

4N051, Module 6, Major Organs and Systems Lesson 1- Introduction to the Human Body



Introduction to the Human Body

Introduction to the Human Body

After completing this lesson, the student will be able to identify human body general principles in accordance with prescribed guidance and publications.

Cells and Tissues

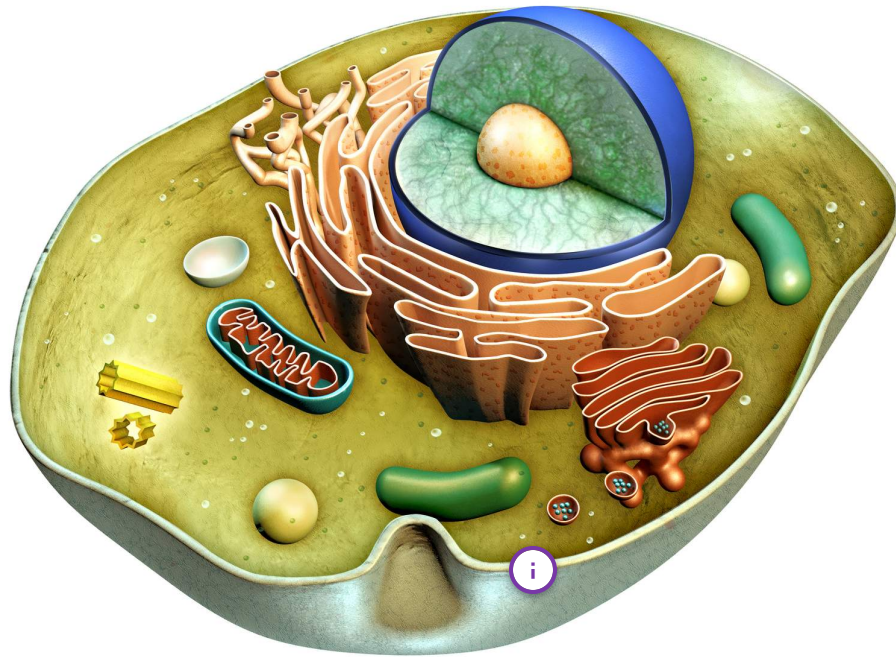
The basic unit of the human body is the cell. The body is made up of 75 trillion cells that are responsible for the entire organization of all body structures and for the continuation of life processes

A microscopic image of tissue, likely stained with hematoxylin and eosin (H&E). The image shows various cellular structures, including nuclei (stained blue/purple) and cytoplasm (stained pink/red). A white line points to a specific cell, highlighting its structure.

A cell's structure is made up of three parts-a cell membrane, nucleus, and cytoplasm.

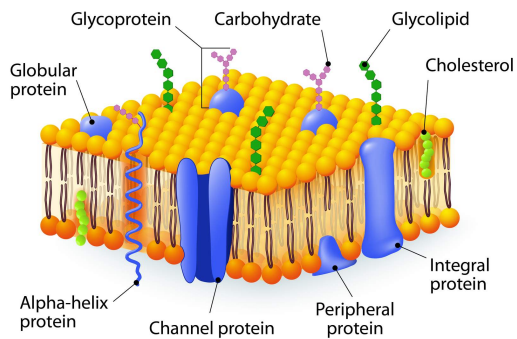
Click on the **hotspots** below to learn more about the cell membrane, nucleus, and cytoplasm.



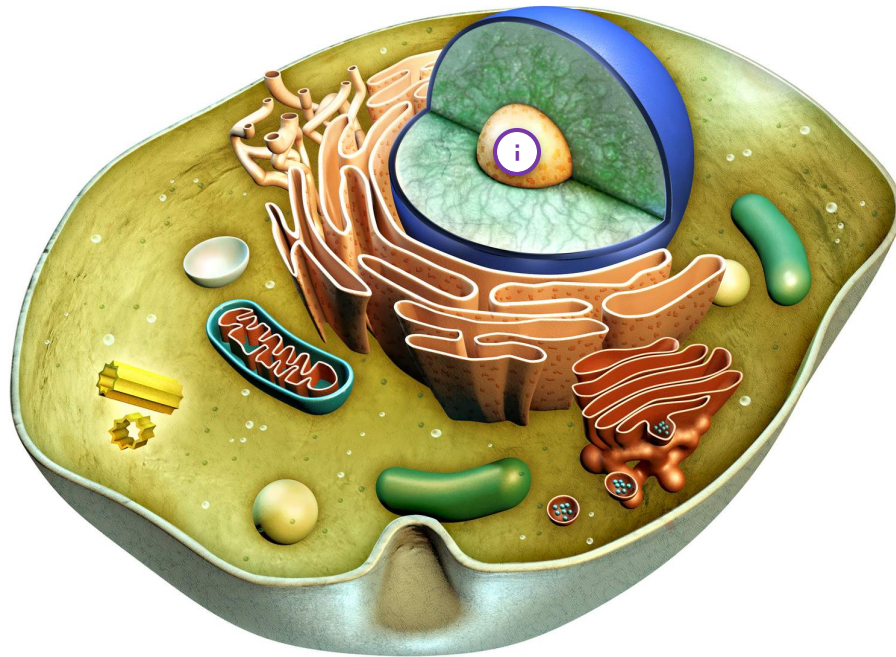


The Cell Membrane

CELL MEMBRANE

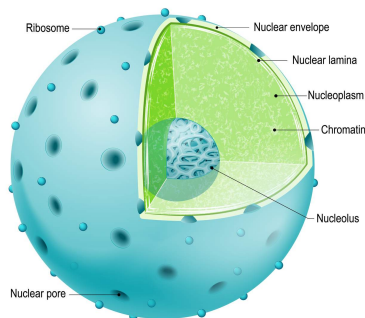


The cell membrane is the outer covering, enclosing the cell and maintains its shape. It is composed mainly of lipids and proteins with a small amount of carbohydrates included. The cell membrane is designed in such a way that it permits the entrance of nourishment to the cell.



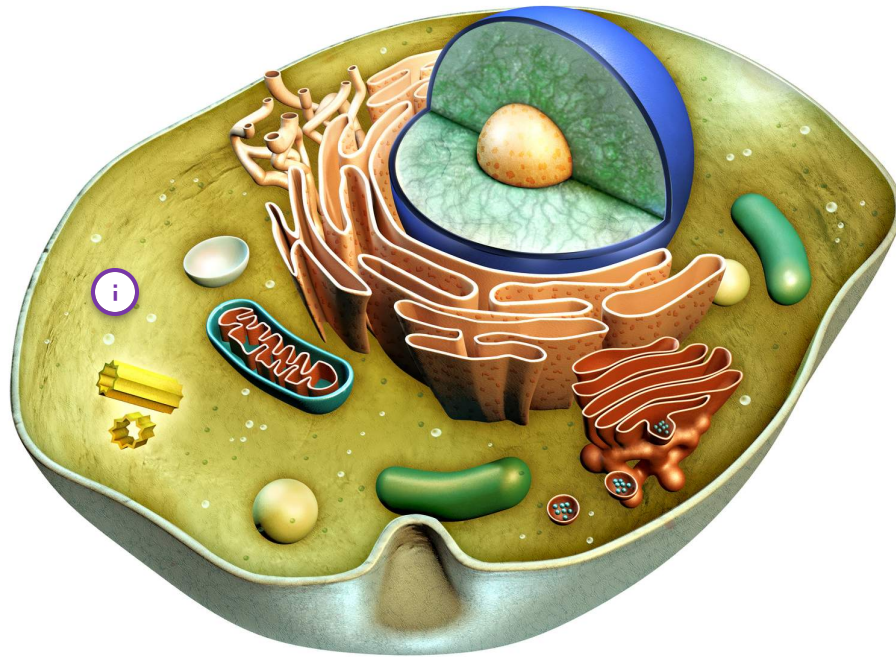
Nucleus

CELL NUCLEUS

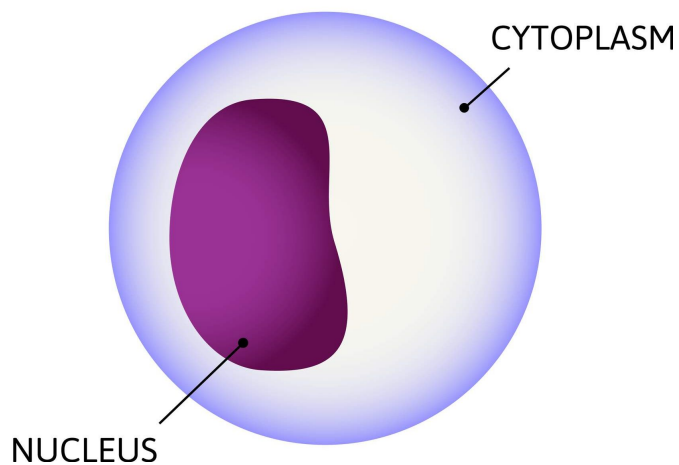


The nucleus is the control center of the cell and directs all cell activities. Part of the nucleus' job is to control the cell's life cycle or cell reproduction. This process is accomplished through mitosis.

It is a structure containing the hereditary information, and its job is to control the growth and reproduction of a cell. The nucleus is the most prominent organelle in all cells. The nucleus is surrounded by a nuclear envelope which is a double membrane. It separates the contents of the nucleus from the cytoplasm with a double layer of lipids.



Cytoplasm



Cytoplasm has all of the contents in a cell that exist outside of the nucleus that are all encased in the cell membrane inside of the cell. Cytoplasm supports and suspends organelles and cellular molecules while performing processes such as cellular respiration for breathing, synthesizing proteins and having division of cells by both mitosis and meiosis.

Mitosis is the division of cells creating new cellular structures which occurs in four phases: prophase, metaphase, anaphase, and telophase. While undergoing mitosis, the division of cytoplasm contents occurs during anaphase continuing through telophase.

As the life cycle continues, interphase is simply the continuation of cell growth from the time it becomes a new cell until mitosis occurs again. The cytoplasm surrounds the nucleus containing all the living substances of a cell.

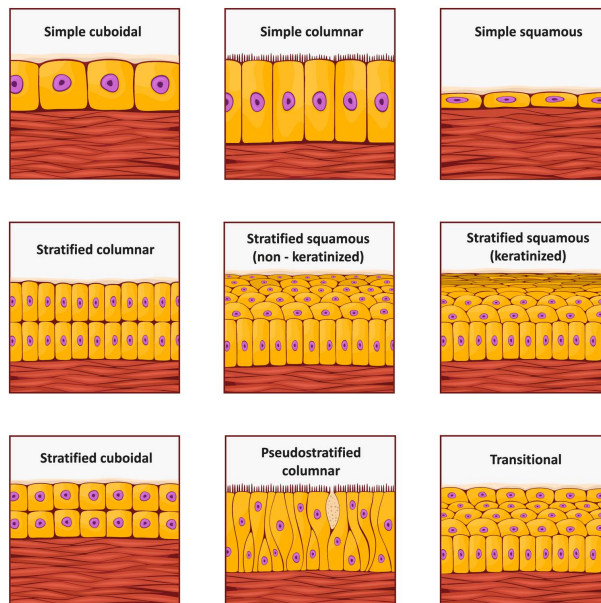
Cytoplasm has two main components: the endoplasm and the ectoplasm. The endoplasm is located in the central area of the cytoplasm, and it contains organelles. The ectoplasm is the gel-like substance on the outer portion of the cytoplasm of a cell.

The grouping of many **cells forms tissues** which joins together to make up the organs of the body. There are **four** types of tissue in the body: **epithelial, connective, muscle and nervous** tissue.

Epithelial Tissue —

Epithelial tissue is found throughout the body, covering all body surfaces, both inside and out. Epithelial tissue covers all organs, forms the inner lining of body cavities, and lines the inside of hollow organs. It also is the major type of tissue found in the glands.

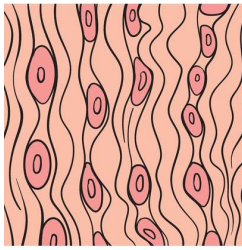
EPITHELIAL TISSUES



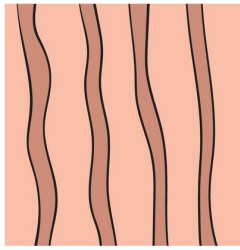
Connective Tissue

Connective tissue is the most abundant throughout the body. Its main purpose is to provide support and protection, fill spaces, store fat, produce blood cells, and help repair tissue damage. Connective tissue is, in essence, the tissue that provides the body with its framework.

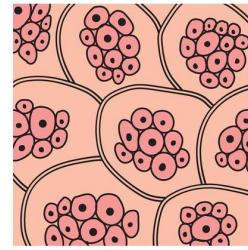
BASIC TYPES OF CONNECTIVE (SUPPORTING) TISSUE



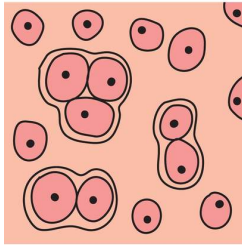
Elastic connective tissue



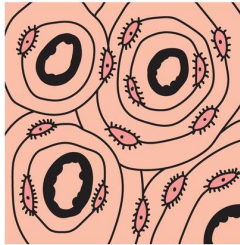
Dense connective tissue



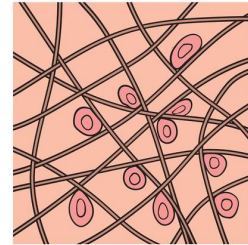
Adipose connective tissue



Cartilaginous
connective tissue



Bone connective tissue



Loose connective tissue

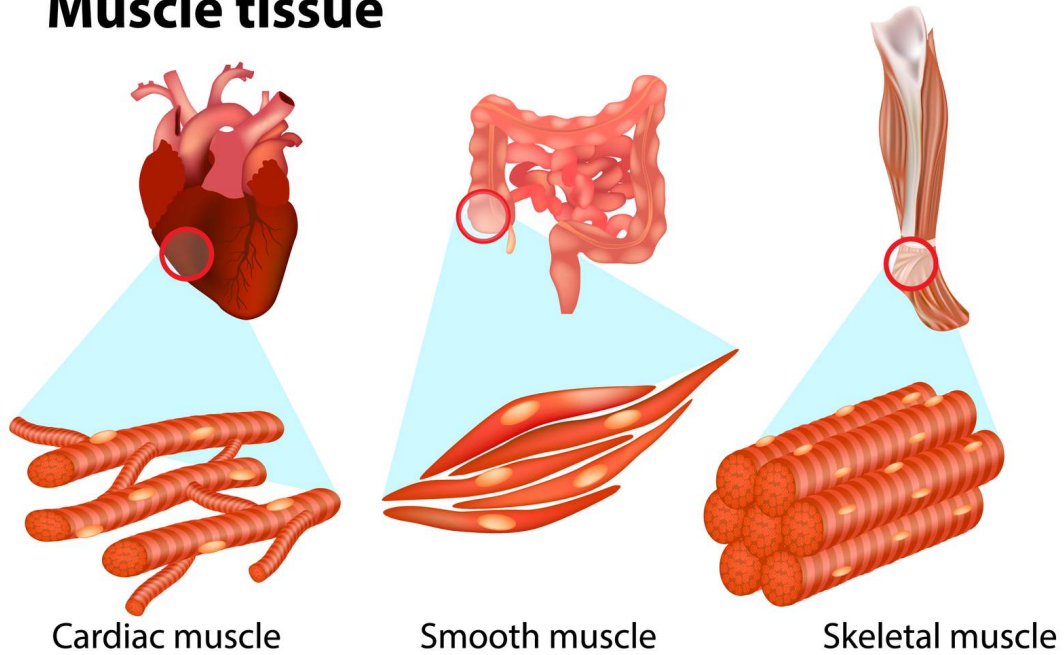
Muscle Tissue

Muscle tissue is unique in having the ability to change shape becoming either shorter or thicker. This ability to change shape is made possible by the construction of the muscle tissue, which is mainly fibrous. There are three types of muscle tissue: skeletal, smooth, and cardiac.

Skeletal muscle tissue is found in muscles that are usually attached to bones. Usually referred to as voluntary muscle this tissue can be controlled by conscious effort. The appearance of skeletal muscle tissue is referred to as “striated” because of its string-like construction. Smooth muscle tissue does not have a striated construction.

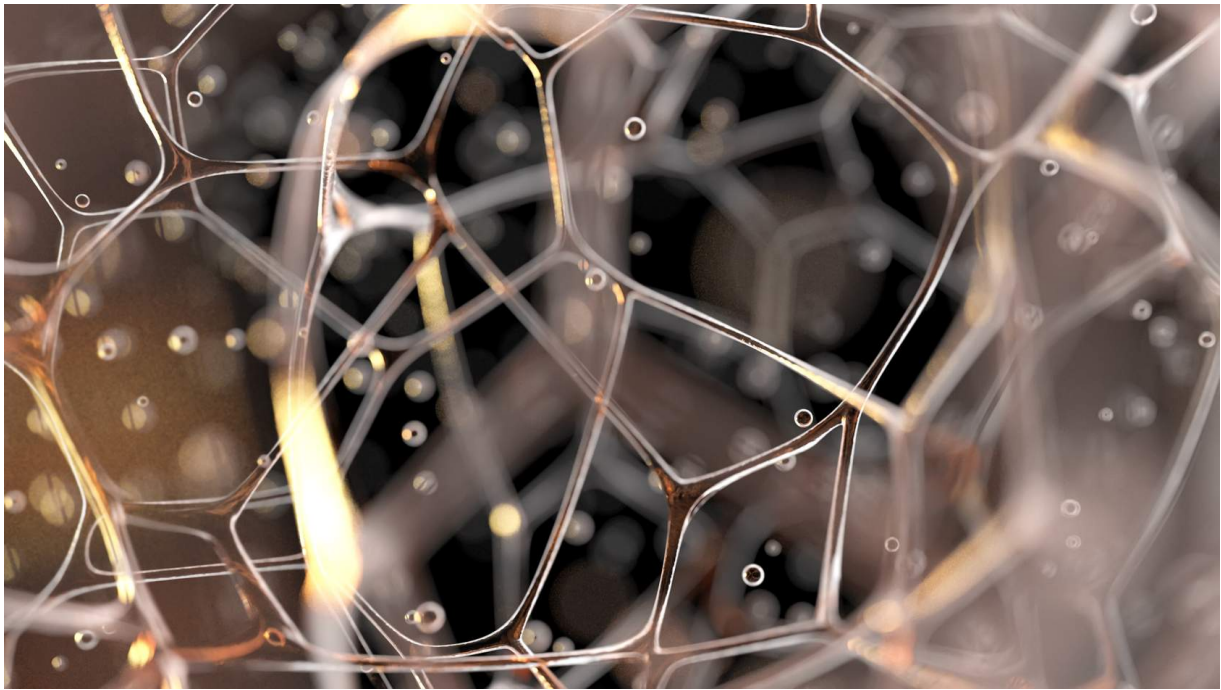
Typically referred to as involuntary muscle, this type of tissue is not under conscious control to move. It is shorter than skeletal muscle tissue and can be found in the walls of internal hollow organs. Cardiac muscle tissue is similar to skeletal muscle in terms of striated appearance however is only found in the heart.

Muscle tissue



Nervous Tissue

Nervous tissue receives and carries impulses to the brain and back to the body parts. It is specifically found in the brain, spinal cord, and peripheral nerves of the body. The basic cells of this type of tissue are called nerve cells.

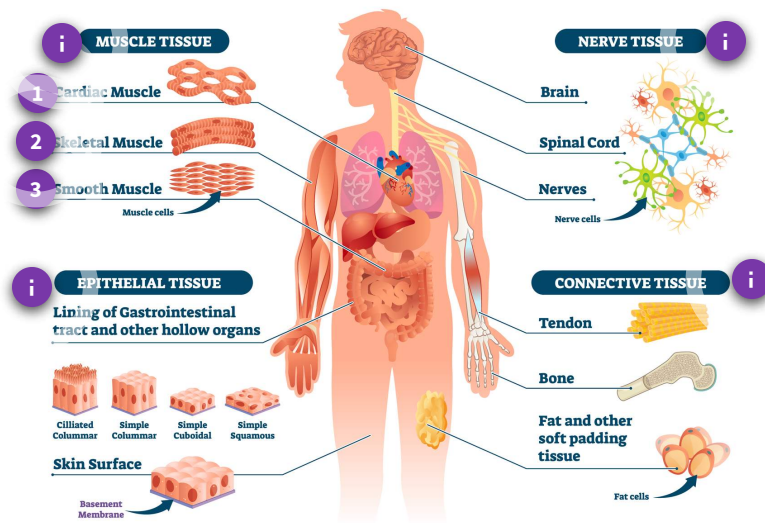


Tissues

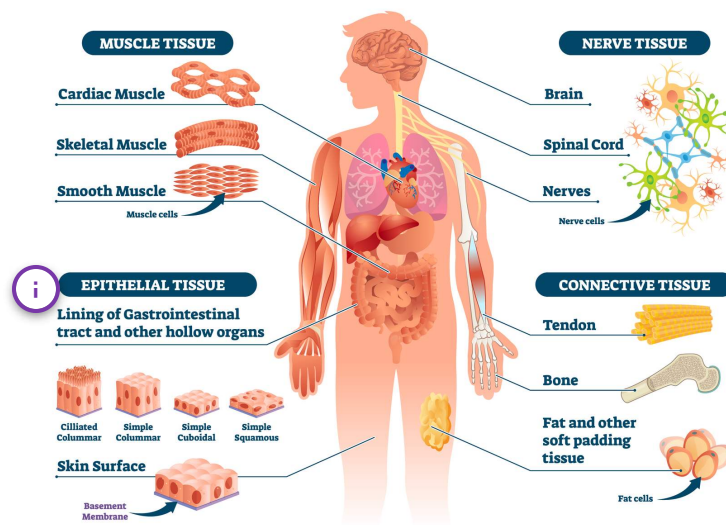
Cells with similar characteristics group together to form tissues. Tissues with similar characteristics then join together to form the organs of the body. There are four general types of tissues in the body: epithelial, connective, muscle, and nervous tissues. This lesson introduces each of these types of tissue.

Click on each hot spot to learn more about each type of tissue.

TYPES OF TISSUES



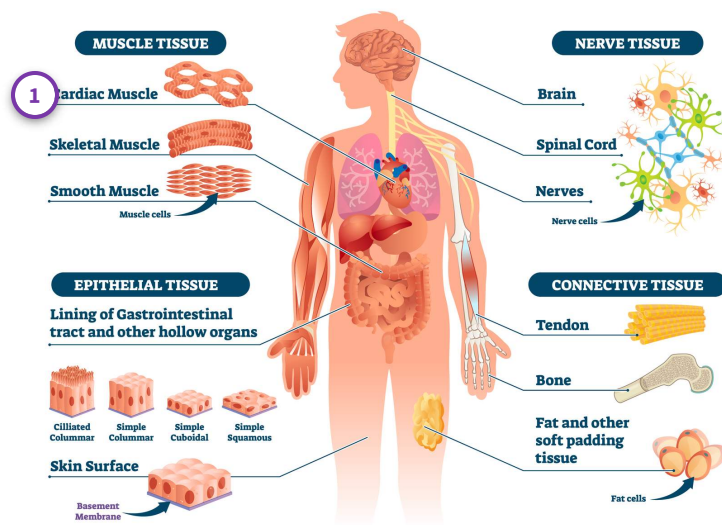
TYPES OF TISSUES



Epithelial Tissue

Epithelial tissue is found throughout the body, covering all body surfaces, both inside and out. Epithelial tissue covers all organs, forms the inner lining of body cavities, and lines the inside of hollow organs. It also is the major type of tissue found in the glands.

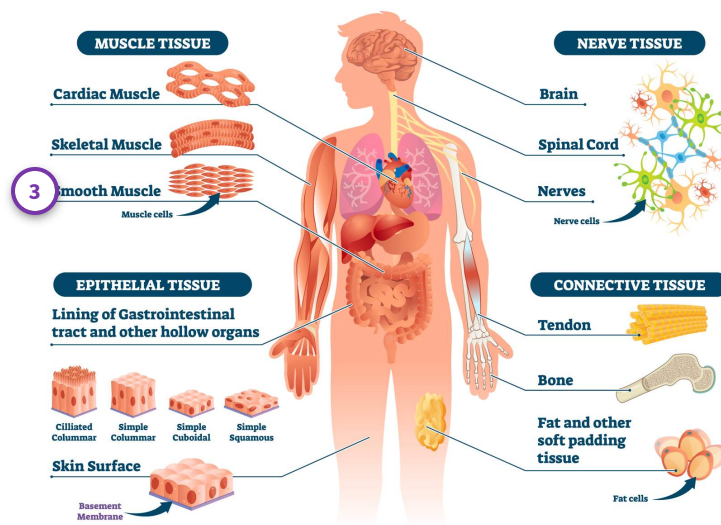
TYPES OF TISSUES



Cardiac Muscle Tissue

This type of muscle tissue is found only in the heart. It is similar in appearance to skeletal muscle tissue because it has a striated appearance.

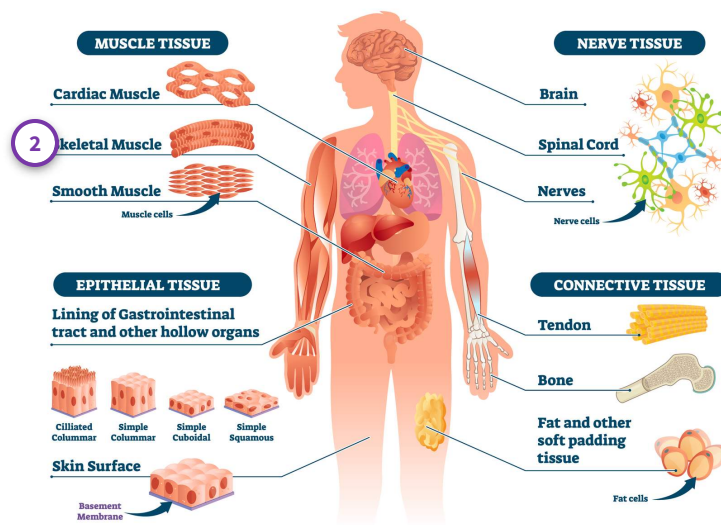
TYPES OF TISSUES



Smooth Muscle Tissue

Smooth muscle tissue does not have a striated construction. This type of tissue is not under conscious control to move; therefore, it is under involuntary control. It is shorter than skeletal muscle tissue and can be found in the walls of internal hollow organs.

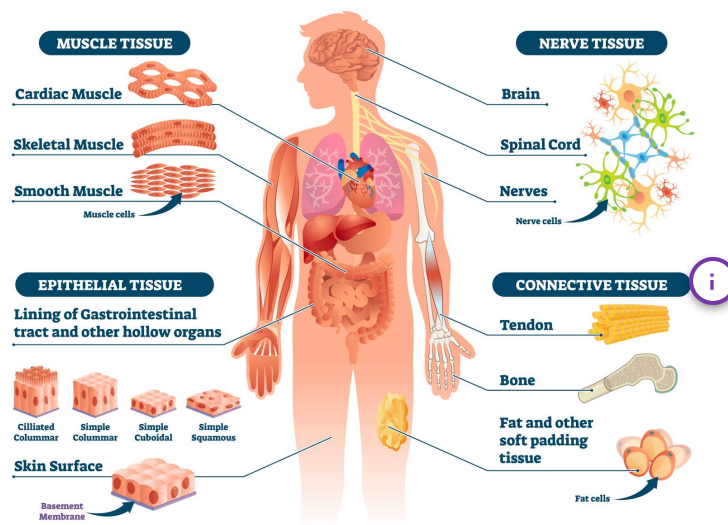
TYPES OF TISSUES



Skeletal Muscle Tissue

Skeletal muscle tissue is found in muscles that are usually attached to bones. Skeletal muscle tissue can be controlled by conscious effort. Because of this, it is sometimes referred to as voluntary muscle tissue. The appearance of skeletal muscle tissue is referred to as “striated” because of its string-like construction.

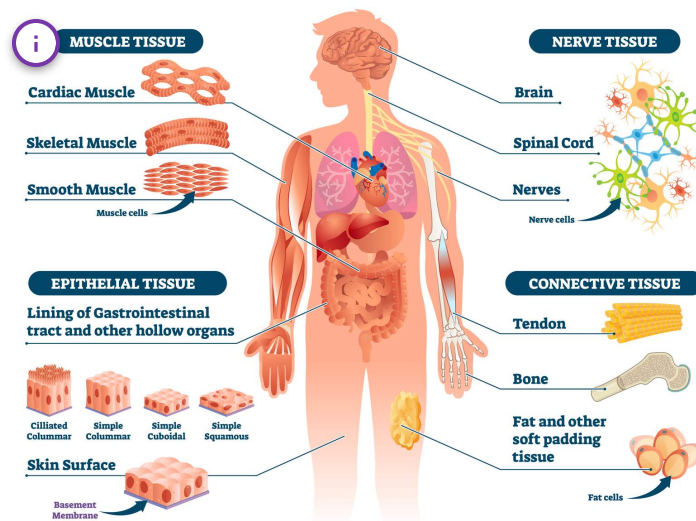
TYPES OF TISSUES



Connective Tissue

By weight, connective tissue is the most abundant type of body tissue. Like epithelial tissue, connective tissue is found throughout the body. The main purpose of this type of tissue is to provide support and protection, fill spaces, store fat, produce blood cells, and help repair tissue damage. Connective tissue is, in essence, the tissue that provides the body with its framework.

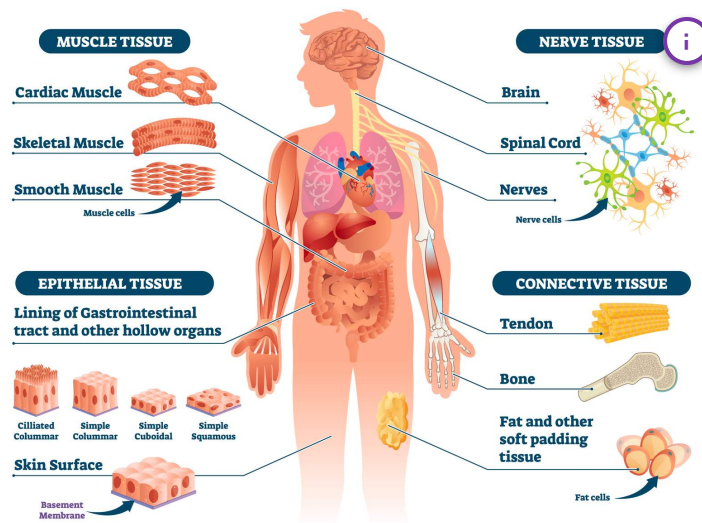
TYPES OF TISSUES



Muscle Tissue

Muscle tissue is unique because it has the ability to change shape by becoming either shorter or thicker. This ability to change shape is made possible by the construction of the muscle tissue, which is mainly fibrous. There are three types of muscle tissue: skeletal, smooth, and cardiac. Click on the numbers to take a look at each.

TYPES OF TISSUES



Nerve Tissue

Nervous tissue is found in the brain, spinal cord, and peripheral nerves of the body. The basic cells of this type of tissue are called “nerve cells.”

Multiple Choice

What kind of muscle tissue is pictured below?


☐

Cardiac

☐

Skeletal

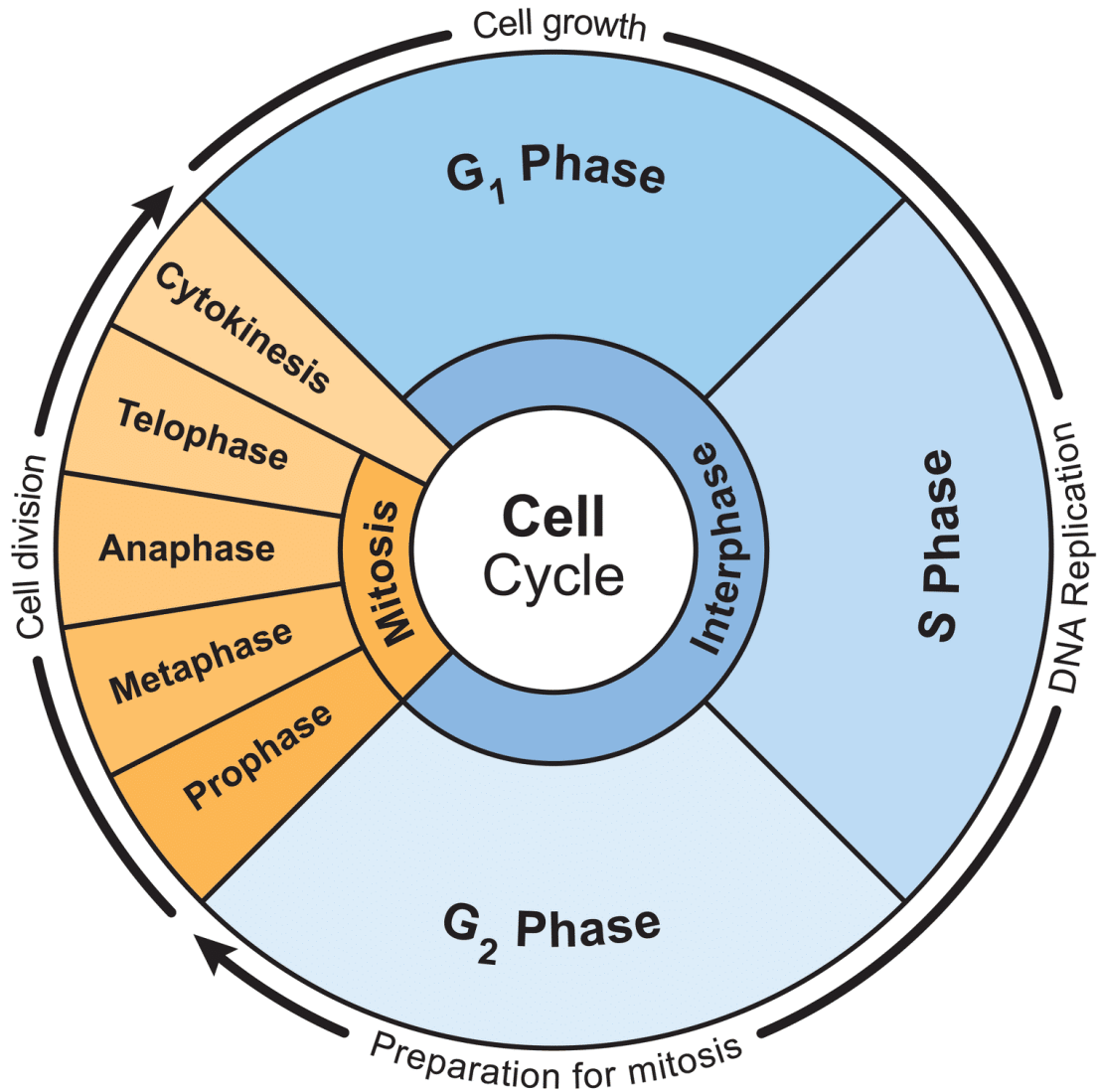
☐

Smooth

SUBMIT



Complete the content above before moving on.



Life cycle of a cell.

Cell Life Cycle

The series of changes that occurs within a cell from the time it is first formed until it reproduces is known as the “cell life cycle”. The cell life cycle is the process involving the growth of a cell until it divides and becomes two new cells.

This cycle consists of four general processes: **mitosis**, **cytoplasmic division**, **interphase**, and **cell differentiation**.

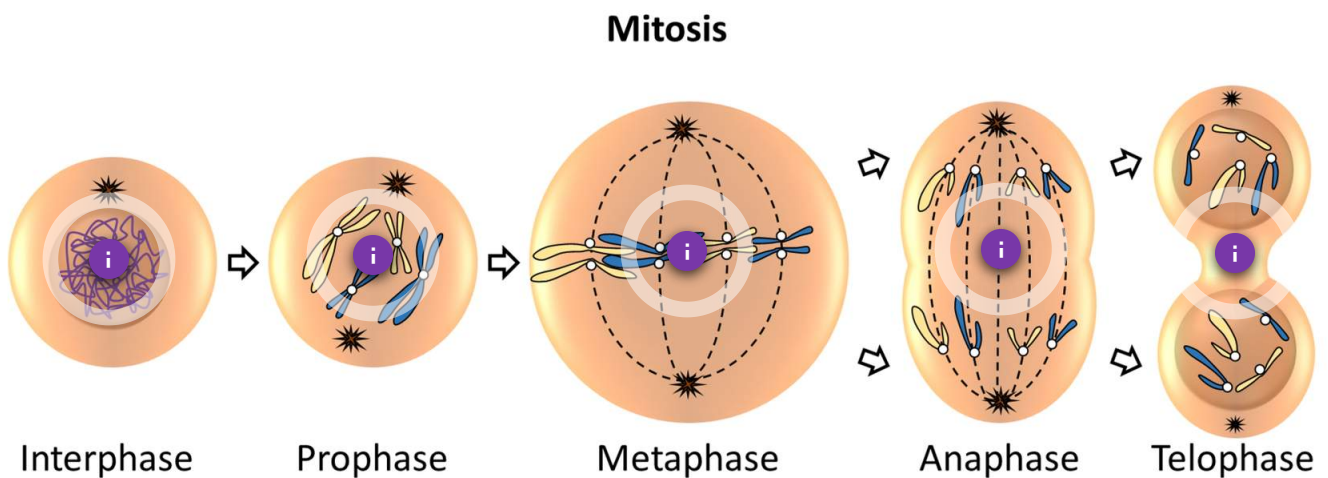
In this lesson, you'll learn about each of these processes.

Cytoplasmic Division - Cytoplasmic division is the division of the contents of cytoplasm. It begins during anaphase and continues through telophase.

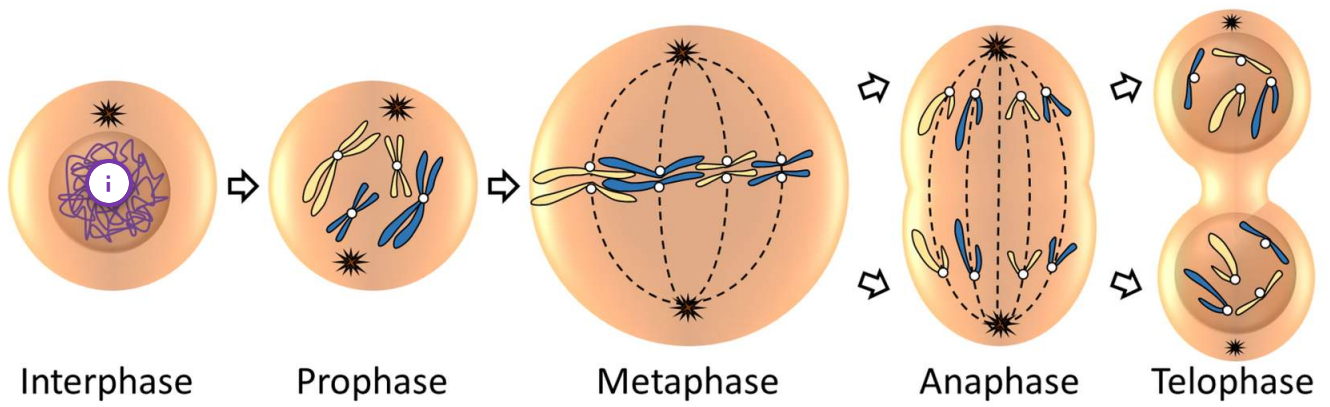
Interphase - Interphase is simply the continuation of cell growth from the time it becomes a new cell until mitosis occurs again.

Cell Differentiation - Cell differentiation is a complicated process that is best explained as the distinction of cell characteristics. The body has many types of cells that must perform various functions. Cell differentiation is the process that gives each cell its specific characteristic.

Click on the **hotspots** below to learn more about each phase in the cell's life cycle during mitosis.



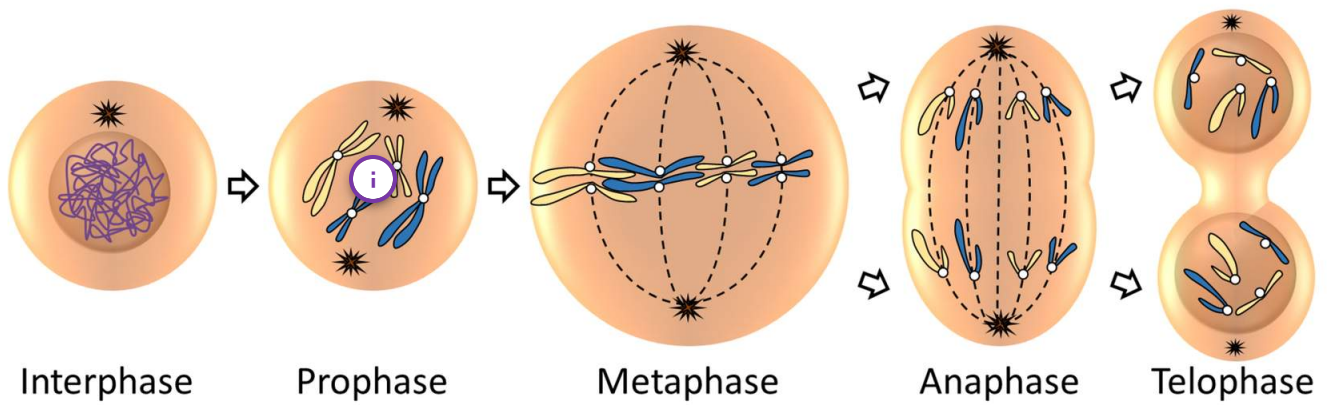
Mitosis



Interphase

This is the continuation of cell growth from the time it becomes a new cell until mitosis occurs again.

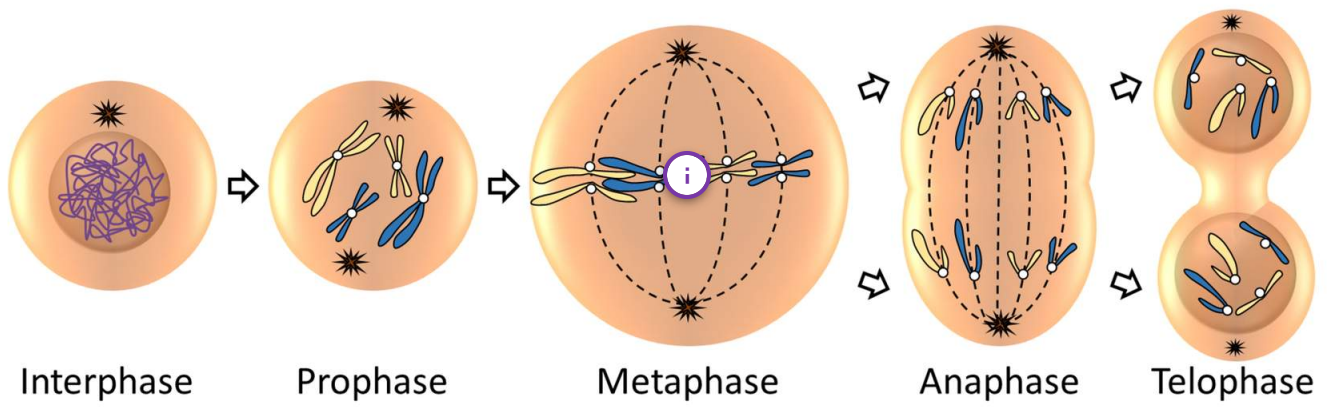
Mitosis



Prophase

The first sign that mitosis is occurring is the appearance of chromosomes. Chromosomes contain the DNA and protein molecules that give the cell its specific characteristics.

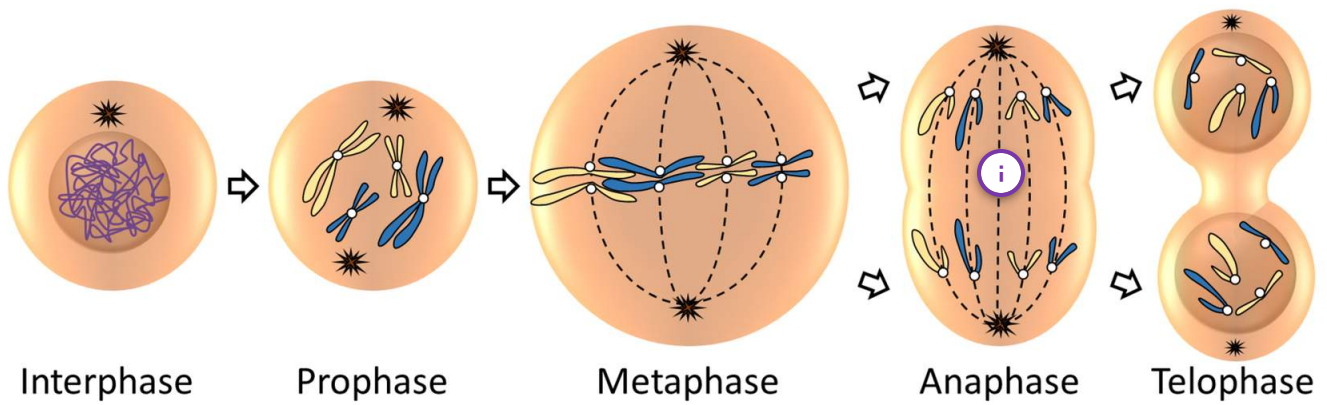
Mitosis



Metaphase

Chromosomes line up in an orderly fashion and prepare to divide during this phase.

Mitosis

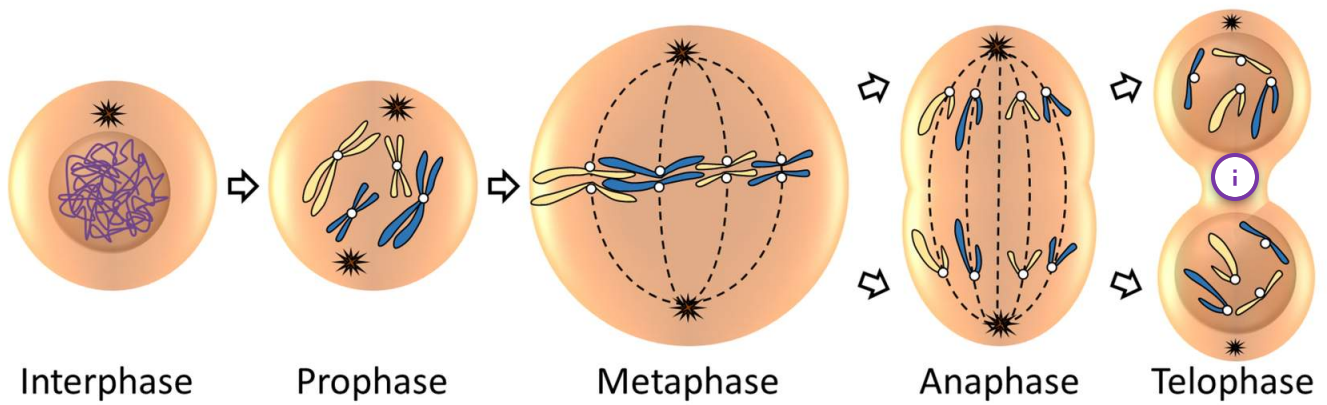


Anaphase

During this phase the following happens:

- The chromosomes divide and move apart from each other.
- Cytoplasmic division begins.

Mitosis

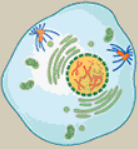
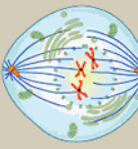
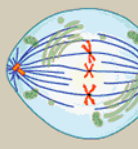
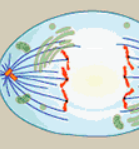
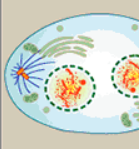
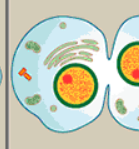
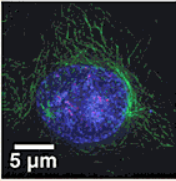
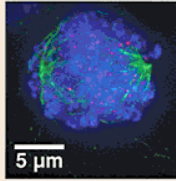
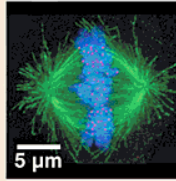
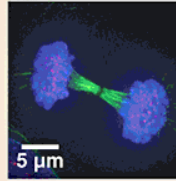
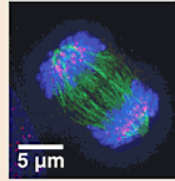
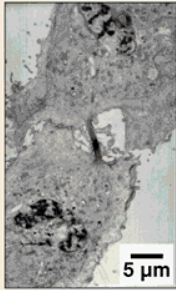


Telophase

During telophase, three things occur:

1. The divided chromosomes change in shape and size and a new nucleus form around each set to complete the cycle.
2. Two new cells have now been created.
3. Cytoplasmic division continues.

Cytoplasmic division of the contents of cytoplasm begins during anaphase and continues through telophase.

Prophase	Prometaphase	Metaphase	Anaphase	Telophase	Cytokinesis
					
<ul style="list-style-type: none"> Chromosomes condense and become visible Spindle fibers emerge from the centrosomes Nuclear envelope breaks down Centrosomes move toward opposite poles 	<ul style="list-style-type: none"> Chromosomes continue to condense Kinetochores appear at the centromeres Mitotic spindle microtubules attach to kinetochores 	<ul style="list-style-type: none"> Chromosomes are lined up at the metaphase plate Each sister chromatid is attached to a spindle fiber originating from opposite poles 	<ul style="list-style-type: none"> Centromeres split in two Sister chromatids (now called chromosomes) are pulled toward opposite poles Certain spindle fibers begin to elongate the cell 	<ul style="list-style-type: none"> Chromosomes arrive at opposite poles and begin to decondense Nuclear envelope material surrounds each set of chromosomes The mitotic spindle breaks down Spindle fibers continue to push poles apart 	<ul style="list-style-type: none"> Animal cells: a cleavage furrow separates the daughter cells Plant cells: a cell plate, the precursor to a new cell wall, separates the daughter cells
					

MITOSIS

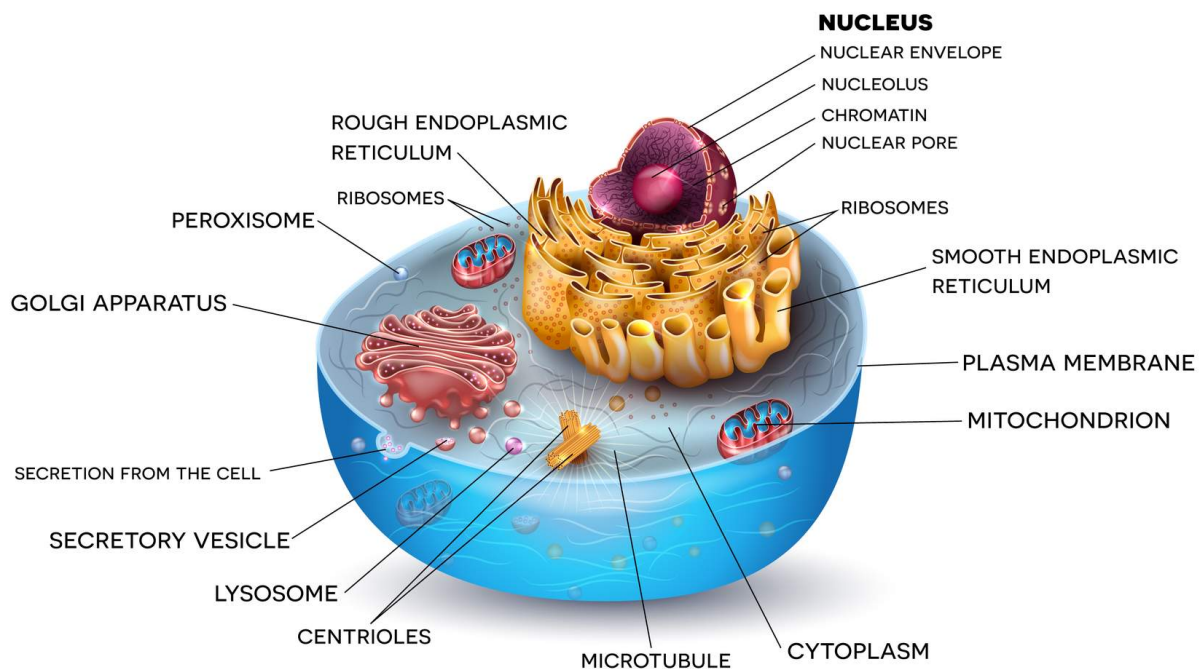
The table below lists additional important components of the cell with their descriptions.

Component	Description
Endoplasmic reticulum	A tubular system within the cell that transports molecules.

Component	Description
Ribosomes	Important for the processing of proteins, both within the cell itself and in other parts of the body.
Golgi apparatus	Located near the nucleus and responsible for distributing proteins the ribosomes processed.
Mitochondria	Principal source of cellular energy. Contains the enzymes involved with electron transport and the citric and fatty acid cycles.
Lysosomes	Tiny membranous sacs that contain enzymes used to break down protein, carbohydrates, acids, and foreign substances that may enter the cell.
Peroxisomes	Found most in cells of the liver and kidneys. Mainly serve to break down toxic substances.
Centrosomes	Vital for cellular reproduction. Centrosomes distribute chromosomes, which carry deoxyribonucleic acid (DNA) information to newly forming cells.
Cilia and flagella	Tiny projections that extend outward from cell surfaces. Responsible for cell movement and the movement of cell products.
Vesicles	Membranous sacs that vary in size. Vesicles are actually an extension of

Component	Description
	the cell membrane that folds inward into the cytoplasm.
Microfilaments and microtubules	Microfilaments are responsible for cell contraction. Microtubules serve as an internal cell “skeleton” that helps maintain the shape of a cell.

ANATOMY OF A CELL



CONTINUE

Functions and Adaptations of Cells and Tissues

The basic unit of the human body is the cell. Cells are responsible for the entire organization of all body structures and for the continuation of life processes. The grouping of many cells forms tissues; the various tissues then join together to make up the organs of the body. In this unit you will briefly examine the basic structures of both cells and tissues. The adult human body contains 50 – 100 trillion cells. This section focuses on the structure and life cycle of cells.

Cells differ in size and shape; however, they all have a common structure. In this lesson, you will take a brief look at the three general parts of the structure of a cell—cell membrane, cytoplasm, and cell nucleus.

The cell membrane is the outermost layer of the cell. It's flexible and protects the entire cell by sealing tiny breaks in the membrane surface whenever they occur. Extensive damage to the membrane will result in the contents of the cell leaking out and eventual cell destruction. The membrane is composed mainly of lipids and proteins; a small amount of carbohydrates also is included. The cell membrane is designed in such a way that it permits the entrance of nourishment to the cell.

With the exception of the nucleus, the cytoplasm contains all of the living substances of the cell. It is a clear liquid that is alive with constant cellular activity. The word metabolism—often used in discussions regarding the human body—actually refers to the activity that occurs in the cytoplasm of each cell. The workings of the cell that occur within the cytoplasm are very complex.

Multiple Choice

These are tiny membranous sacs that contain enzymes used to break down protein, carbohydrates, acids, and foreign substances that may enter the cell.

☐

Ribosomes

☐

Peroxisomes

☐

Lysosomes

☐

Vesicles

SUBMIT

**Watch the four part video series to learn more about
tissues. Ensure your speakers are turned on or you can use the
transcripts posted below.**



Tissues Part 1 Crash Course Anatomy & Physiology Transcript.pdf

163.5 KB





Tissues Part 2 Epithelial Tissue Crash Course Anatomy & Physiology Transcript.pdf

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Tissues Part 3 Connective Tissues Crash Course Anatomy & Physiology Transcript.pdf

162 KB



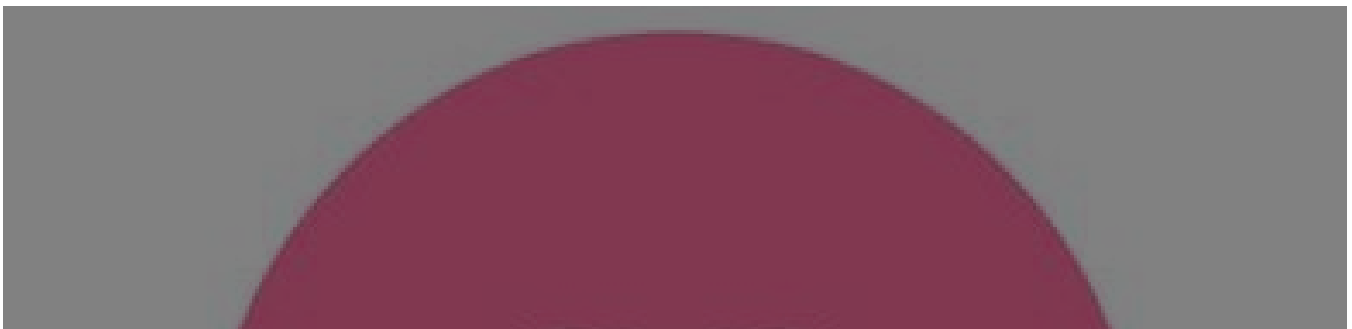


**Tissues Part 4 Types of Connective Tissues Crash Course
Anatomy & Physiology Transcript.pdf**

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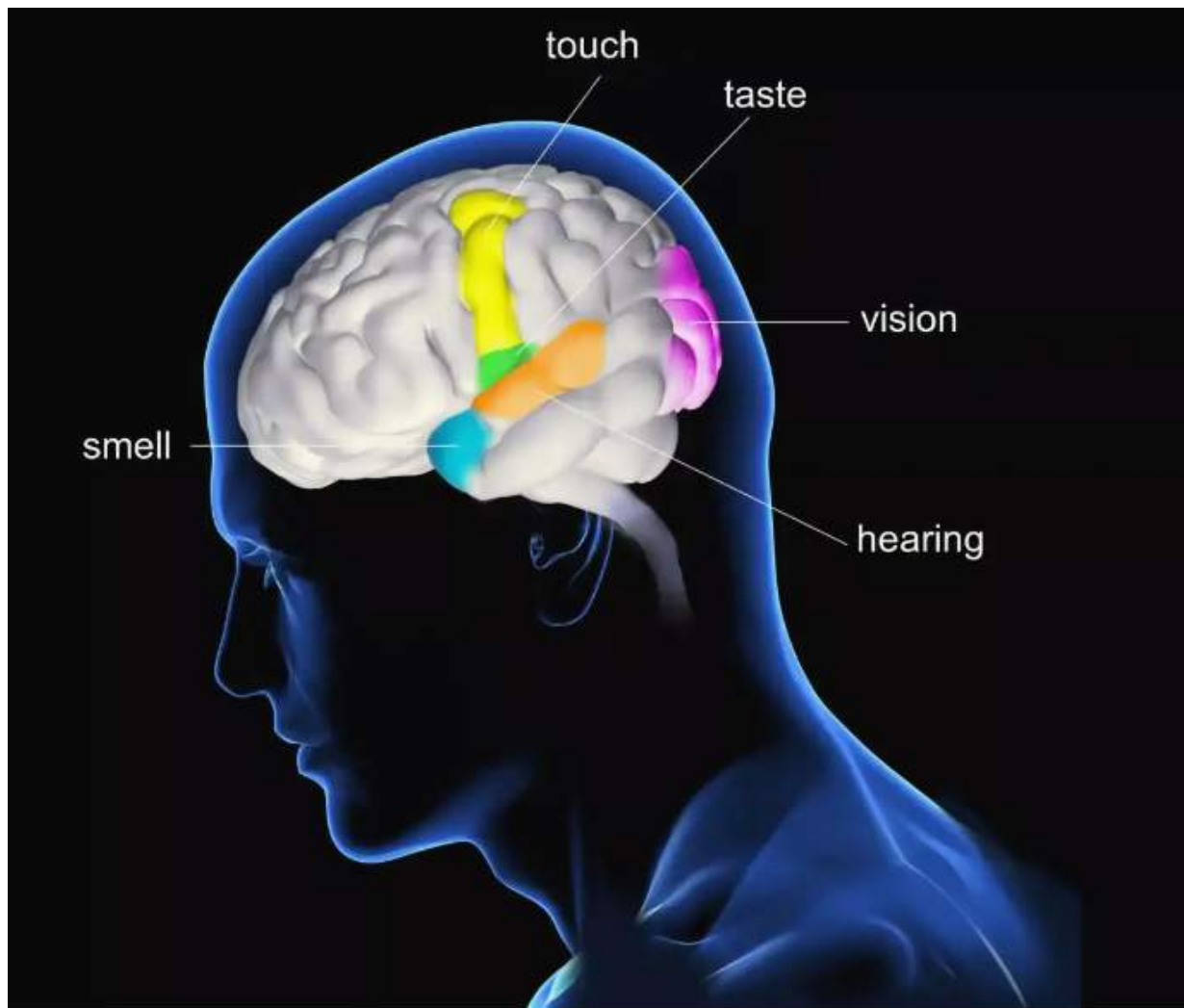
CONTINUE



A stylized graphic of a mouth with red lips and a black outline, set against a dark red circular background. The graphic is centered on the slide.

Anatomy and Physiology of Sensory Organs

The **five** senses are **sight, hearing, smell, taste, and touch**. As you know, the sense of touch is attributed to the organs of the integumentary and nervous systems.



The ways we understand and perceive the world around us as humans are known as senses. We have five traditional senses known as sight, hearing, smell, taste and touch. The stimuli from each sensing organ in the body are relayed to different parts of the brain through various pathways. Sensory information is transmitted from the peripheral nervous system to the central nervous system. A structure of the brain called the thalamus receives most sensory signals and passes them along to the appropriate area of the cerebral cortex to be processed.

Sensory information regarding smell, however, is sent directly to the olfactory bulb and not to the thalamus. Visual information is processed in the visual cortex of the occipital lobe, sound is processed in the auditory cortex of the temporal lobe, smells are processed in the olfactory cortex of the temporal lobe, touch sensations are processed in the somatosensory cortex of the parietal lobe, and taste is processed in the gustatory cortex in the parietal lobe.

The limbic system is composed of a group of brain structures that play a vital role in sensory perception, sensory interpretation, and motor function. The amygdala, for example, receives sensory signals from the thalamus and uses the information in the processing of emotions such as fear, anger, and pleasure. It also determines what memories are stored and where the memories are stored in the brain. The hippocampus is important in forming new memories and connecting emotions and senses, such as smell and sound, to memories.

The hypothalamus helps regulate emotional responses elicited by sensory information through the release of hormones that act on the pituitary gland in response to stress. The olfactory cortex receives signals from the olfactory bulb for processing and identifying odors. In all, limbic system structures take information perceived from the five senses, as well as other sensory information (temperature, balance, pain, etc.) to make sense of the world around us.



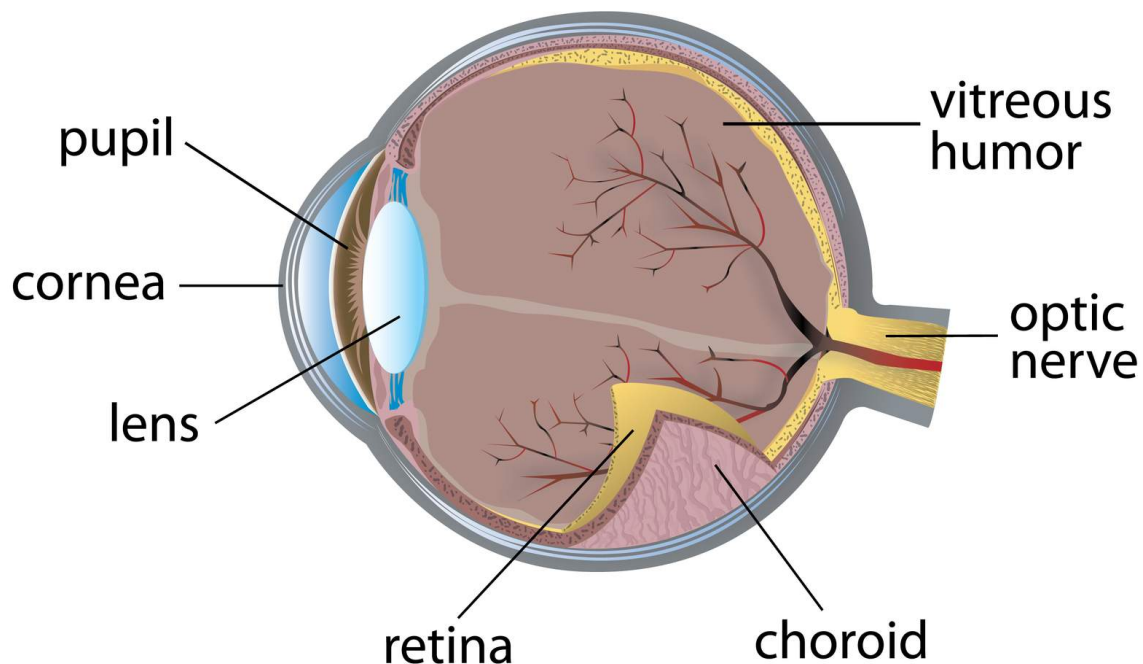
Sight

Let's begin with one of the most complex organs of the body, the eye. Sphere-shaped and approximately one inch in diameter, most of the eyeball itself is not visible, but rather located

within a socket in the skull known as the orbit. The lacrimal gland is located within the orbit. The outer portion of the eye is covered by two protective flaps, upper and lower eyelids, comprised of skin, muscle, connective tissue, and conjunctiva.

The two muscles attached to the eyelids are the orbicularis oculi and levator palpebrae superioris. Six extrinsic muscles extend from the outer surface of the eye to the bones of the orbit which are the superior rectus, inferior rectus, medial rectus, lateral rectus, superior oblique, and the inferior oblique.

Parts of the Human Eye



Many **parts** make up the eye; each located in one of **three** layers. The outer layer is the outer tunic, the center is the middle tunic, and the **deepest** layer is the inner tunic.

OUTER TUNIC	MIDDLE TUNIC	INNER TUNIC
<p>The outer tunic includes the cornea and the sclera. Cornea is the outer transparent covering of the eye primarily composed of connective tissue. The sclera, the white portion of the eye is made of tough fibrous tissue resistant to stretching and tearing. Additionally, it is covered with a thin mucous membrane layer known as the conjunctiva, which also lines the inner surface of the eyelids.</p>		

OUTER TUNIC	MIDDLE TUNIC	INNER TUNIC
<p>The middle tunic contains the choroid coat, ciliary body, iris, lens and has a rich supply of blood vessels. The choroid coat is joined loosely with the sclera extending around the entire eyeball from the iris to the optic nerve. The ciliary body is the thickest part of the middle tunic, extending from the choroid coat to form a ring around the anterior portion of the eyeball.</p> <p>Ciliary muscles are a prominent part of the ciliary body. The iris is a circular muscle located posterior to the sclera. The iris is composed of connective tissue and smooth muscle fibers which gives the eye its distinctive color. The center opening of the iris is the pupil. The lens is located posterior to the iris and is a transparent portion held in position by fibers known as suspensory ligaments. The main body of the lens is composed of specialized epithelial cells and does not contain any blood vessels.</p>		

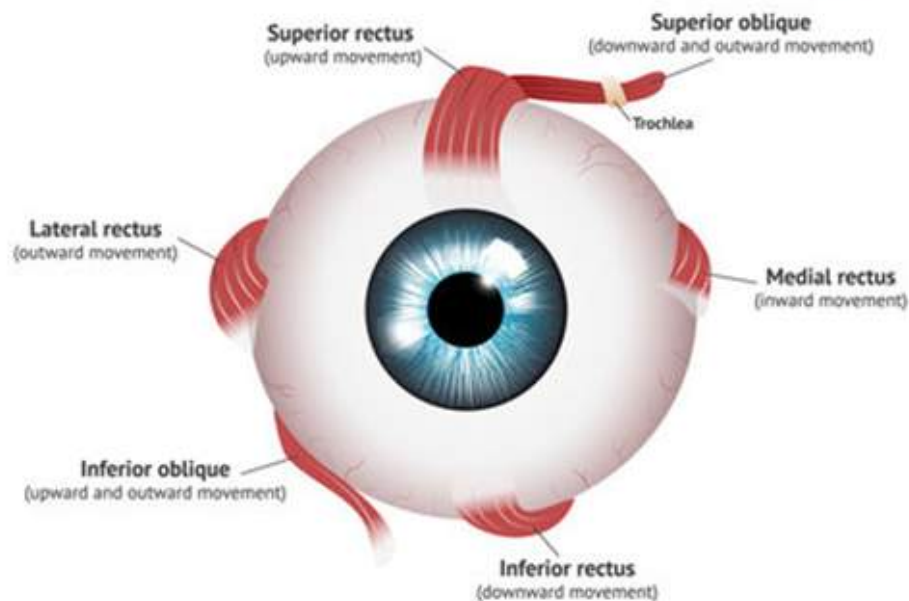
OUTER TUNIC	MIDDLE TUNIC	INNER TUNIC
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The inner tunic contains only one structure, the retina. The retina extends from behind the ciliary body to the optic nerve. The retina is composed of photoreceptors which include two types of receptor cells: rods and cones. The eye contains approximately 100 million rods and 3 million cones. Midway along the length of the retina are neurons that transmit impulses toward the optic nerve. The nerve fibers of the retina join to the optic nerve at an area known as the optic disk.

The optic nerve is the pathway of vision extending from the optic disk along nerve pathways to the brain. Two chambers make up the part of the eye between the cornea and the lens. The anterior chamber is known as the aqueous chamber it is located between the cornea and the iris. This chamber is filled with aqueous humor which also fills the space between the cornea and the lens to help provide nourishment to these parts. This fluid is regularly circulated from the anterior chamber through the pupil and into the posterior chamber, the area of the eye occupied by the lens.

The largest portion of the eye is the vitreous body or posterior cavity, located behind the lens. This area is filled with a gelatin-like substance, vitreous humor, that is responsible for supporting the internal structures of the eye while ensuring the eye maintains its shape.

Muscles of the Human Eye

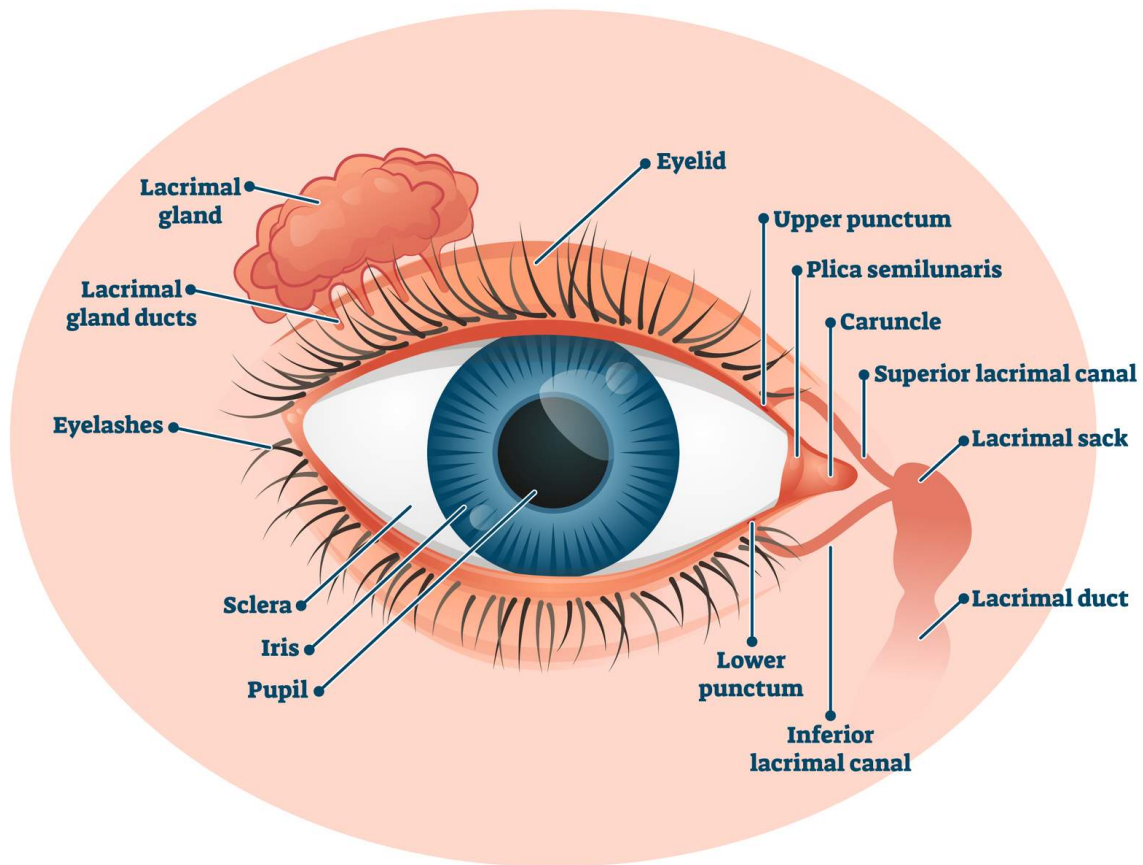


Movement of the eye is possible through **six** main muscles. The superior rectus rotates the eye upward and toward the midline. Inferior rectus rotates the eye downward and toward the midline. The medial rectus rotates the eye toward the midline. The lateral rectus rotates the eye away from the midline. The superior oblique rotates the eye downward and away from the midline.

Lastly, the inferior oblique rotates the eye upward and away from the midline. Vision is an instantaneous process through which light images entering are changed into electrical impulses transmitted to the brain. The process begins with an adjustment made by the iris to regulate the amount of light entering the eye. When a bright light is present, the iris constricts decreasing the pupil thus allowing a small amount of light. When it is dark, the iris dilates, increasing pupil size to allow as much light in as possible. Then, the lens changes in thickness and shape to permit viewing objects according to how close they are to the eye through accommodation. When looking at a close object, the lens thickens and becomes convex in shape. In turn when looking at a distant object, the ciliary muscles relax, and the lens becomes thinner.

As images enter the lens, the rods and cones receive them in the retina. The rods are very sensitive to light and are largely responsible for viewing dimly lit images. Rods permit seeing a general image, while cones make viewing color images possible. Rods can only permit colorless vision. Cones are responsible for sharpening the view of an image. The neurons that are midway along the length of the retina transmit impulses toward the optic nerve, which transmits them to the brain. At this point, the brain translates the impulses into visual images.

PARTS OF THE EYE



Multiple Choice

What are the two muscles attached to the eyelids?

- ☐ Medial rectus and inferior oblique
- ☐ Superior rectus and inferior rectus

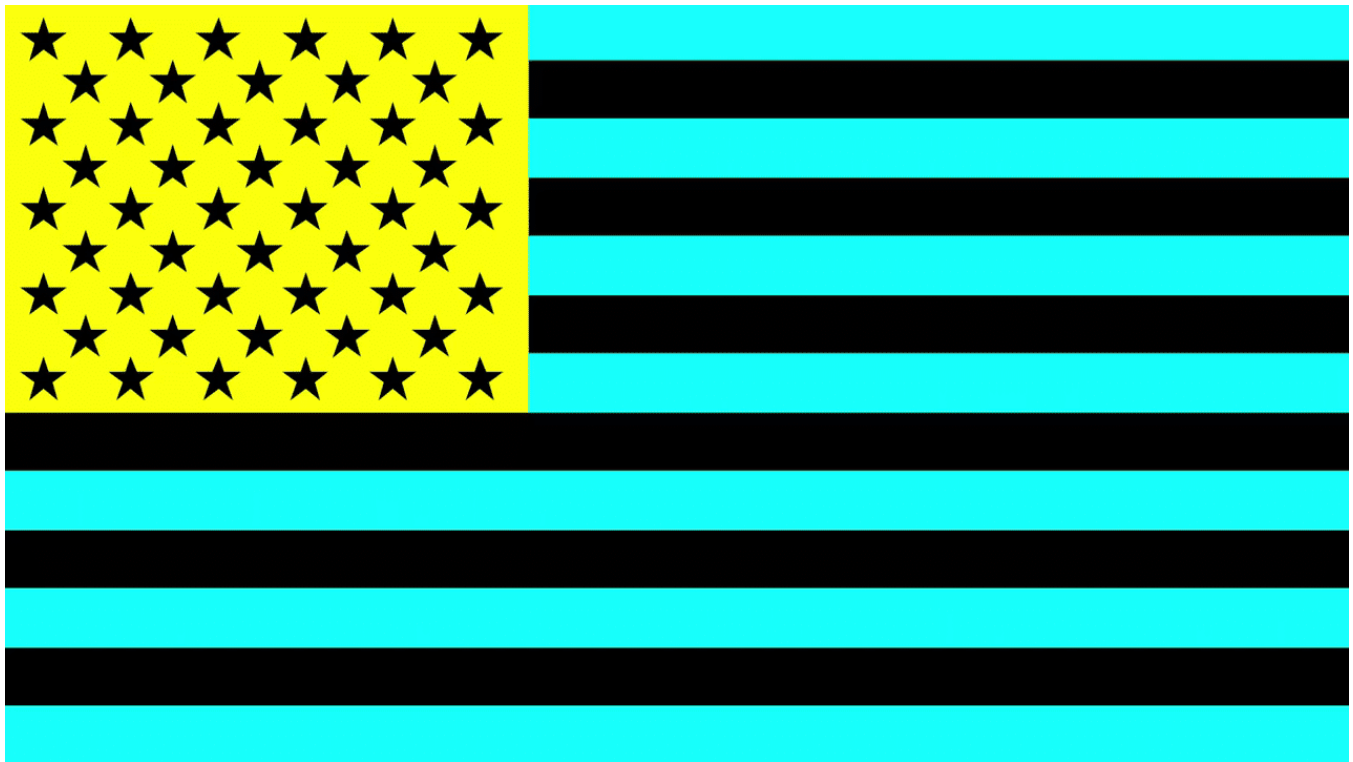
- ☐ Orbicularis oculi and levator palpebrae superioris
- ☐ Superior oculi and levator palpebrae superioris

SUBMIT



Complete the content above before moving on.

Watch the video below to learn more about the eye. Ensure your speakers are turned on or you can use the transcript posted below.



Vision Crash Course Anatomy & Physiology Transcript.pdf

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CONTINUE

The eye is protected from exterior particles by the eyelids and lacrimal glands. The eyelids close voluntarily, controlled by two muscles the orbicularis oculi, which closes the eyelid and the levator palpebrae superioris, which opens the eyelid. The eyes involuntarily blink to help keep the conjunctiva lubricated with fluid from the lacrimal glands. If debris does enter the eye

despite the protection from the eyelids, the eyelashes trap the debris before causing serious problems.



Hearing

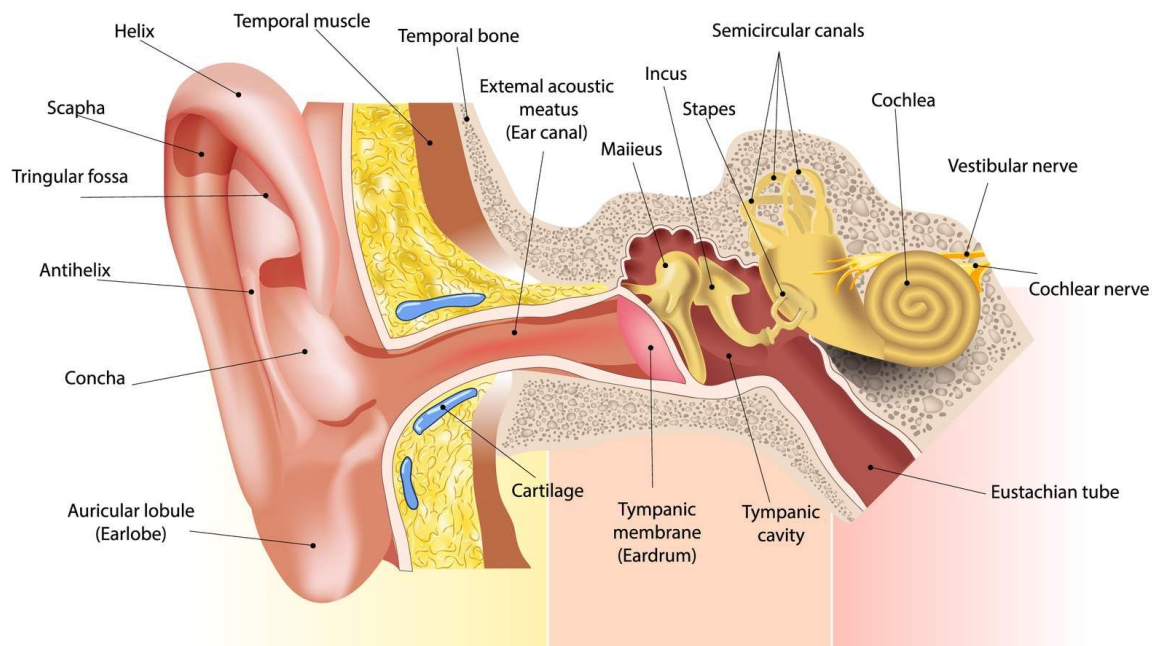
The Ear

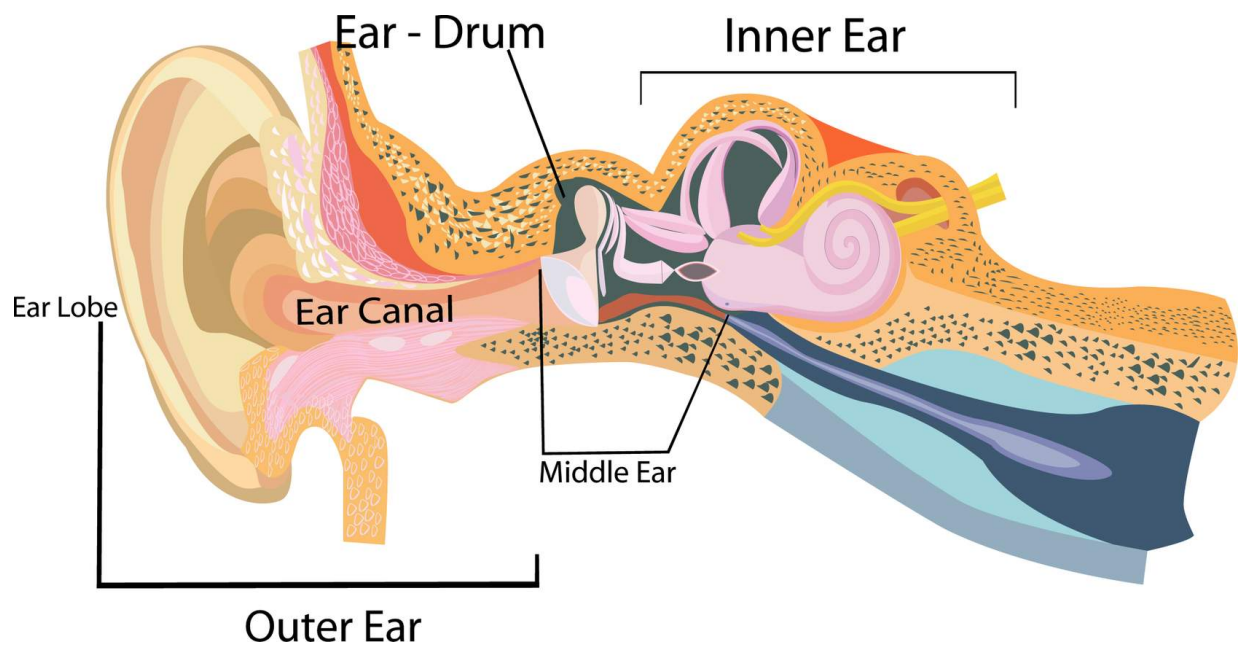
The ear is another sense organ functioning in hearing and balance. The structure of the ear is divided into three parts, the external, middle, and inner ear. The external ear has two parts, the auricle and the external auditory canal.

The auricle also known as the pinna is the visible part of the ear. The pinna is composed of cartilage and has various folds and curves guiding sound waves into the auditory canal. The external auditory canal is a tube-like passageway that is approximately one inch long leading from the pinna to the middle ear. Small hairs line the opening of the canal and small ceruminous glands are located within the canal. The middle ear includes the tympanic cavity, tympanic membrane, and auditory ossicles.

In addition, the eustachian tube is sometimes considered a part of the middle ear. The tympanic cavity is a space within the temporal bone filled with air, serving as a dividing chamber between the external and inner ear. The tympanic membrane, known as the eardrum, is covered by a thin layer of skin on the outside with a thin layer of mucous membrane on the inside.

Anatomy of the Ear





The eardrum is shaped like an oval and has a slight cone shape at one end that points toward the inner ear maintained by the malleus. The malleus, incus, and stapes are three tiny bones collectively known as the auditory ossicles. Each of these bones are attached to the wall of the tympanic cavity, together forming a bridge from the eardrum to the inner ear. The stapes are attached to a small opening in the wall of the tympanic cavity that opens to the inner ear known as the oval window.

The eustachian tube is a small tube that connects the middle ear to the pharynx. It has a small flap-like valve that opens to the throat. The inner ear contains a system of chambers and tubes, known as the labyrinth. The cochlea resembles the shape of a coiled snail shell and is covered with a thin membrane. The inside of the cochlea is divided into two compartments. The upper compartment is connected to the oval window of the middle ear and extends to the center of the coiled cochlea. The lower compartment extends from the center of the cochlea to the round window, an opening in the wall of the inner ear.

The inner ear has three semicircular canals each resembling a loop extending outward from the area of the vestibule and back. The vestibule is a bony chamber located between the cochlea and semicircular canals containing various membranous structures. Lastly, the organ of Corti is a

highly sensitive part of the inner ear, located within the cochlea. The organ of Corti contains approximately 16,000 hearing receptor cells referred to as hair cells because of the tiny hairlike projections that extend outward from them.

The process of receiving and interpreting sound waves is so rapid that normal hearing can detect more than 20,000 sound vibrations per second. Sounds are produced by vibrations traveling through air in the form of sound waves. These sound waves are guided into the external auditory canal by the auricle. Once the vibrations enter the external auditory canal, they travel the entire length of the canal until they reach the eardrum. Sound waves cause pressure changes in the canal resulting in a back-and-forth movement of the eardrum. The malleus, then moves in unison with the eardrum and stimulates the incus and stapes to move.

Watch the video below to learn more about hearing and balance. Ensure your speakers are turned on or you can use the transcript posted below.



**Hearing & Balance Crash Course Anatomy & Physiology
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Movement of the stapes causes pressure to be applied against the oval window stimulating the movement of fluid within the cochlea. The fluid movement within the cochlea stimulates the hair cells to pick up vibrations as they move changing with the frequencies of the vibrations. The receptor cells in the organ of Corti then transmit the vibrations to the auditory nerve pathways, which lead to the auditory nerve. The auditory nerve then transmits them to the cerebrum as the brain interprets the sound vibrations. Balance often is referred to as equilibrium. The physiological process of maintaining equilibrium for the body is divided into two categories, static equilibrium and dynamic equilibrium. Static equilibrium involves determining the position of the head when no head or body movement is occurring interpreted by the chambers of the vestibule.

Small hairs within the vestibule project either horizontally or vertically, depending on the position of the head. The position of the hairs is detected by nerve fibers and sent as a message to the brain, where head position is interpreted instantly. Dynamic equilibrium involves the interpretation of head and body movement. This interpretation is made possible by the semicircular canals, which act somewhat like a gyroscope when determining the position of the head and body. Receptor cells transmit the positions through nerve pathways to the brain, where head and body positions are interpreted. The brain can then stimulate action by the skeletal muscles to prevent individuals from falling.

Multiple Choice

_____ involves determining the position of the head when no head or body movement is occurring interpreted by the chambers of the vestibule.

- ☐ Static equilibrium
- ☐ Dynamic equilibrium
- ☐ Stationary equilibrium
- ☐ Distance equilibrium

SUBMIT



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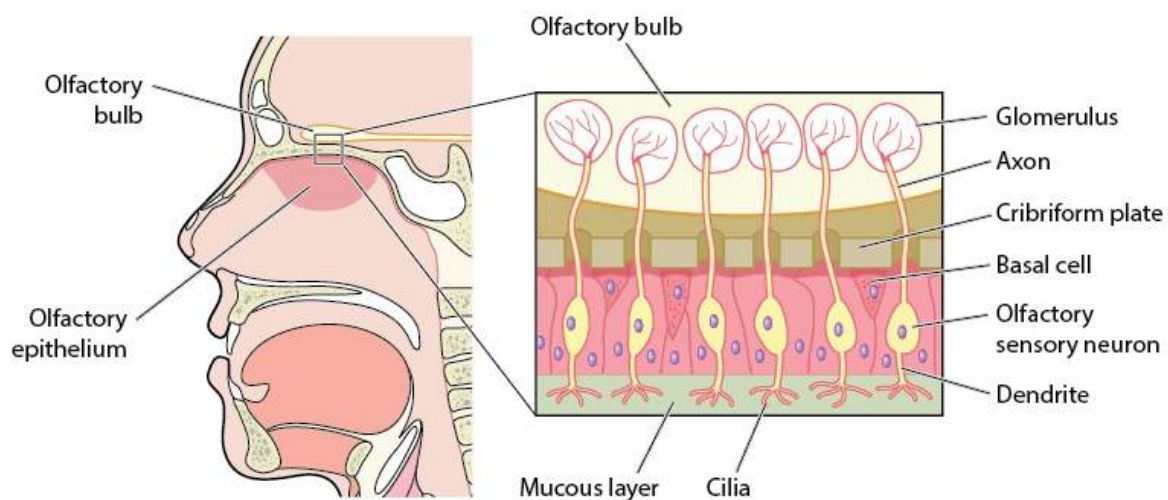
Smell

The Nose

The nose is a part of the respiratory system, however, serves as a sense organ providing smell. The nasal cavity lies behind the externally visible nose and is divided into three passageways; superior meatus, middle meatus, and inferior meatus that make up the nasal conchae. The upper posterior portion of the nasal cavity is lined with olfactory receptors. These receptor cells are bipolar neurons that have tiny knob-like projections covered with fine, hair-like cilia that project into the nasal cavity.

Olfactory nerves extend from the olfactory receptors to enlarged areas known as olfactory bulbs. The pathways extending beyond the bulbs are olfactory tracts. Ultimately, the nerve pathways lead to a receiving area of the brain located anterior to the hypothalamus. Most experts agree there are at least seven groups of odors that can be discerned by olfaction as research indicates any odor can be described as belonging to one of these primary odor groups or a combination of these groups.

The seven primary odor groups are camphoraceous, musky, floral, peppermint, ethereal, pungent and putrid. Three unique items of interest are associated with olfaction. First, detecting some odors is often difficult since the olfactory receptors are located very high in the nasal cavity.



A person will often need to sniff forcefully to permit enough airflow to reach above the normal air pathway. Second, olfactory receptors rapidly adapt to the sensation of an odor. This means that approximately 50 percent of the intensity of an odor is lost within the first second following stimulation. After one minute, it is possible for the receptors to become completely insensitive to an odor. Third, the receptor neurons of the olfactory pathways are the only parts of the nervous system that are always in direct contact with the environment. This third fact makes it possible for damage to the olfactory neurons to occur. Damage to these neurons is

irreversible when it occurs; thus, a person can lose some or even all of their sense of smell as exposure continues during the process of aging.

Watch the video below to learn more about Taste. Ensure your speakers are turned on or you can use the transcript posted below.



Taste & Smell Crash Course Anatomy & Physiology Transcript.pdf

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Taste

The Mouth

Taste is attributed to the tongue and the nervous system. Taste, also known as gustation, is the ability to detect chemicals in food, minerals and dangerous substances such as poisons. This detection is performed by sensory organs on the tongue called taste buds. There are five basic tastes that these organs relay to the brain: sweet, bitter, salty, sour and umami. Receptors for each of our five basic tastes are located in distinct cells and these cells are found in all areas of the tongue. Using these tastes, the body can distinguish harmful substances, usually bitter, from nutritious ones. People often mistake the flavor of food for the taste. The flavor of a particular food is actually a combination of the taste and smell as well as the texture and temperature.

CONTINUE



Touch

Touch

Our sense of touch is called somatosensory sensation and is located around the neural receptors in the skin. Mechanoreceptors similar to those in the ears are also in the skin. These receptors sense varying amounts of pressure on the skin - from gentle brushing to firm pressing. These receptors can also sense the duration and location of the touch.

The special thing about our somatosensory perception is the variety of things we can feel. Our thermoreceptors can detect different levels of temperature. Thanks to the thermoreceptors, you don't need to put your hand inside of fire to feel how hot it is. Our nociceptors work both in the body and the skin to sense pain. All three of these receptors travel through the peripheral to the central nervous system arriving in the brain.

END OF LESSON