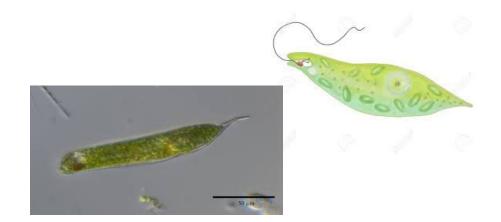
•Multicellular plant-like protists are called **algae**.

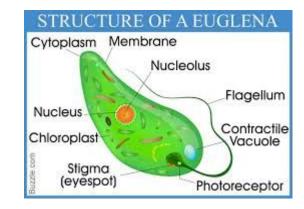
•All algae have the green pigment chlorophyll in their cells. Many also have other pigments.

•Algae are grouped by color, which determines what wavelengths of light the algae can absorb. The three main groups are brown algae, red algae, and green algae.

## Euglena

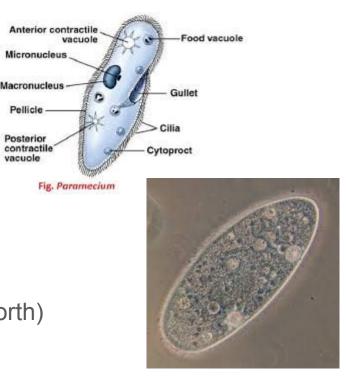
- Single-celled Protist that lives in freshwater
- Captures food by eating other organisms
- Has Chlorophyll
- Flagellate eukaryotes
- Eyespot helps it sense light
- Waste contractile vacuole collects excess water then squirts it out of the cell.
- Movement by a flagella
- Reproduction asexual (binary fission)
- Special features shape changes easily so it can move around





## Paramecium

- Found in freshwater
- This is a complex single-celled organism.
- Cilia sweep food into food passageway.
- Waste -
  - Anal pore (food waste is removed) Ο
  - Contractile vacuole (water waste removed) 0
- Movement cilia (tiny hairs that move back and forth)
  - Cilia also sweep feed into the oral groove and gullet 0
- Reproduction sexual (two parents)
- Special features two nuclei (macronucleus and micronucleus)



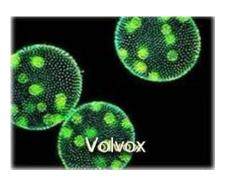
Pellicle

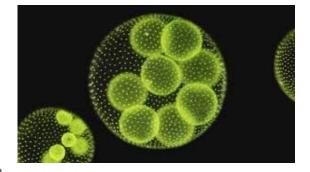
Posterior contractile

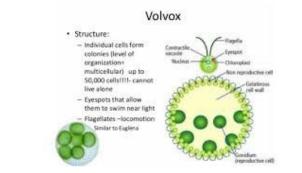
vacuole

## Volvox

- Found in ponds, ditches and puddles.
- Composed of a colony of more than 50,000 tiny cells
- Often called algae.
- Photosynthesis and flagella help bring in nutrients.
- Eyespots sense light.
- Movement many flagella help move the colony.
- Reproduction asexual and sexual, daughter colonies created.



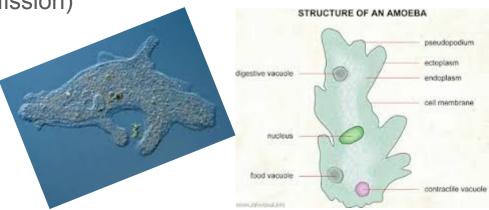




## Amoeba

- Found in freshwater and saltwater around a lot of dead and decaying material
- Hunter
- Can be parasite in humans
- Waste contractile vacuole squirts out excess water
- Movement the cell shapes itself into pseudopods (false feet)
- Reproduction asexual (binary fission)





## On the Cellular

## What parts do all cells have in common?

•All cells have some structures in common.

•A **cell membrane** is a protective layer that covers a cell's surface and controls materials moving into and out of the cell.

•The **cytoplasm** is the region inside the cell that includes the fluid and all the organelles except for the nucleus.

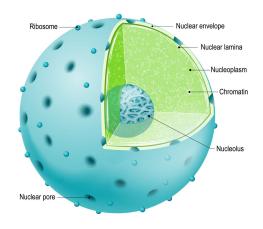
## What parts do all cells have in common?

•An **organelle** is a small body in the cytoplasm that is specialized to perform a specific function.

•The **nucleus** is a membrane-bound organelle that contains DNA.

•DNA, or deoxyribonucleic acid, is genetic material that provides instructions for all cell processes.

#### **CELL NUCLEUS**



### What parts do all cells have in common?

•How many parts of a cell can you name?



## Being Eu-nique

What are the characteristics of eukaryotic cells? •Eukaryotic cells differ from each other depending on their structure and function.

•Structure is the arrangement of parts. Function is the activity the parts carry out.

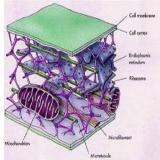
•All eukaryotic cells have a nucleus, membrane-bound organelles, and parts that protect and support the cell.

### What are the characteristics of eukaryotic cells?

•The cell membrane protects the cell and regulates what enters and leaves the cell.

•Throughout the cytoplasm of eukaryotic cells is a **cytoskeleton**, or network of protein filaments that gives shape and support to cells.

•The cytoskeleton also helps in cell division and in movement.



# What are the characteristics of eukaryotic cells?

•The nucleus is an organelle that contains the cell's genetic material or DNA.

•Instructions for making proteins are stored in DNA and sent out of the nucleus through pores in the nuclear membrane.

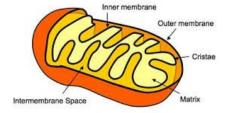
## Part-iculars

# What organelles are found in plant and animal cells?

•*Cellular respiration* is the process by which cells get energy by breaking down food.

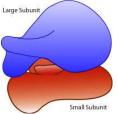
•Mitochondrion is an organelle where cellular respiration occurs.

•Mitochondria have their own DNA and two membranes.



•**Ribosomes** are organelles that make proteins by putting together chains of amino acids.

•Ribosomes are not enclosed in a membrane.



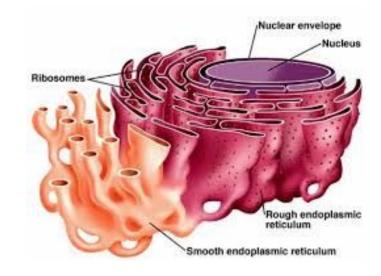
•Some ribosomes are free, and others are attached to an organelle called the *endoplasmic reticulum*.

#### •The endoplasmic reticulum, or ER,

assists in the production, processing, and transport of proteins and in the production of lipids.

•Rough ER has ribosomes attached to its membrane.

•Smooth ER makes lipids and breaks down toxins.



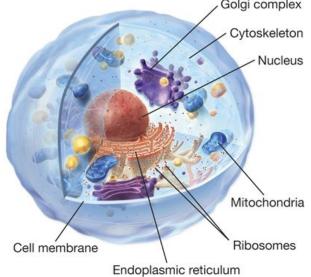
•The **Golgi complex** is a system of flattened membrane sacs. It packages and distributes materials in a cell.

•Lipids and proteins from the ER are delivered to the Golgi complex to be modified for different jobs.

•Vesicles of pinched-off Golgi complex membrane carry products out of the cell or to other parts of the cell.



•Describe the functions of the organelles in the image below.



# Now Showing: The Plant Cell What additional parts are found in plant cells?

•In plants, the **cell wall** is a rigid structure that surrounds the cell membrane, providing support and protection to the cell.

 Some fungi, archaea, bacteria, and protists also have cell walls.

### What additional parts are found in plant cells?

•A **vacuole** is a fluid-filled vesicle found in the cells of most animals, plants, and fungi.

•A vacuole may contain enzymes, nutrients, water, or wastes.

•Plant cells have large central vacuoles that store water and help support the cell.



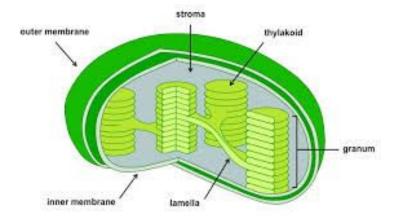
Figure 1

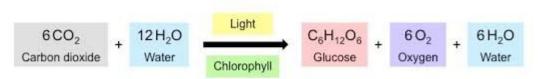
### What additional parts are found in plant cells?

•A chloroplast is an organelle where photosynthesis occurs.

•Photosynthesis is the process by which cells use sunlight, carbon dioxide, and water to make sugar and oxygen.

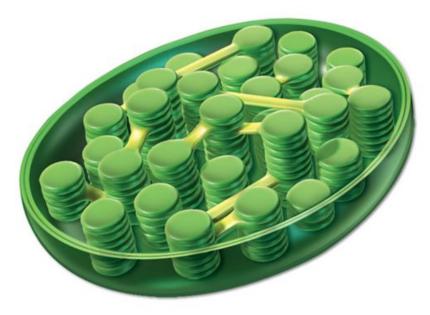
•Chloroplasts are green because of green pigment called *chlorophyll*, which absorbs solar energy.





### What additional parts are found in plant cells?

#### •How does a chloroplast make food for a plant cell?



Lysosome

## Introducing: The Animal Cell



## What additional part is found in animal cells?

•Lysosomes are organelles in animal cells that contain digestive enzymes.

•These enzymes break down damaged organelles, waste material, and foreign invaders in the cell.

•Some of these materials are collected in vacuoles. A lysosome attaches to the vacuole and releases the digestive enzymes inside.

## **Body Building**

## How are living things organized?

•An **organism** is a living thing that can carry out life processes by itself.

•Unicellular organisms are made up of just one cell that performs all the functions necessary for life.

•Unicellular organisms do not have levels of organization.

•Unicellular organisms need fewer resources and some can live in harsh conditions.

•They are very small and are easily eaten by other organisms.

•If the single cell dies, the entire organism dies.

•*Multicellular organisms* have multiple cells that are grouped into different levels of organization.

•Multicellular organisms are larger, more efficient, and have a longer lifespan than unicellular organisms.

•Multicellular organisms need more resources than unicellular organisms.

•The cells are specialized and must depend on each other for survival of the organism.

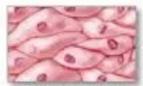
•A **tissue** is a group of similar cells that perform a common function.

•Humans and other animals are made up of nervous, epithelial, connective, and muscle tissues.

•Plants have transport, protective, and ground tissues.

Four types of tissue





Epithelial tissue



Muscle tissue



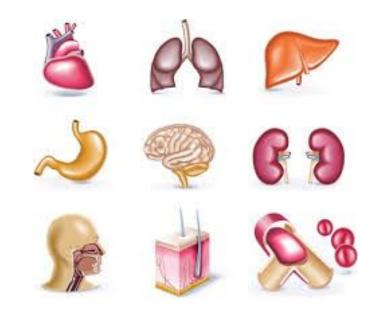
Nervous tissue

10.60.40M, Inc.

•An **organ** is a structure made up of a collection of tissues that carries out a specialized function.

•Different tissues can work together to accomplish a function, such as digesting food.

•Plants have organs such as leaves, stems, and roots.



•An **organ system** is a group of organs that work together to perform body functions.

•Each organ system in the body has a specific job to do for the organism.



## What's Your Function?

- What is the connection between structure and function?
- •Cells, tissues, organs, and organ systems make up the structure of a multicellular organism.
- •Structure is the arrangement of parts in an organism or object.

•Function is the activity of each part in an organism.

## Systems at Work

# What tasks do systems perform to meet the needs of cells?

•A unicellular organism must perform all functions necessary for life.

•A multicellular organism has specialized cells, tissues, organs, and organ systems that perform specific functions.

•Some plants have a vascular system that transports water and nutrients to and from cells throughout the plant.

# What tasks do systems perform to meet the needs of cells?

•Food is broken down by the digestive system. Nutrients are delivered to cells via the circulatory system.

•Oxygen is taken in by the respiratory system. This oxygen is carried to cells via the circulatory system.

•Wastes are removed from the body by the skin, lungs, digestive system, and kidneys.

# Human Body Systems

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## Inside Out

## What do the body systems do?

•Body systems, also called *organ systems*, help organisms coordinate and complete the necessary functions for life.

•Groups of organs that work together form body systems.

•The **muscular system** allows movement of body parts.

•The **skeletal system** supports the body, protects important organs, and makes blood cells.

•The **respiratory system** gathers oxygen from the environment and gets rid of carbon dioxide.

•The male reproductive system produces sperm and delivers it to the female reproductive system.

•The **female reproductive system** produces eggs and nourishes a developing fetus.

•The **cardiovascular system** moves blood through the body.

•The **lymphatic system** returns leaked fluids back to the blood and is a part of the immune system.

•The **endocrine system** makes chemical messages that regulate conditions in the body.

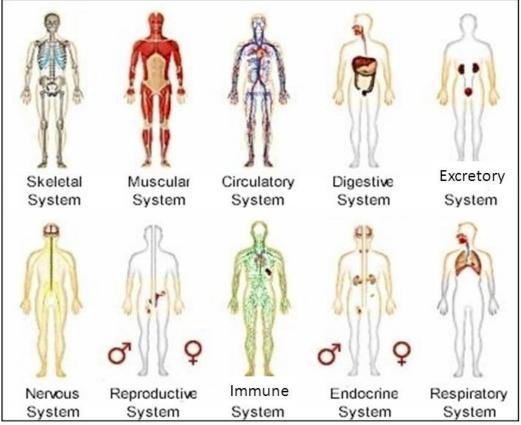
•The **integumentary system** is the protective covering of the body that acts as a barrier.

•The excretory system gets rid of the body's waste.

•The **digestive system** breaks down food into nutrients that can be used by the body.

•The **nervous system** collects information and responds to it by sending messages.

## Human Organ Systems



## A Closer Look

### How are structure and function linked?

•Different organisms can have organs with similar structures, functions, shapes, and sizes.

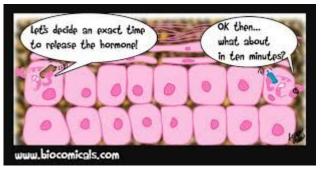
•The shapes and sizes of cells are related to their function.

### How do body systems work together?

•Body systems must work together to keep the body working properly.

Many organs are part of several body systems.

•Cells communicate by electrical and chemical messages.



# Keeping the Balance What is homeostasis?

•Homeostasis is the body maintaining a constant internal environment when outside conditions change.

•Body systems can respond to changes in the external environment.

•Body systems must respond to changes quickly and in the right way.

### What can go wrong with homeostasis?

•A problem in one body system may cause problems in other body systems.

•Lack of food and the presence of toxins or pathogens may disrupt the proper functioning of body systems.

### What can go wrong with homeostasis?

•Problems with cells, tissues, or organs can cause problems in the body.



•If cells cannot get energy or necessities, they cannot work properly.

•When the body cannot maintain homeostasis, it is easier for pathogens to invade the body.

## You Are What You Eat!

### What is the digestive system?

•Cells use nutrients from food for energy, growth, maintenance, and repair.

•The **digestive system** breaks down food into nutrients that can be used as building materials that provide energy for cells.

### What are the two types of digestion?

 Mechanical digestion is the breaking, crushing, and mashing of food.

•Chemical digestion occurs when large molecules of food are broken down so that they can pass through the bloodstream.

•An **enzyme** is a chemical that breaks down large molecules into smaller molecules.

## **Chew on This**

### What are the parts of the digestive system?

•The mouth is where mechanical and chemical digestion begins. *Saliva* helps to break down food.

•Food moves through the throat into a long tube called the esophagus.

•Muscle contractions called *peristalsis* move the food to the stomach.

### What are the parts of the digestive system?

•The **stomach** is a muscular bag that crushes food and contains acids and enzymes for killing bacteria and breaking down proteins.

•*Chyme* is the mushy mix of food that passes from the stomach to the small intestines.

### What are the parts of the digestive system?

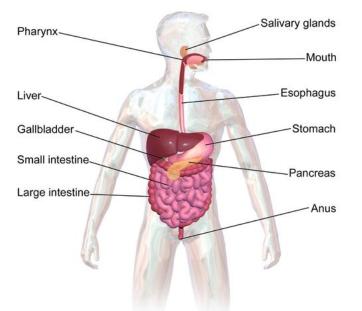
•The **small intestine** is a muscular tube where most chemical digestion takes place and most nutrients are absorbed.

•In the large intestine, water and nutrients are absorbed, leaving waste.



### What are the parts of the digestive system?

•Identify and describe the parts of the digestive system.



The Components of the Digestive System



#### Where are nutrients absorbed?

•The **pancreas** makes fluids that break down proteins, carbohydrates, fats, and nucleic acids.

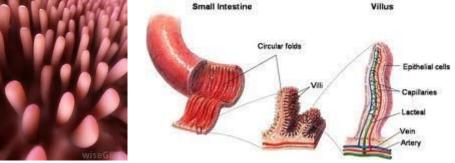
•The **liver** makes and releases a mixture called *bile* that is stored in the gall bladder.

•Bile breaks up large fat droplets.

#### Where are nutrients absorbed?

•The walls of the small intestine have many folds that increase the surface area, allowing more room for nutrients to be absorbed.

•Each fold has *villi*, which are covered with microvilli, that absorb more nutrients.



#### Where are nutrients absorbed?

•The large intestine removes water, absorbs vitamins, and turns food into waste called feces.

•Bacteria live in the large intestine to help break down foods the body cannot use or digest.

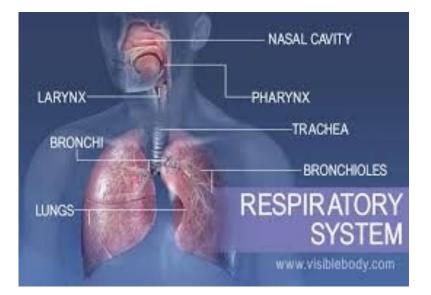
•The *rectum* is the end of the large intestine that stores feces until they can be expelled by the *anus*.

## Take a Deep Breath

## What are the functions of the respiratory system?

•The **respiratory system** is the group of organs that take in oxygen and get rid of carbon dioxide.

•*Respiration* is the transport of oxygen from outside the body to cells and tissues and the transport of wastes out of the body.



## **Breathe Easy**

# What are the parts of the respiratory system?

•The mouth and nose take in air, which then flows to the pharynx, or throat.

•The pharynx branches into the *esophagus*, which leads to the stomach, and the **larynx**, which leads to the lungs.

# What are the parts of the respiratory system?

•Air flows through the trachea, or windpipe, to the lungs.

•The trachea splits into two branches called **bronchi**, which connect to each lung.

•Each bronchus branches into *bronchioles*.

# What are the parts of the respiratory system?

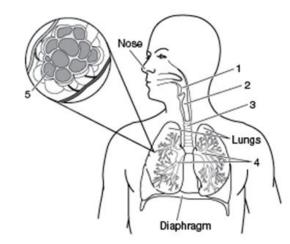
•The bronchioles lead to tiny sacs called **alveoli**, where gas exchanges take place.

•The *diaphragm* is a muscle below the ribcage and lungs that contracts as you inhale and relaxes as you exhale.



# What are the parts of the respiratory system?

•Identify the main parts of the respiratory system.

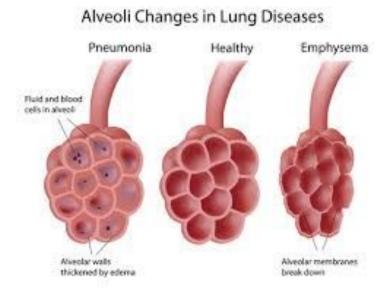


# What are some disorders of the respiratory system?

•Asthma is a condition in which the airways are narrowed due to inflammation of the bronchi.

•Pneumonia is an inflammation of the lungs caused by bacteria or viruses.

•Emphysema occurs when alveoli have been damaged, resulting in poor oxygen transport.



## Reproduction



What are the main functions of the male reproductive system?

•Sperm are the male cells that carry 23 chromosomes and are used for reproduction.

•**Testes** are the main organs of the male reproductive system that produce the male sex hormone *testosterone*.

•Testosterone, the male sex hormone, causes male characteristics to develop.

What are the main functions of the male reproductive system?

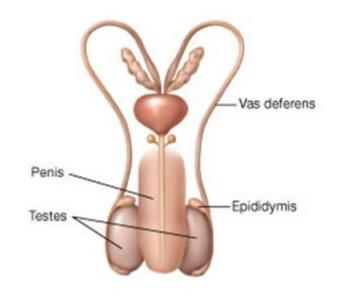
•The testes make sperm, which are stored in the *epididymis*.

•Sperm leave the epididymis through the *vas deferens* and mix with fluids to produce *semen*.

•To leave the body, semen passes through the *urethra* in the male sex organ, called the **penis**.

What are the main functions of the male reproductive system?

•How is sperm produced in the male reproductive system?



What are the main functions of the female reproductive system?

•An egg is the female sex cell. It carries 23 chromosomes.



•The female reproductive hormones, *estrogen* and *progesterone*, control the development of female characteristics and the release of eggs.

•An ovary is the reproductive organ that produces eggs.

## Fertile Ground

#### How are eggs released?

•The *menstrual cycle* is the changes that produce an egg, release the egg, and prepare the body for pregnancy.

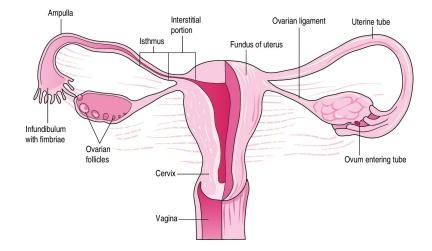
•About halfway through the cycle, which is about one month long, an egg is released from the ovary.

### How are eggs released?

•The egg travels through the *fallopian tube* that connects the ovary to the uterus.

•The **uterus** is the organ in which a fertilized egg develops into a baby.

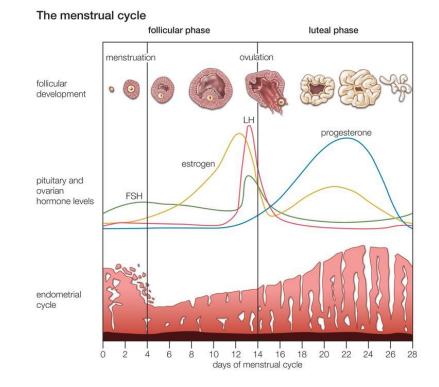
•A baby passes through a canal between the uterus and the outside of the body called the **vagina**.



### How are eggs released?

•Eggs that are not fertilized are shed with the lining of the uterus.

•The monthly discharge of blood and tissue from the uterus is called *menstruation*.



### How are eggs fertilized?

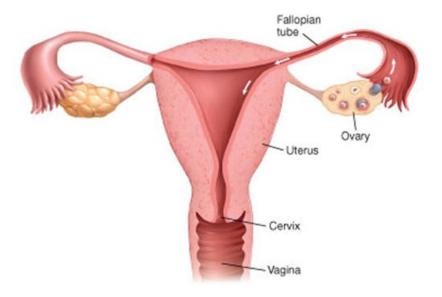
•When sperm enters the egg, one cell is formed and fertilization has occurred.

•Once cell division occurs, the fertilized egg becomes an embryo.

•The embryo then travels to the uterus and attaches to the thick, nutrient-rich lining.

### How are eggs fertilized?

•What happens to fertilized eggs? What happens to eggs that are not fertilized?



# Happy Birthday!

### What are the stages of pregnancy?

•A pregnancy lasts about nine months, which are broken down into three 3-month *trimesters*.

•The **placenta** is a network of blood vessels that provides the embryo with oxygen and nutrients from the mother's blood and carries away wastes.



### What are the stages of pregnancy?

•The embryo connects to the placenta by the **umbilical cord**.



•The embryo is surrounded by the *amnion*, a sac filled with fluid that protects the embryo.



### What are the stages of pregnancy?

•After week 10 in the first trimester, the embryo is called a

fetus.



•Many organs such as the heart, liver, and brain form. Arm, legs, fingers, and toes also form in this trimester.

•In the second trimester, the fetus develops joints and bones and grows stronger. It can even breathe and swallow.

### What are the stages of pregnancy?

•The fetus begins to make movements the mother can feel in the second trimester.

•In the third trimester, the brain develops further and the organs become fully functional.

•A full-term pregnancy lasts about 40 weeks.

### How are babies born?

•During *labor*, the uterus goes through a series of contractions that push the baby through the vagina.

•The umbilical cord is cut when the baby is born.

•Once the mother pushes out the placenta, labor is complete.

# What changes occur during infancy and childhood?

•Babies grow quickly in infancy, which is from birth to about age 2.

Childhood lasts from age 2 to puberty.

•Children learn to speak, gain coordination, get permanent teeth, and experience more as they grow older.

## What changes occur during adolescence and adulthood?

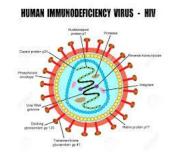
•The stage from puberty to adulthood is *adolescence*.

•The reproductive system matures during adolescence.

•Physical and emotional maturity are reached in adulthood.

### Infections

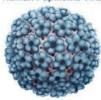
#### What causes STIs?



•Sexually transmitted infections (STIs) are infections passed during sexual contact.

•Acquired immunodeficiency syndrome (AIDS) is caused by the human immunodeficiency virus (HIV), which destroys immune-system cells.

•Genital herpes, human papillomavirus (HPV), and hepatitis B are other viral STIs.



### What causes STIs?

•Chlamydia, gonorrhea, and syphilis are STIs caused by bacteria.

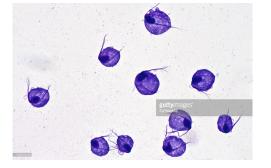
•Syphilis is caused by the the bacterium Treponema Pallidum.



•Trichomoniasis and pubic lice are STIs that are caused by parasites.

•Trichomoniasis is caused by the protozoan Trichomonas vaginalis.





### Seeing Double

•Multiple birth occurs when two or more babies are carried in the same pregnancy.

•About 3 percent of all births result in twins, and 0.1 percent of births result in triplets.

•Identical twins are from one embryo that splits into two.

•Fraternal siblings are caused by two sperm fertilizing two or more separate eggs.

### Go with the Flow!

### What is the circulatory system?

•The *circulatory system* includes both the cardiovascular system and the lymphatic system.

•Both systems move fluids around the body and protect it from disease.



### What is the circulatory system?

•The **cardiovascular system** is your heart, blood, and blood vessels.

•Blood is the fluid that carries gases, nutrients, and wastes through the body.

•The cardiovascular system is a closed-loop system.

### What is the circulatory system?

•The **lymphatic system** is a group of organs and tissues that collect fluid that leaks from blood and returns it to the blood.

•Lymph is the leaked fluid.

•The lymphatic system is an open-loop system. It can move in and out of blood vessels.

#### How do the systems work together?

•As the heart pumps, fluid leaks out through *capillaries*, or the tiniest blood vessels.

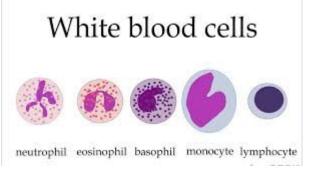
Most of this fluid is reabsorbed by the capillaries.

•Lymph capillaries absorb the extra fluid that contains particles such as dead cells and pathogens.

#### How do the systems work together?

•Lymph is returned to the cardiovascular system when it drains into blood vessels in the base of the neck.

•*White blood cells,* which fight pathogens, mature in the lymphatic system.



### Node Doubt!

### What are the parts of the lymphatic system? •Lymph nodes are small, bean-shaped organs that remove pathogens and dead cells from lymph.

•Infection-fighting *white blood cells* are found in lymph nodes.

•Lymph nodes are concentrated in the armpits, neck, and groin. Swelling in lymph nodes can be a sign of infection.

### What are the parts of the lymphatic system?

•Lymph vessels are the thin-walled vessels with valves that carry lymph back to lymph nodes.

•*Bone marrow* is the soft tissue inside bones where blood cells are produced.

•*Tonsils* are small organs at the back of the throat that help defend the body against infection. An infection of the tonsils is called *tonsillitis*.

### What are the parts of the lymphatic system?

•The *thymus* is an organ in the chest where some white blood cells go to finish developing.

•The *spleen* is the largest lymphatic organ. It stores white blood cells and allows them to mature.

•As blood flows through the spleen, white blood cells attack or mark pathogens in the blood.

#### What are some disorders of the lymphatic system?

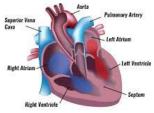
•Lymphoma is a type of cancer that begins in the lymph nodes that can cause a swelling, or *tumor*.

•Lymphedema is a swelling of the body caused by blockage or injury to lymph vessels.

•Filariasis is a disease caused by thread-like worms called *nematodes*.

•Bubonic plague is a bacterial infection of the lymphatic system.

### The Heart of the Matter



What are the parts of the cardiovascular system?
The heart is a fist-sized organ that pumps blood around your body.

•The right side of the heart pumps oxygen-poor blood to the lungs.

•The left side of the heart pumps oxygen-rich blood to the body.

# What are the parts of the cardiovascular system?

•Each side of the heart has an upper and a lower chamber.

•Each upper chamber is called an *atrium*. Each lower chamber is called a *ventricle*.

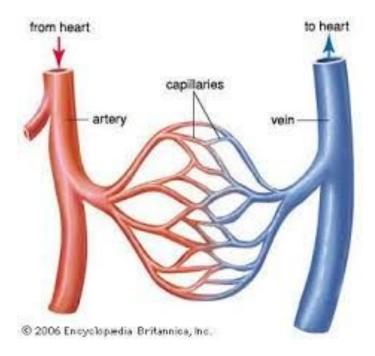
•Blood enters the atria and pumps to the ventricles after passing through *valves* that keep blood from moving backward in the heart.

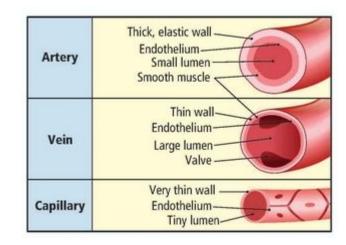
# What are the parts of the cardiovascular system?

•Blood is a type of connective tissue that contains cells, fluids, and other materials.

•Blood travels throughout the body in tubes called *blood vessels*.

•Three types of blood vessels are arteries, capillaries, and veins.





# What are the parts of the cardiovascular system?

•An **artery** carries blood away from the heart under high pressure. We call this pressure *blood pressure*.

•A **capillary** is a tiny blood vessel that allows exchanges between body cells and blood.

•A **vein** carries blood back to the heart. Valves in veins keep blood from flowing backward.

### It's in the Blood

### What is blood made of?

•The fluid part of blood is *plasma*, which is a mixture of water, minerals, nutrients, sugars, proteins, and waste.

•*Platelets* are tiny pieces of larger cells found in bone marrow.

•Platelets clump together to form blood clots when injury occurs.

### What is blood made of?

•*White blood cells* in the blood fight pathogens and keep you healthy.

•Antibodies are chemicals that identify pathogens.

•*Red blood cells* are disk-shaped cells that bring oxygen to every cell in the body.

•Red blood cells contain *hemoglobin*, which is an oxygen-carrying protein.

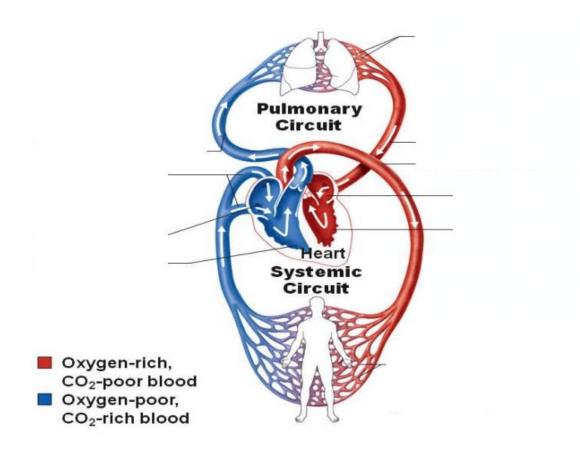


#### How does blood move through the body?

•Blood moves in two loops or circuits in the body.

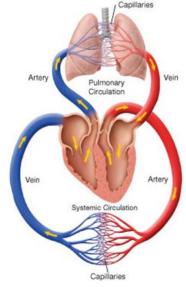
•The flow of blood between the heart and the lungs is called *pulmonary circulation*.

•The circulation of blood between the heart and the rest of the body is called *systemic circulation*.



#### How does blood move through the body?

•Describe the movement of blood from the lungs, through the heart, to the body, and back again.



# How does circulation help maintain body temperature?

•Rising temperatures in the body cause blood vessels in the skin to widen, allowing heat to be transferred out of the body.

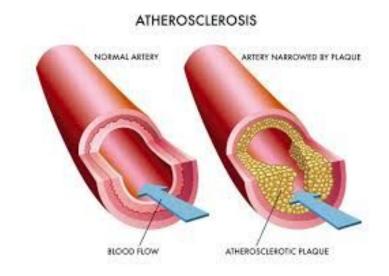
•Blood vessels get narrower to conserve heat when body temperature gets too low.

# What are some problems that affect the cardiovascular system?

•*Atherosclerosis* is a hardening of the artery walls caused by a buildup of cholesterol and other lipids.

•*Hypertension* is abnormally high blood pressure.

•Heart attacks and strokes are caused when arteries become blocked or burst.

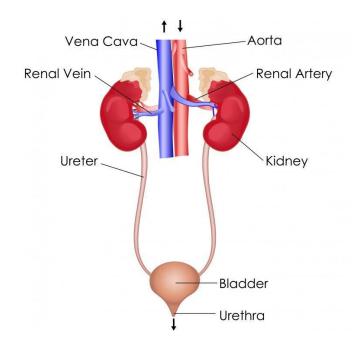


### **Toxic Waste!**

## What are the functions of the excretory system?

•Waste in the body would become toxic without a method to eliminate it.

•The excretory system eliminates cellular wastes from the body through the lungs, skin, kidneys, and digestive system.



# What are the functions of the excretory system?

•Excess salts are released through the skin as you sweat.

•The lungs release carbon dioxide and water as you exhale.

•The kidneys and the digestive system remove cellular waste.

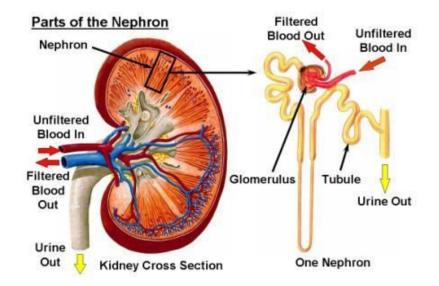
**Cleanup Crew** 

## What organs are in the urinary system?

•A **kidney** is one of a pair of organs that remove waste from the blood.

•Nephrons are structures in the kidneys where fluid is filtered from the blood.

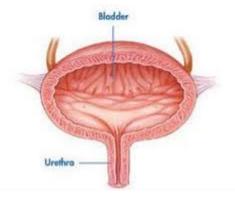
•Water and wastes filtered from the blood form a liquid called **urine**.



### What organs are in the urinary system?

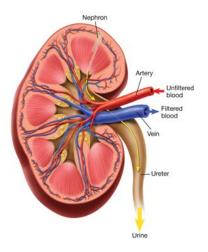
•Urine travels from the kidneys, through the *ureters*, to the bladder.

The bladder is a saclike organ that stores urine.
Urine exits the bladder through a tube called the urethra.



### What organs are in the urinary system?

 How does a kidney work to eliminate wastes from the blood?



## How does the urinary system maintain homeostasis?

•Cells need a certain level of salt and water to maintain homeostasis.

•Chemical messengers called *hormones* signal the kidneys to filter more or less water and salt as needed.