

### CELL HISTORY

<b>Cell</b>	basic and smallest unit of life
<b>Robert Hooke</b>	discovered cell through a microscope in 1665
<b>Matthias Jakob Schleiden &amp; Theodor Schwann</b>	developed the cell theory in 1839

### CELL

Parts of a Cell	Function
nucleus	- control center of cell
cell membrane	- outer layer and protection of the cell
nucleolus	- in the nucleus and contains genetic info (RNA)
nucleoplasm	- liquid inside nucleus (DNA)
cytoplasm	- liquid that fills the inside of the cell
golgi bodies	- protein package
mitochondria	- powerhouse of the cell
ribosome	- RNA carrier
lysosome	- killing cells
chromosome	- DNA carrier
endoplasmic reticulum	- passageway

**DNA** - deoxyribonucleic acid

**RNA** - ribonucleic acid

**Necrosis** - death of a cell or a body tissue

### MITOSIS

#### PHASES

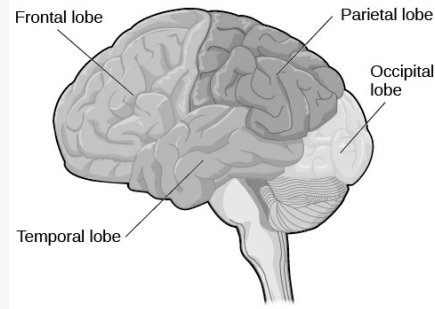
<b>1. Interphase</b>	a complete cell
<b>2. Prophase</b>	chromosome pairing occurs
<b>3. Metaphase</b>	division of cell
<b>4. Anaphase</b>	in position of cleavage furrow
<b>5. Telophase</b>	two complete cells with identical genomes

**Mitosis** is the process, in the cell cycle, by which the chromosomes in the cell nucleus are separated into two identical sets of chromosomes, each in its own nucleus.

**Cleavage furrow** is the indentation of the cell's surface that begins the progression of cleavage, by which animal and some algal cells undergo cytokinesis, the final splitting of the membrane, in the process of cell division.



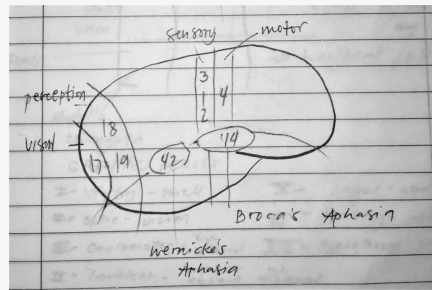
### BRAIN



### LOBES OF THE BRAIN

<b>frontal lobe</b>	is located in the forward part of the brain, extending back to a fissure known as the central sulcus. The frontal lobe is involved in reasoning, motor control, emotion, and language.
<b>parietal sensory</b>	is located immediately behind the frontal lobe, and is involved in processing information from the body's senses.
<b>temporal lobe</b>	is located on the side of the head, and is associated with hearing, memory, emotion, and some aspects of language.
<b>occipital lobe</b>	is located at the very back of the brain, and contains the primary visual cortex, which is responsible for interpreting incoming visual information.

### BRODMANN's AREAs OF THE BRAIN



### AREAS

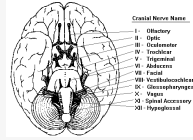
<b>Areas 3, 1 &amp; 2</b>	Primary Somatosensory Cortex (frequently referred to as Areas 3, 1, 2 by convention)
<b>Area 4</b>	Primary Motor Cortex
<b>Area 17</b>	Visual / Primary visual cortex (V1)
<b>Area 18</b>	Perception / Secondary visual cortex (V2)
<b>Areas 41 and 42</b>	Wernicke's Aphasia / Auditory cortex



### AREAS (cont)

**Area 44** Broca's Aphasia / Pars opercularis, part of the inferior frontal gyrus and part of Broca's area

### CRANIAL NERVES



The cranial nerves are 12 pairs of nerves that can be seen on the ventral (bottom) surface of the brain. Some of these nerves bring information from the sense organs to the brain; other cranial nerves control muscles; other cranial nerves are connected to glands or internal organs such as the heart and lungs.

### LAMINA

<b>I - Olfactory Nerve</b>	Smell
<b>II - Optic Nerve</b>	Vision
<b>III - Oculomotor Nerve</b>	Eye movement; pupil constriction
<b>IV - Trochlear Nerve</b>	Eye movement
<b>V - Trigeminal Nerve</b>	Somatosensory information (touch, pain) from the face and head; muscles for chewing.
<b>VI - Abducens Nerve</b>	Lateral Rectus
<b>VII - Facial Nerve</b>	Taste (anterior 2/3 of tongue); somatosensory information from ear; controls muscles used in facial expression.
<b>VIII - Vestibulocochlear Nerve</b>	Hearing; balance
<b>IX - Glossopharyngeal Nerve</b>	Taste (posterior 1/3 of tongue); Somatosensory information from tongue, tonsil, pharynx; controls some muscles used in swallowing.
<b>X - Vagus Nerve</b>	Sensory, motor and autonomic functions of viscera (glands, digestion, heart rate)
<b>XI - Spinal Accessory Nerve</b>	Controls muscles used in head movement.
<b>XII - Hypoglossal Nerve</b>	Controls muscles of tongue

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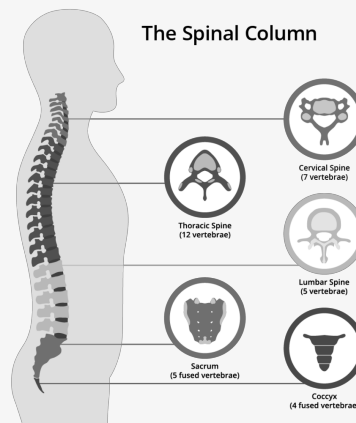
### BRAINSTEM

The brainstem (middle of brain) connects the cerebrum with the spinal cord. The brainstem includes the midbrain, the pons and the medulla.

### PARTS OF A BRAINSTEM

- Midbrain** facilitate various functions, from hearing and movement to calculating responses and environmental changes.
- Pons** enable a range of activities such as tear production, chewing, blinking, focusing vision, balance, hearing and facial expression.
- Medulla** the medulla regulate many bodily activities, including heart rhythm, breathing, blood flow, and oxygen and carbon dioxide levels.
- Oblongata** the medulla produces reflexive activities such as sneezing, vomiting, coughing and swallowing.

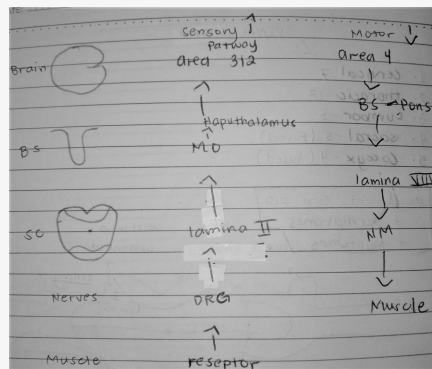
### SPINAL CORD



### Main Parts of Spine

- Cervical Spine - Neck
- Thoracic Spine - Mid Back
- Lumbar Spine - Low Back
- Sacral / Sacrum
- Coccyx

### SENSORY PATHWAY

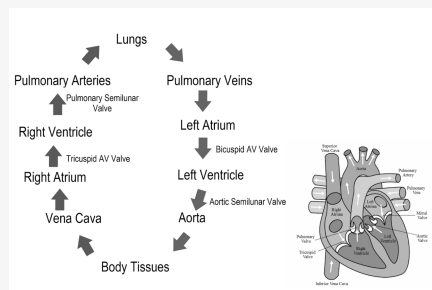


### DIGESTIVE SYSTEM

<b>Mouth</b>	Mechanical is breaking foods into pieces such as chewing, squeezing, and mixing. Chemical is where digestive juices, such as stomach acid, bile, and enzymes are involved.
<b>Esophagus</b>	After you swallow, peristalsis pushes the food down your esophagus into your stomach.
<b>Stomach</b>	After food enters your stomach, the stomach muscles mix the food and liquid with digestive juices. The stomach slowly empties its contents, called chyme, into your small intestine.
<b>Small intestine</b>	The muscles of the small intestine mix food with digestive juices from the pancreas, liver, and intestine, and push the mixture forward for further digestion. The walls of the small intestine absorb water and the digested nutrients into your bloodstream.
<b>Large Intestine</b>	Waste products from the digestive process include undigested parts of food, fluid, and older cells from the lining of your GI tract. The large intestine absorbs water and changes the waste from liquid into stool.
<b>Rectum and Anus</b>	The lower end of your large intestine, the rectum, stores stool until it pushes stool out of your anus during a bowel movement.

**Peristalsis** is a series of wave-like muscle contractions that move food through the digestive tract. It starts in the esophagus where strong wave-like motions of the smooth muscle move balls of swallowed food to the stomach.

### PULMONARY CIRCULATION



### PLANT DEVELOPMENT

Is a continuous process starting with embryogenesis and the formation of the primary plant body (embryonic root and embryonic shoot) and continuing post germination with the regular production of new organs (roots, leaves, branches, and flowers).

**Plant Growth** - increasing of plant volume or mass without formation of new structures (e.g. organs, tissues, cells, etc.)

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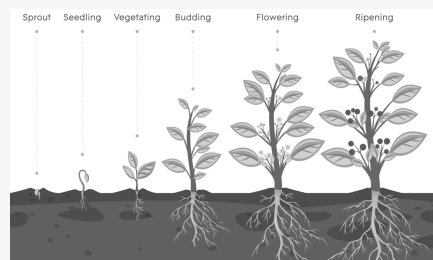
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### LIFE CYCLE OF A SUNFLOWER

#### PHASES

<b>Seeds</b>	the seeds are planted in the ground or they fall from the seed head and settle
<b>Germination</b>	hard shell softens and splits, roots grow downwards and shoots grow upwards
<b>Seedling</b>	after about a week, leaves start to grow and then so on
<b>Young Plant</b>	buds form and unfolds into petals
<b>Adult Plant</b>	flower blooms
<b>Seeds Fall</b>	the dead plant's seeds dries up and the cycle repeats

### LIFE CYCLE OF A TOMATO



### PARTS OF A SEED

<b>Epicotyl</b>	region of an embryo or seedling stem
<b>Radicle</b>	develops into the primary root
<b>Testa</b>	the seed coat / protective layer
<b>Cotyledon</b>	an embryonic leaf in seed-bearing plants
<b>Micropyle</b>	a small opening in the surface of an ovule

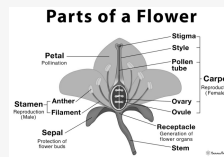
### PLANT REPRODUCTION

<b>Sexual Reproduction</b>	requires genetic material from two parents / combination of gametes for fertilization to produce offspring <b>flowering plants</b> reproduce through <b>pollination</b> / can either self-pollinate or cross-pollinate
<b>Asexual Reproduction</b>	requires DNA from one parent / identical offspring are called clones two methods are <b>vegetation propagation</b> and <b>fragmentation</b>

**Cross-pollination** happens when the wind or animals move pollen from one plant to fertilize the ovules on a different plant. The advantage of cross-pollination is that it promotes genetic diversity. Some plants have features that **prevent self-pollination**, such as pollen and ovules that develop at different times.



### FLOWER STRUCTURE



The flowers contain male sex organs called **stamens** and female sex organs called **pistils**. The **anther** is the part of the stamen that contains pollen. This pollen needs to be moved to a part of the pistil called the **stigma**.

### ANIMAL DEVELOPMENT

**Cleaving** fertilized egg undergoes mitosis or cell multiplication / forms *Morula*, a ball consists of clustered cells / forms a *Blastula* — hollow cell sphere of blastomeres.

**Gastrulation** an early multicellular embryo composed of germinal layers, that subsequently formed after the blastula

**Germinal Layers** : Ectoderm, Endoderm, Mesoderm

**Organo-genesis** starts at the end of the process of gastrulation / the formation of organs and organ systems that continues until birth

**Ectoderm**: Nervous System - Eye Lenses - Mouth (Including Teeth) - Sense Organs - Skin

**Mesoderm**: Circulatory System - Bone Marrow - Bone - Sex Organs - Body Cavity

**Endoderm**: Respiratory System - Gastrointestinal Tract (Except mouth and anus) - Thyroid Glands - Parathyroid Glands - Pharynx

Sequence of Animal Development: Cleaving -> Gastrulation -> Organogenesis

### REGULATION OF BODILY FLUIDS

**Homeostasis** from greek word "Homoios" means like or similar, and from the latin word "stasis" means standing state

any process of bodily regulation that maintains an internal stable state

includes bodily temperature, blood calcium levels, and level of blood glucose

**Osmoregulation** **Osmoconformers** - internal osmolarity is *the same* with it's external environment

**Osmoregulators** - internal osmolarity is *constantly regulated* regardless of the osmolarity within the environment.



### REGULATION OF BODILY FLUIDS (cont)

**Osmoregulation on Homeostasis**      **Osmosis** - movement of water to solute materials in the body through a semipermeable membrane

**Osmolarity** - concentration of solutes into water.

**Kidney**      regulates the concentration of water and minerals in the body

Sequence: Homeostasis -> Osmoregulation

### ANIMAL REPRODUCTION

**Sexual Reproduction**      requires genetic material from two parents / combination of gametes for fertilization to produce offspring

**Internal Fertilization** occurs inside the female organism's body / oviparity - eggs / ovoviviparity - eggs laid before hatch / viviparity - like mammals

**External Fertilization** occurs apart from the female organism's body

**Asexual Reproduction**      requires one living organism to reproduce / offspring genetically identical

**Binary Fission** - organism duplicates its genetic material and then divides into two parts (cytokinesis), with each new organism receiving one copy of DNA

**Budding** - producing an individual through the buds that develop on the parent body

**Fragmentation** - parent body divides into several fragments and each fragment develops into a new organism

**Regeneration** - growing a new organism from the lost body part

### RESPIRATORY SYSTEM



The Respiration begins when oxygen enters into our body through the nose and the mouth. The oxygen then travels through the trachea and pharynx where the trachea divides into two bronchi. Here, the bronchi are divided into bronchial tubes, in the chest cavity, so air can be directly moved into the lungs.





### RESPIRATORY SYSTEM

**Alveoli:** They are like tiny grape-like sacs at the end of the tree of respiratory system and average adult has about 600 million alveoli. The exchange of oxygen and carbon dioxide gases occurs at the alveolar level.

**Diaphragm:** This is a primary muscle used in the process of inhalation, and exhalation. It is a dome shaped piece of muscle located in the lower ribs. Flattens when inhale, stretches and relaxes during exhale.

Adults breathe 12 to 20 times per minute. Average of 45 when exercising or doing an strenuous activity.

### IMMUNE SYSTEM

- protects body from germs; bacteria, viruses, fungi, and toxins.

**White Blood Cells** known as *leukocytes* that protects the body from infections, injury, and illness.

**Antibodies** known as *immunoglobulin* are proteins that protects your body from unwanted substances.

### COMPLEMENT SYSTEM

- made up of a large number of distinct plasma proteins that react with one another to opsonize pathogens and induce a series of inflammatory responses that help to fight infection.

- interacting proteins are produced by the liver and activates when the system receives a signal

**Carbohydrates** turns into sugars that goes into the blood

**Pancreas** releases insulin that acts as a bridge for the sugar to go into the cell and use it for energy.

**Type 1 Diabetes** - body stops making insulin

**Type 2 Diabetes** - both body not making insulin and cells having insulin resistance

**Prediabetes** - blood sugar above typical but not enough to be diagnosed as diabetes

**Gestational Diabetes** - develops in second or third trimester of pregnancy

With diabetes, your body doesn't make enough insulin or can't use it as well as it should. When there isn't enough insulin or cells stop responding to insulin, too much blood sugar stays in your bloodstream. Over time, that can cause serious health problems, such as heart disease, vision loss, and kidney disease.

