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Unit 8 - How are animals adapted to Life:

Interacting with the Environment:

Adaptations:

Adaptations are traits or characteristics that organisms develop over time to better suit their environment and improve their chances of survival and reproduction. These adaptations can be structural, physiological, behavioral, or even genetic. Here's a breakdown of each type:

- **Structural Adaptations**: Physical features like a giraffe's long neck or camouflage patterns that help organisms blend in with their surroundings.
- **Physiological Adaptations**: Internal mechanisms such as sweating to cool down or storing fat for energy during hibernation.
- **Behavioral Adaptations**: Actions like migration to find food or huddling together for warmth.
- **Genetic Adaptations**: Inherited traits like disease resistance or specific dietary preferences passed down through genes.

How have humans adapted to survive in different Environments:

1. **Arctic Adaptations**:
    - Physiological: Inhabitants of the Arctic, such as the Inuit people, have evolved shorter, stockier bodies with a higher percentage of body fat to conserve heat in frigid temperatures.

- Technological: They use igloos, made from compacted snow blocks, as temporary shelters, which provide insulation against the cold. Additionally, they wear thick, fur-lined clothing to stay warm.
- Cultural: Inuit societies have developed hunting techniques suited to the Arctic environment, such as ice fishing and hunting seals, whales, and other marine mammals for food and resources.

2. **Desert Adaptations**:
    - Physiological: People living in desert regions often have adaptations such as efficient water retention and cooling mechanisms. For example, the Bedouin of the Arabian Desert have developed the ability to conserve water and withstand extreme heat.
    - Technological: Nomadic desert communities use camel caravans for transportation and carry portable tents made from lightweight materials like camel hair or woven fabrics to provide shade.
    - Behavioral: Desert dwellers often engage in nocturnal activities to avoid the intense heat of the day and conserve energy. They also have specific knowledge of edible plants and water sources in the desert landscape.
3. **High Altitude Adaptations**:
    - Physiological: Populations living at high altitudes, like the Sherpa people of the Himalayas, have evolved increased lung capacity and hemoglobin levels to cope with lower oxygen levels.
    - Technological: Sherpas use yak hair tents that provide insulation against the cold and wind at high altitudes. They also utilize oxygen tanks for climbers attempting to reach extreme altitudes.
    - Cultural: Sherpa communities have developed specialized knowledge of mountain terrain and weather patterns, enabling them to guide mountaineers safely and efficiently.
4. **Coastal Adaptations**:
    - Technological: Coastal communities often rely on fishing as a primary food source and use boats, nets, and hooks to harvest seafood. They also build

houses elevated on stilts or platforms to protect against flooding and storms.

- Behavioral: Many coastal cultures have developed a deep understanding of tides, currents, and marine ecosystems, allowing them to navigate and exploit coastal resources effectively.
- Cultural: Coastal societies often have rich maritime traditions and rituals associated with fishing, boatbuilding, and seafaring, passed down through generations.

These examples illustrate the diverse ways in which humans have adapted to different environments through a combination of physiological, technological, cultural, and behavioral strategies. Such adaptations highlight our remarkable ability to thrive in a wide range of ecological niches across the globe.

https://www.youtube.com/watch?v=V1qn6H5Im4g

Animals and their Communities:

Animals living in groups or solitary lifestyles often do so as a result of evolutionary adaptations shaped by ecological, social, and environmental factors. Here's a breakdown of why some animals choose to live in groups while others prefer solitude:

Living in Groups:

1. **Protection:** Group living provides safety in numbers. Animals like meerkats and African buffalo form groups to defend against predators. With more individuals watching out for danger, there's a higher chance of detecting threats early and responding collectively.
2. **Resource Access:** Group-living animals may benefit from improved access to resources like food, water, and shelter. Cooperative foraging or hunting strategies can enhance the efficiency of resource acquisition, ensuring everyone in the group has their needs met.

3. **Reproduction:** Many social animals, such as lions and elephants, live in groups to facilitate reproduction. Group dynamics often involve dominant individuals monopolizing mating opportunities, while subordinate members contribute to the group's survival by helping rear offspring or defend territory.
4. **Social Bonding and Learning:** Group living fosters social bonds and facilitates learning. Animals like dolphins and primates exhibit complex social structures where individuals engage in social activities, communication, and learning from one another, which can be advantageous for survival and adaptation.
5. **Temperature Regulation:** In colder climates, huddling together in groups can help animals conserve body heat. Penguins and emperor penguins, for instance, form tightly packed groups to endure harsh Antarctic winters.

Group-Living Animals:

1. African Elephants
2. Wolves
3. Chimpanzees
4. Dolphins
5. Penguins

Living Solitarily:

1. **Resource Independence:** Solitary animals don't have to compete with others for resources like food, mates, or territory. They can rely solely on their own abilities to hunt, forage, and survive without having to share or cooperate.
2. **Reduced Competition:** Solitary living minimizes competition for resources and reduces the risk of conflicts with conspecifics (members of the same species). This can be advantageous in environments where resources are scarce or where aggressive interactions are common among individuals.
3. **Predator Avoidance:** Some solitary animals, such as snow leopards and solitary predators like crocodiles, choose to live alone to avoid competition with other predators and maximize their hunting success. By operating alone, they can minimize the chances of encountering rivals and increase their stealth when hunting.
4. **Territoriality:** Many solitary species are territorial, defending a specific area that provides all the resources they need to survive. By living alone, they can maintain exclusive access to these resources and prevent intrusion by competitors.

5. **Mating Strategies:** Some solitary animals adopt a solitary lifestyle except during the breeding season when they seek out mates. This allows them to avoid competition and maintain exclusive access to mates during the critical reproductive period

Solitary Animals:

1. Snow Leopard
2. Orangutans
3. Polar Bears
4. Sloths
5. Tasmanian Devils

Habitat of different Plants:

Plants' habitat preferences, whether damp environments or deserts, are often shaped by their evolutionary adaptations to environmental conditions. Here's why some plants thrive in damp environments while others flourish in deserts:

Plants in Damp Environments:

1. **Water Availability:** Damp environments typically offer abundant water, a crucial resource for plant growth and survival. Plants adapted to these habitats often have specialized structures like extensive root systems or water-absorbing tissues to efficiently extract water from the soil or absorb moisture from the air.
2. **Humidity:** Damp environments often have high humidity levels, which reduce water loss through transpiration. This allows plants to maintain adequate hydration without excessive water loss, particularly in dense forests or tropical regions where the canopy provides shade and traps moisture.
3. **Nutrient Availability:** Damp environments tend to have rich, fertile soils enriched with organic matter. This abundance of nutrients supports lush vegetation growth, enabling plants to thrive and compete for space and sunlight.
4. **Adaptations to Shade:** Many plants in damp environments have adaptations to cope with low light conditions, such as broad leaves to capture available sunlight or specialized photosynthetic mechanisms optimized for low light intensity.
5. **Biotic Interactions:** Damp environments often harbor diverse communities of organisms, including symbiotic relationships with fungi or bacteria that aid in nutrient uptake or provide protection against pathogens. These interactions can benefit plant growth and enhance ecosystem resilience.

Plants in Desert Environments:

1. **Water Conservation:** Desert plants have evolved various adaptations to minimize water loss and maximize water uptake. Features like succulent stems or leaves, reduced leaf surface area, and thick waxy coatings (cuticles) help desert plants retain moisture in arid conditions.
2. **Deep Root Systems:** Desert plants often possess deep root systems that can tap into underground water sources, such as groundwater or moisture stored

in deeper soil layers. These roots enable plants to access water during dry periods when surface soils may be parched.

3. **Reduced Transpiration:** Desert plants may have specialized mechanisms to reduce water loss through transpiration. Some close their stomata during the hottest parts of the day to conserve moisture, while others have modified leaf structures like spines or hairs that create a boundary layer, reducing air movement and water loss.
4. **Heat Tolerance:** Desert plants are adapted to withstand high temperatures prevalent in arid environments. They may have mechanisms to dissipate excess heat, such as reflective surfaces or mechanisms for rapid cooling, allowing them to survive extreme heat stress.
5. **Drought Resistance:** Desert plants are often drought-tolerant, capable of entering dormancy or shedding leaves during prolonged dry spells. Some desert plants can quickly resume growth and flowering when moisture becomes available again, allowing them to exploit short periods of rainfall efficiently.

In summary, plants' adaptation to damp or desert environments reflects their ability to optimize water use, nutrient acquisition, and energy capture in response to specific environmental challenges and opportunities.

https://www.youtube.com/watch?v=MDjlfqYFYqE

Humans and How they react to the Environment:

Stimuli and Reflexes:

Stimuli: Stimuli are changes in the environment that trigger a response in an organism. These changes can be physical, chemical, or biological and can originate from both external and internal sources.

Stimuli can include things like light, temperature, sound, touch, chemicals, or the presence of other organisms. When organisms detect stimuli, it initiates a series of physiological or behavioral responses that allow them to adapt to their environment or respond to changes in their surroundings.

Reflex: A reflex is a rapid, involuntary response to a stimulus that occurs without conscious thought or decision-making. It is an automatic, pre-programmed reaction that helps organisms respond quickly to potentially harmful or dangerous stimuli in their environment. Reflexes are typically mediated by neural pathways known as reflex arcs, which involve sensory neurons, interneurons, and motor neurons.

When a stimulus is detected by sensory receptors, such as those in the skin or muscles, sensory neurons transmit signals to the spinal cord or brainstem, where the reflex is processed. The nervous system then sends out motor signals that trigger a coordinated response from muscles or glands, producing the reflex action.

Reflexes play a crucial role in protecting organisms from harm, maintaining balance and posture, and facilitating rapid responses to changes in the environment.

Examples of reflexes include the knee-jerk reflex, withdrawal reflex (pulling a hand away from a hot object), and pupillary reflex (constriction of pupils in response to bright light).

Neurons: Neurons are cells in the body's nervous system that send and receive signals. They're like messengers, transmitting information through electrical and chemical signals to help the body function, think, and respond to the environment.

Transmitter (Neurotransmitter): A neurotransmitter is a chemical messenger released by neurons to communicate with other cells, such as other neurons, muscles, or glands. They help relay signals between neurons and regulate various bodily functions, like movement, mood, and memory. Examples include dopamine, serotonin, and acetylcholine.

CNS and PNS:

Central Nervous System (CNS):

The central nervous system consists of the brain and spinal cord. It serves as the main control center for the entire nervous system. The brain is responsible for processing sensory information, initiating responses, coordinating movements, and regulating bodily functions.

The spinal cord acts as a pathway for transmitting nerve impulses between the brain and the rest of the body. The CNS integrates and processes information received from sensory receptors and coordinates motor responses, allowing for complex functions such as thinking, learning, and consciousness.

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- Coordinates motor responses, allowing for complex functions such as thinking, learning, and consciousness.

Peripheral Nervous System (PNS):

The peripheral nervous system includes all nerves and ganglia (clusters of nerve cell bodies) outside of the brain and spinal cord. It connects the CNS to the body's organs, muscles, and sensory receptors. The PNS is subdivided into the somatic nervous system and the autonomic nervous system.

The somatic nervous system controls voluntary movements and sensory perception, transmitting signals between the CNS and skeletal muscles, skin, and sensory organs. The autonomic nervous system regulates involuntary bodily functions, such as heart rate, digestion, and respiration, and is further divided into the sympathetic and parasympathetic divisions, which often have opposing effects to maintain balance in physiological processes.

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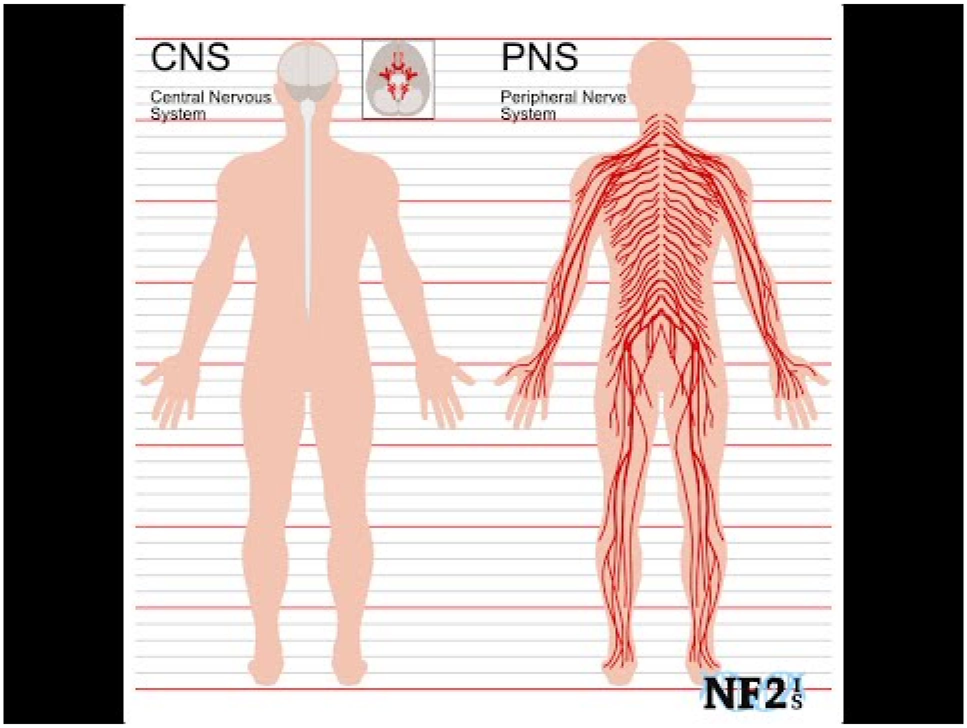
Differences:

Peripheral Nervous System	Central Nervous System
The peripheral nervous system comprises the sensory receptors, ganglia, and nerves.	The central nervous system comprises the brain and the spinal cord.
The function of the peripheral nervous system is to transmit sensory impulses to the central nervous system and motor impulses to the effector organs.	The major function of the central nervous system is to organize and process information obtained from sensory organs.
Damage to the peripheral nervous system would affect a local region of the body.	Damage to the central nervous system would affect the entire body.
The peripheral nervous system arises from the CNS and runs laterally throughout the body.	The central nervous system runs along the axis of the body.



Neurons:

Motor Neuron:

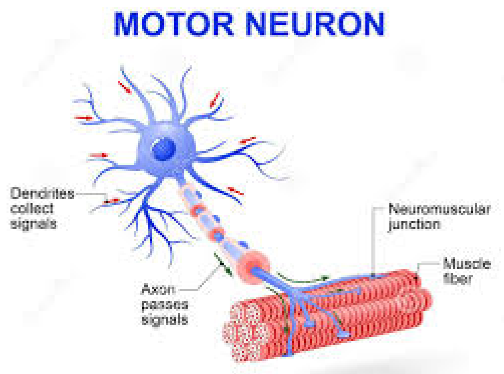
A motor neuron is a nerve cell that sends signals from the brain or spinal cord to muscles or glands, controlling movement or glandular activity.

Description:

Motor neurons have a cell body, dendrites to receive signals, and a long axon to transmit signals to muscles or glands. They come in two main types:

- **Upper Motor Neurons:** Originate in the brain and control voluntary movements.
- **Lower Motor Neurons:** Located in the spinal cord and directly controls muscle movements.

In summary, motor neurons are essential for controlling muscle movements and glandular activity, with upper motor neurons originating in the brain and lower motor neurons located in the spinal cord.



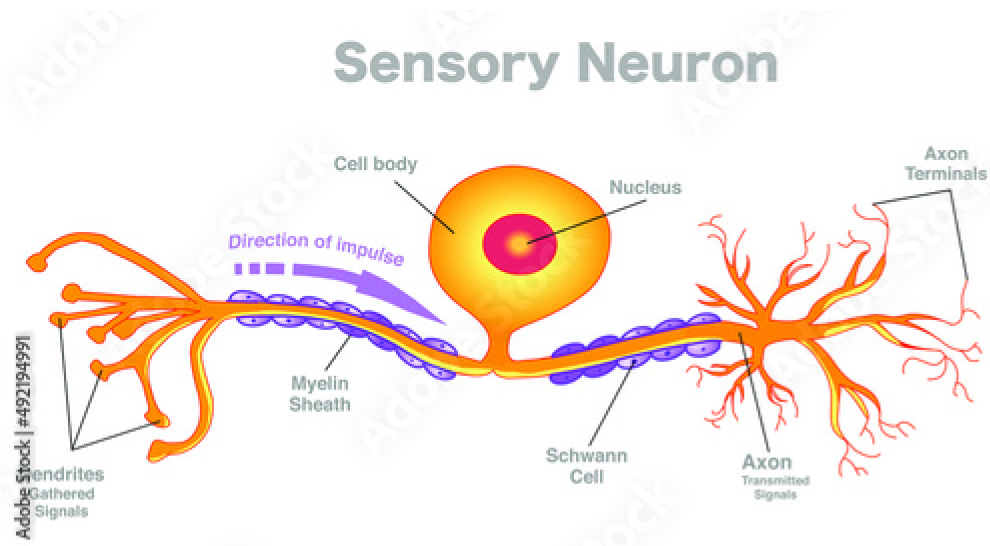
Sensory Neurons:

Sensory Neurons:

Sensory neurons are nerve cells that carry information from sensory receptors to the brain and spinal cord.

Description:

Sensory neurons have a cell body and a long projection called an axon. They detect sensations like touch or pain and transmit them to the brain for processing.



Relay Neurons:

Relay neurons, also known as interneurons, are nerve cells found in the central nervous system (CNS). They act as connectors between sensory and motor neurons, transmitting signals within the CNS.

Description:

Relay neurons receive signals from sensory neurons, process them, and then transmit signals to motor neurons. They play a vital role in integrating information and coordinating responses within the nervous system.

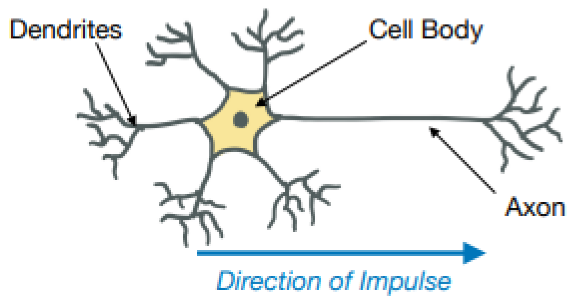


Fig 5. A Relay Neurone.

Reflex Arc:

A reflex arc is a neural pathway that controls a reflex action. It involves a rapid, involuntary response to a stimulus, bypassing conscious thought processes. The reflex arc consists of several components:

1. **Receptor:** This is the sensory organ or structure that detects the stimulus. It could be a specialized sensory nerve ending in the skin, muscle, or internal organs.
2. **Sensory Neuron:** Once the receptor detects the stimulus, it sends a signal to the spinal cord or brainstem through a sensory neuron. The sensory neuron carries the signal from the receptor to the central nervous system.
3. **Integration Center:** In the spinal cord or brainstem, the sensory neuron communicates with interneurons (relay neurons) that process the incoming signal and determine the appropriate response.
4. **Motor Neuron:** After processing, the integration center sends signals through a motor neuron to the effector organ, typically a muscle or gland, to produce a response.
5. **Effector:** The effector is the muscle or gland that carries out the response. In muscle reflexes, the effector is usually a muscle that contracts in response to

the stimulus. In glandular reflexes, the effector is a gland that secretes a substance in response to the stimulus.

6. **Response:** Finally, the effector organ produces the reflexive response, which is typically a quick and automatic action aimed at removing the body from harm or maintaining homeostasis.

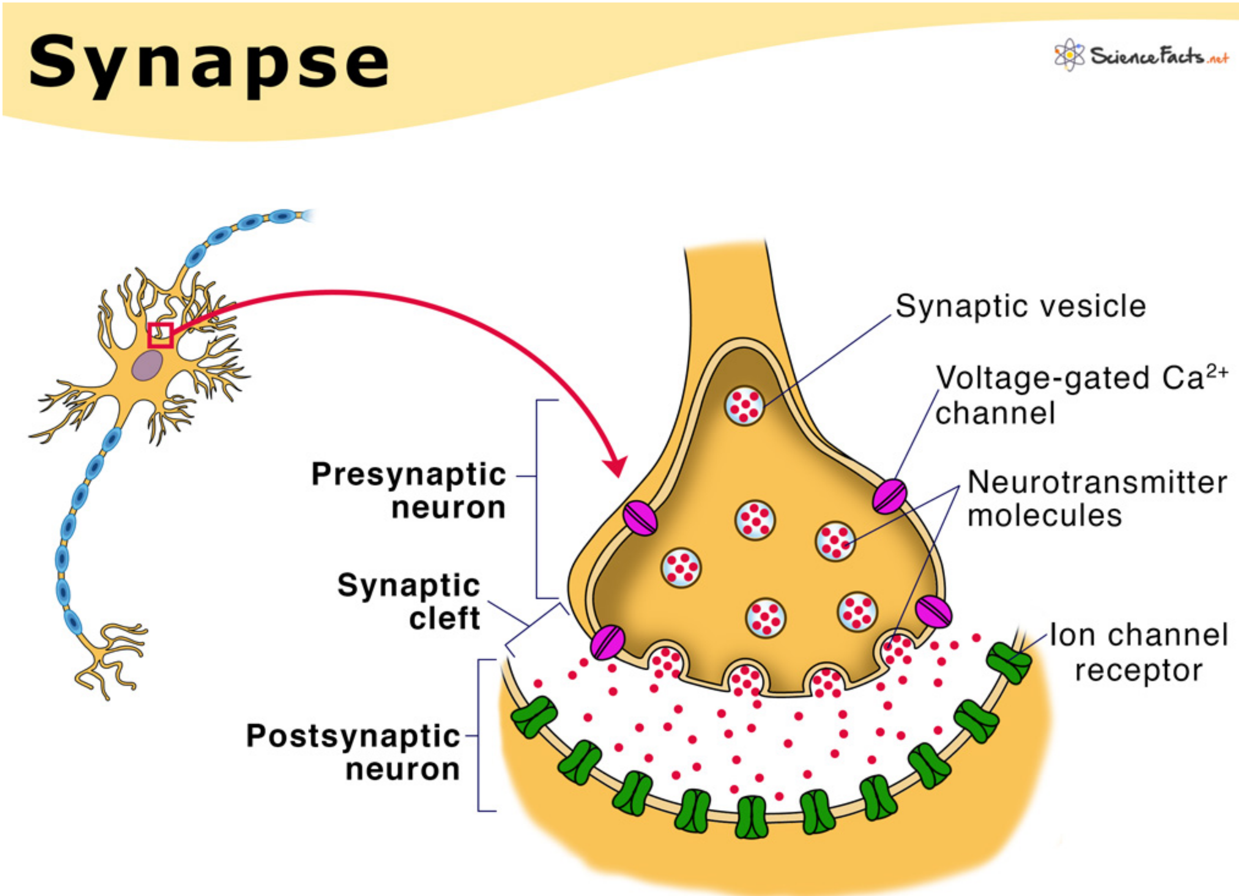
The reflex arc allows for rapid, automatic responses to potentially harmful stimuli, protecting the body from injury and maintaining physiological balance.

https://www.youtube.com/watch?v=Nn2RHLWST-k

Synapse:

1. **Transmission of Signal:** When an electrical signal (action potential) reaches the end of a neuron's axon (presynaptic neuron), it triggers the release of chemical messengers called neurotransmitters into the synaptic cleft.
2. **Neurotransmitter Release:** Neurotransmitters are released from the presynaptic neuron's axon terminals into the synaptic cleft.
3. **Binding to Receptors:** Neurotransmitters diffuse across the synaptic cleft and bind to receptors on the membrane of the postsynaptic neuron or target cell.
4. **Postsynaptic Response:** Binding of neurotransmitters to receptors causes changes in the postsynaptic neuron's membrane potential, either exciting or inhibiting its activity.
5. **Signal Integration:** The postsynaptic neuron integrates signals from multiple synapses to determine whether to generate an action potential and transmit the signal further.
6. **Neurotransmitter Removal:** Neurotransmitters are removed from the synaptic cleft through mechanisms like enzymatic degradation, reuptake into the presynaptic neuron, or diffusion.

In summary, a synapse functions by transmitting signals from one neuron to another or to a target cell through the release and binding of neurotransmitters, leading to changes in membrane potential and signal propagation.



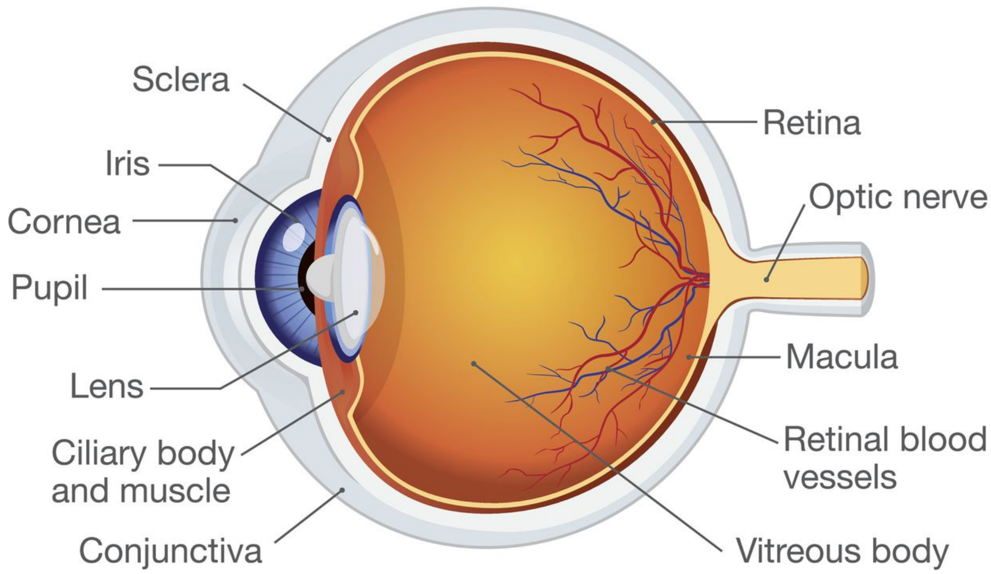
Senses:

A sense refers to a physiological capacity or ability of an organism to perceive and respond to specific stimuli from the external or internal environment. Senses enable organisms to gather information about their surroundings, interpret sensory input, and make appropriate behavioral or physiological responses.

1. **Eyes (Visual Organs):**

   - Function: The eyes are responsible for vision, allowing humans to perceive and interpret light and images from the surrounding environment.
   - Structure: The eyes consist of various parts including the cornea, iris, pupil, lens, retina, and optic nerve. Light enters through the cornea and pupil, passes through the lens, and is focused onto the retina, where photoreceptor cells (rods and cones) convert light into electrical signals that are transmitted to the brain via the optic nerve.

Human Eye Anatomy



2. **Ears (Auditory Organs):**
    - Function: The ears are responsible for hearing and balance (equilibrium), allowing humans to detect sound waves and maintain spatial orientation.
    - Structure: The ears are divided into the outer ear, middle ear, and inner ear. Sound waves enter the outer ear and travel through the ear canal to the eardrum in the middle ear. The eardrum vibrates, transmitting these vibrations to the middle ear ossicles (bones), which amplify the sound and transmit it to the cochlea in the inner ear. The cochlea contains hair cells that convert sound vibrations into electrical signals sent to the brain via the auditory nerve.
3. **Nose (Olfactory Organ):**
    - Function: The nose is responsible for the sense of smell (olfaction), allowing humans to detect and differentiate various odors in the environment.
    - Structure: The nose contains olfactory receptors located in the olfactory epithelium, a specialized tissue in the upper nasal cavity. When odor

molecules enter the nasal cavity, they bind to olfactory receptors, triggering electrical signals that are transmitted to the olfactory bulb and then to the brain's olfactory cortex for interpretation.

4. **Tongue (Gustatory Organ):**
    - Function: The tongue is responsible for the sense of taste (gustation), allowing humans to detect different flavors and chemical compositions of substances.
    - Structure: Taste buds, which contain taste receptor cells, are located on the surface of the tongue and other areas of the mouth. Taste receptor cells detect five primary taste sensations: sweet, salty, sour, bitter, and umami (savory). When food molecules dissolve in saliva and come into contact with taste receptor cells, they trigger electrical signals that are transmitted to the brain's gustatory cortex via the facial, glossopharyngeal, and vagus nerves.
5. **Skin (Tactile Organs):**
    - Function: The skin is responsible for the sense of touch (tactile sensation), allowing humans to perceive pressure, temperature, pain, and other tactile stimuli from the external environment.
    - Structure: Tactile receptors, including mechanoreceptors, thermoreceptors, and nociceptors, are distributed throughout the skin and underlying tissues. These receptors detect mechanical pressure, temperature changes, and tissue damage, respectively, and generate electrical signals that are transmitted to the brain via sensory nerves for processing and interpretation.

In summary, the five sensory organs in humans are the eyes (vision), ears (hearing and balance), nose (smell), tongue (taste), and skin (touch). Each organ plays a vital role in sensing and perceiving different stimuli from the surrounding environment, contributing to human perception and interaction with the world.

https://www.youtube.com/watch?v=-2caC-ul7I4

Eye vs. Ear:

Function	Eye	Ear
Sensory	Responsible for vision	Responsible for hearing and balance (equilibrium)
Structures	Includes cornea, iris, pupil, lens, retina, optic nerve	Includes external ear, middle ear, inner ear
Protection	Eyelids, eyelashes, tears	-
Lubrication	Tears	-

Stimuli:

Types of Stimuli:

1. **Visual Stimulus:** Stimuli that are perceived through the sense of sight. Examples include light, colors, shapes, and movements.
2. **Auditory Stimulus:** Stimuli that are perceived through the sense of hearing. Examples include sounds, tones, pitches, and rhythms.
3. **Olfactory Stimulus:** Stimuli that are perceived through the sense of smell. Examples include odors, scents, fragrances, and aromas.
4. **Gustatory Stimulus:** Stimuli that are perceived through the sense of taste. Examples include flavors, tastes, sweetness, bitterness, sourness, and saltiness.
5. **Tactile Stimulus:** Stimuli that are perceived through the sense of touch. Examples include pressure, temperature, texture, pain, and vibration.
6. **Thermal Stimulus:** Stimuli that are perceived through temperature changes. Examples include heat, cold, warmth, and coolness.
7. **Chemical Stimulus:** Stimuli that are perceived through chemical changes or interactions. Examples include the presence of specific chemicals, such as those detected by taste and smell receptors.
8. **Mechanical Stimulus:** Stimuli that are perceived through mechanical forces or movements. Examples include pressure, stretching, compression, and

vibration.

These different types of stimuli play crucial roles in sensory perception, allowing organisms to detect and respond to changes in their environment.

Receptors:

Receptors are specialized structures or proteins found in cells, tissues, or organs that detect specific stimuli from the internal or external environment. They play a crucial role in sensory perception, allowing organisms to respond to changes in their surroundings or within their bodies.

1. **Photoreceptors:**
    - Location: Retina of the eye
    - Function: Detect light and initiate vision
2. **Mechanoreceptors:**
    - Location: Skin, muscles, inner ear (cochlea and vestibular apparatus)
    - Function: Detect mechanical stimuli such as pressure, touch, vibration, and sound waves
3. **Chemoreceptors:**
    - Location: Nose (olfactory receptors), taste buds on the tongue (gustatory receptors)
    - Function: Detect chemical stimuli such as odors and tastes
4. **Thermoreceptors:**
    - Location: Skin, hypothalamus
    - Function: Detect changes in temperature
5. **Nociceptors:**
    - Location: Skin, muscles, organs, and other tissues
    - Function: Detect pain or tissue damage
6. **Proprioceptors:**
    - Location: Muscles, tendons, joints, inner ear (vestibular apparatus)

- Function: Detect the position, movement, and orientation of the body in space

7. **Electroreceptors:**
   - Location: Certain fish (e.g., sharks, rays), platypus, and other aquatic or semi-aquatic animals
   - Function: Detect electrical fields or changes in electrical potentials

These receptors play essential roles in sensory perception by detecting various stimuli from the environment or within the body and converting them into electrical signals that can be interpreted by the nervous system.

https://www.youtube.com/watch?v=vjFes5I07c0

Response of Animals and Plants to Different Stimulus:

Tropism is a biological phenomenon characterized by the growth or movement of an organism in response to a directional stimulus, such as light, gravity, touch, or chemicals. Tropisms are typically observed in plants, although some aspects can also be seen in certain animals.

1. **Phototropism:**
   - **Plants:** Phototropism is the growth of plants in response to light. Positive phototropism involves the growth of plant parts towards a light source, while negative phototropism involves growth away from light. This response allows plants to optimize photosynthesis by positioning their leaves or stems to receive maximum light exposure.
   - **Animals:** While animals do not exhibit phototropism in the same way as plants, they may display behavioral responses to light, such as seeking out light sources for warmth or foraging during daylight hours.
2. **Gravitropism (Geotropism):**
   - **Plants:** Gravitropism is the growth response of plants to gravity. Roots exhibit positive gravitropism, growing towards the gravitational pull, while

shoots exhibit negative gravitropism, growing away from gravity. This helps roots anchor the plant in the soil and shoots grow upwards towards light.

- **Animals:** Animals may also have a sense of gravity, which aids in spatial orientation and balance, but they do not exhibit gravitropic growth responses as plants do.

3. **Thigmotropism:**
    - **Plants:** Thigmotropism is the growth response of plants to touch or physical contact. It can result in the curling or bending of plant parts in response to mechanical stimuli, such as wind or physical support. This response allows plants to adapt to their physical environment and support structures.
    - **Animals:** Animals may exhibit behavioral responses to touch or contact, such as withdrawing from painful stimuli or seeking out tactile stimulation for grooming or social interactions.
4. **Chemotropism:**
    - **Plants:** Chemotropism is the growth response of plants to chemical stimuli. Plant roots may grow towards sources of nutrients or water, guided by chemical gradients in the soil. This enables plants to optimize resource uptake and growth.
    - **Animals:** Animals often display chemotactic behaviors, moving towards or away from chemical stimuli based on their biological significance. For example, animals may be attracted to food sources by chemical cues or repelled by noxious odors.
5. **Hydrotropism:**
    - **Plants:** Hydrotropism is the growth response of plants to water. Plant roots may grow towards sources of moisture, allowing them to access water for hydration and nutrient uptake. This response is essential for plant survival in fluctuating moisture conditions.
    - **Animals:** Animals also exhibit behavioral responses to water availability, such as seeking out water sources for drinking or avoiding areas prone to flooding.

These responses illustrate how both plants and animals adapt and interact with their environment to optimize growth, survival, and reproduction.

Biotic vs. Abiotic Factors:

Biotic Factors:

1. **Definition:** Biotic factors are living or once-living components of an ecosystem that directly or indirectly influence the life and behavior of organisms.
2. **Examples:** Biotic factors include plants, animals, fungi, bacteria, and other organisms in an ecosystem.
3. **Impact:** Biotic factors can affect organisms through predation, competition for resources (such as food, mates, or territory), mutualistic interactions (such as pollination or symbiosis), parasitism, and disease transmission.
4. **Dynamic Nature:** Biotic factors can adapt, evolve, and change rapidly, influencing the structure and function of ecosystems over time.

Abiotic Factors:

1. **Definition:** Abiotic factors are non-living components of an ecosystem that affect the distribution, behavior, and survival of organisms.
2. **Examples:** Abiotic factors include physical and chemical components such as temperature, sunlight, water, soil composition, pH, humidity, wind, and altitude.
3. **Impact:** Abiotic factors influence the availability of resources, physiological processes, reproductive success, and overall fitness of organisms. They can shape the structure and functioning of ecosystems and determine which species can thrive in particular environments.
4. **Stability:** Abiotic factors tend to change more slowly than biotic factors and can create stable environmental conditions or conditions that fluctuate seasonally or over longer periods.

https://www.youtube.com/watch?v=qJr1p55rT5M