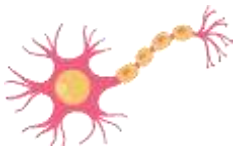
Nervous System:

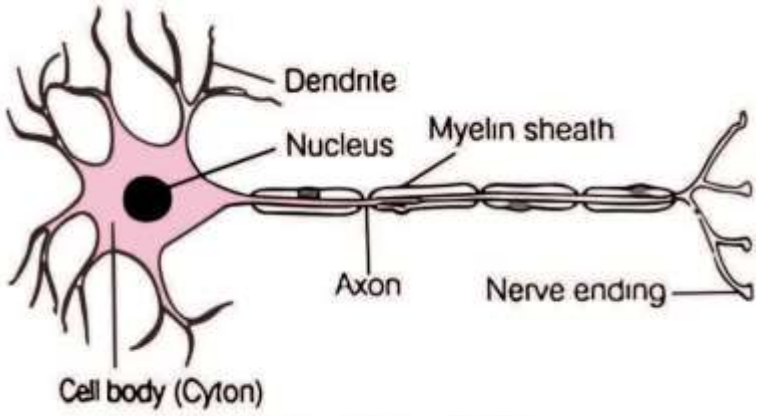
The nervous system is like the control center of our bodies. It's made up of special tissues called nervous tissue. The worker in this system is the nerve cell or neuron. The nervous system is mainly in charge of managing and coordinating things in complex animals.

Functions of the nervous system:

1. The nervous system gets information from the world around us.
2. It collects information from different parts of our body.
3. It helps us make decisions and control our muscles and glands.

Neuron or Nerve cell: Neuron is a highly specialized cell which is responsible for the transmission of nerve impulses.





Structure of a neuron

- **The cell body,** or cyton, is the main rounded part of the neuron where you find the central nucleus and cytoplasm.
- **Dendrites** are like the tree branches of the neuron's cell body. They receive and pass on signals or messages.
- **The axon** is the neuron's long part that carries messages away from the cell body. It's protected by a covering called the myelin sheath.
- **Nerve endings** are like tiny branches at the ends of neurons, and they send electrical signals to other neurons.

E.M.A

Working of a neuron:

1. The neuron gets information from receptors as an electrical signal at the start of its dendrite.
2. This signal travels from the dendrite to the cell body and then all the way to the tip of the axon.
3. Between two neurons, there's a small gap known as a synapse. Special chemicals bridge this gap to transmit the same signal to the next neuron.
4. At the end of the axon, electrical signals trigger the release of these chemicals.

A synapse is where the end branches of one neuron's axon connect with the dendrite of another neuron.

E.M.A

- **Transmission of nerve impulse:** Nerve impulses travel in the following manner from one neutron to the next.

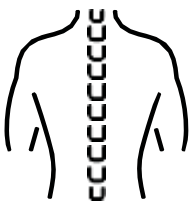
Dendrites → cell body → axon → nerve endings at the tip of axon → synapse → dendrite of next neuron.

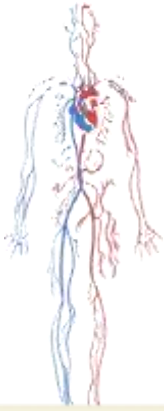
The chemicals released from the tip of a neuron's axon traverse the synapse or neuromuscular junction to connect with the adjacent cell.

types of Nervous system

CENTRAL NERVOUS SYSTEM (CNS)
{Human Brain & Spinal Cord}

PERIPHERAL NERVOUS SYSTEM (PNS)
{3 types of Nerves}





CeNtral Nervous System (CNS)

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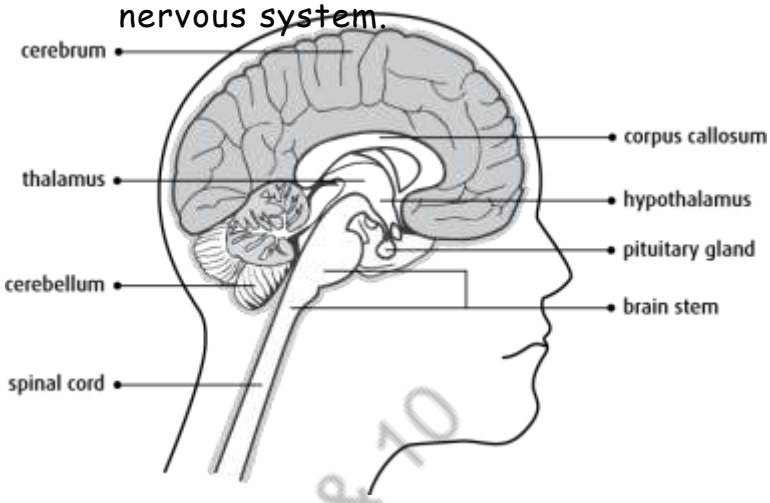
The central nervous system includes the brain and spinal cord. The brain controls bodily functions, while the spinal cord relays signals between the brain and the peripheral nervous system.

Human brain:



It serves as the ceNtral coordiNatioN hub of the body, empoweriNg aN orgaNism to both thiNk aNd act.

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Three Regions of Brain:

- Fore-brain: It is composed of the cerebrum.
- Mid-brain: It is composed of the hypothalamus.
  Hind-brain: It is composed of the cerebellum, pons, medulla, oblongata.

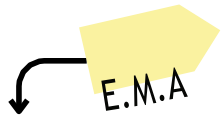
Forebrain: The largest and primary cognitive region of the brain responsible for receiving sensory impulses. Its components include:

1. **Cerebrum:** Shaped like a dome, it serves as the brain's uppermost structure and functions as the primary thinking center. Responsible for tasks such as reasoning, speech, and information processing.

- The cerebrum controls voluntary motor actions.
  It is the site of sensory perceptions, like tactile and auditory
- perceptions.
  It is the seat of learning and memory.

2. **Lobes**

- Frontal- controls voluntary movements of muscles, memory, and speech.
- Parietal- a sense of touch and taste.
- Temporal- a sense of smell and hearing.
- Occipital- a sense of vision.



Midbrain: The inclusion of the hypothalamus defines its composition.

Hypothalamus:

It lies at the base of the cerebrum.
It also controls the urges for eating and drinking.
It controls sleep and wake cycle of the body.

Hindbrain: Serving as the link between the spinal cord and the rest of the brain, it consists of three distinct parts.

1. **Cerebellum:**

- It's under the cerebrum and does three main things:
  - helps you move
  - keeps you balanced
  - manages things you do on purpose

2. **Medulla:**

It's the brain stem, found at the bottom of the brain and stretching into the spinal cord. It handles things our body does automatically, like hearing, heartbeats, breathing, and actions like salivating and vomiting.

3. **Pons:**

- It also controls involuntary actions.
- It regulates respiration

Spinal Cord: It manages quick reflex actions and sends messages between the body and the brain.

Peripheral Nervous System:

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The peripheral nervous system includes cranial nerves and spinal nerves. We have 12 pairs of cranial nerves that extend from the brain to the head's organs. Additionally, there are 31 pairs of spinal nerves that come out of the spinal cord and connect to organs below the head.

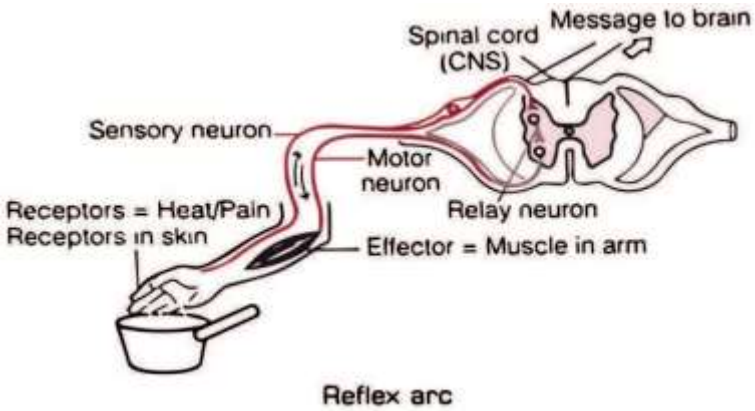
- **Cranial Nerves:** Originate from the brain and extend throughout the head.
- **Spinal Nerves:** Arise from the spinal cord and extend throughout the body, excluding the head.
- **Visceral Nerves:** Emerge from the spinal cord and establish connections with internal organs.

Reflex Action: A rapid, sudden, and immediate bodily response to a stimulus. Examples include the knee jerk and withdrawing the hand upon touching an object.

Reflex Arc: The route traveled by nerve impulses during a reflex action is known as a reflex arc.

HEAT --> RECEPTORS --> SPINAL ORGAN --> EFFECTOR ORGAN --> RESPONSE

(Stimulus) (skiN) (Muscles) (HaNd Withdraw)



Reflex arc

THREE TYPES OF RESPONSES:

- Voluntary Actions: Governed by the forebrain. Examples include talking and writing.
- Involuntary Actions: Regulated by the mid and hind brain. Examples encompass heartbeat, vomiting, and respiration.
- Reflex Actions: Orchestrated by the spinal cord. An instance is the withdrawal of a hand upon touching a hot object.

SECRET QUESTIONS

1. The two glands A and B which occur in pairs are present in endocrine system. The pair of glands A is found only in females whereas the pair of glands B occur only in males. The gland A make and secrete hormone C whereas gland B make and secrete hormone E. In addition to hormone, gland A makes gamete F whereas gland B makes gamete G.

a. What are glands A and B?
b. Name the hormone C and E
c. Name the gamete F and G.

a. glands A - ovaries B-testes
b. Hormone C - oestrogen E-testosterone
c. The gamete F - ova G-sperms

2. Tendrils encircle or coil around the object in contact with it. Elaborate.

Tendrils are sensitive to touch. When they come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus, cling to it.

3. Write two differences between the response of the plants and response of the animals to stimuli?

Plants	Animals
• No specific or specialized tissue present for conduction of information.	No specific or specialized tissue present for conduction of information.
• Plant cells change shape by changing the amount of water in them.	Specialised proteins are found in muscle cells which help in changing the shape.

Coordination in PLANTS:

Control and coordination in plants are carried out by hormones.

Plant Hormones	Functions
Auxin	Helps in the growth of plant tissues
Cytokinin	Promotes cell division, delays ageing of cells
Gibberellins	Facilitates stem growth, triggers seed germination, stimulates flowering, supports cell division, and fosters seed development post-germination.
Abscisic acid	Suppresses growth, induces wilting of leaves, encourages bud and seed dormancy.
Ethylene	This is a gas hormone responsible for fruit ripening.

E.M.A

Growth Independent Movements:

Movements unrelated to growth are termed nastic movements. These responses occur due to environmental stimuli, but the direction of the response is not determined by the direction of the stimulus.

The movement in the touch-me-not plant is thigmonastic movement (movement in response to touch).

Plant Movements Associated with Growth:

Growth-related movements are referred to as tropic movements. These responses occur in reaction to environmental stimuli, and the direction of the response is influenced by the direction of the stimulus.

E.M.A

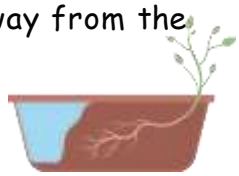
- **Phototropic movement** (light-dependent)
- **Geotropic movement** (gravity-dependent)
- **Chemotropic movement** (chemical-dependent)
- **Hydrotropic movement** (water-dependent)
- **Thigmotropic movement** (touch dependent)

Geotropism: The response of plant parts to the Earth's gravitational force is termed geotropism or gravitropism.

Positive geotropism refers to growth towards gravity, while negative geotropism involves growth away from gravity. Roots exhibit positive geotropism by growing towards gravity, while shoots display negative geotropism by growing away from gravity.

Phototropism: The response of plant parts to light is termed phototropism.

Positive phototropism involves movement towards light, while negative phototropism entails movement away from light. Stems exhibit positive phototropism by moving towards the light, while roots demonstrate negative phototropism by moving away from the light.



Hydrotropism: Movement of plant parts in response to water or moisture.

Positive hydrotropism involves movement towards water, while negative hydrotropism entails movement away from water. Root movement in search of water is an example of positive hydrotropism, as seen in the movement of roots towards areas with high humidity.

Chemotropism: The response of plant parts to chemical stimuli is termed chemotropism.

Positive chemotropism involves movement towards a chemical stimulus, while negative chemotropism entails movement away from a chemical stimulus. The growth of the pollen tube towards the ovule exemplifies positive chemotropism.

Thigmotropism: Movement of plant parts in response to touch is called as thigmotropism.

Positive thigmotropism involves movement towards touch, while negative thigmotropism entails movement away from touch. The movement of tendrils around a support is an example of positive thigmotropism.

The Endocrine System

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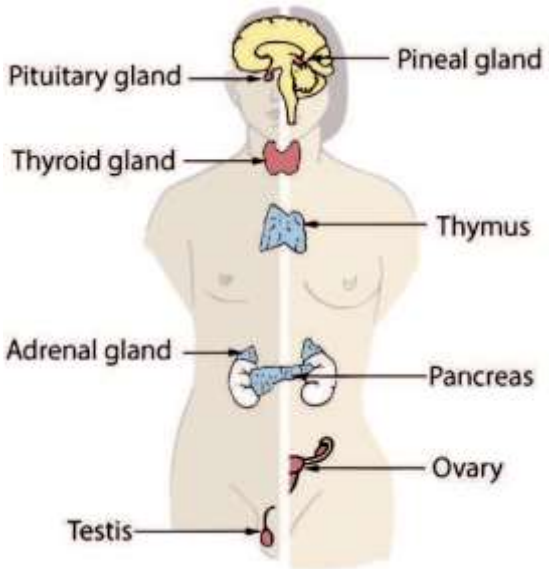
- ## Exocrine Glands:

  Exocrine glands release their secretions through ducts that open onto an epithelial surface.

- ## Endocrine Glands

  Endocrine glands are ductless glands that release hormones directly into the bloodstream in humans.

  In the human body, notable endocrine glands include the pituitary, thyroid, adrenal, pineal, pancreas, ovary (female), testis (male), and others. Now, let's delve into each gland to learn more.



- ## Pituitary Gland:

  - Pea-sized gland situated at the base of the brain
    Functions as the master gland, overseeing the
  - secretions of all other endocrine glands
  - Produces Growth Hormone (GH)
  - Insufficient GH secretion results in Dwarfism
  - Excessive GH secretion leads to Gigantism in children
    Excessive GH in adults causes 'Acromegaly'

Thyroid Gland:

- Butterfly-shaped gland in the throat
- Secretes the hormone 'Thyroxine,' which regulates body metabolism
- Requires iodine for thyroxine synthesis in the body
- Iodine deficiency results in under-secretion of thyroxine
- Under-secretion of thyroxine causes goitre

Pancreas:

- Leaf-like gland located behind the stomach in the abdomen
- Functions as both an endocrine and exocrine gland
- Endocrine function involves the production of two hormones: Insulin and glucagon
- Insulin and glucagon act antagonistically to regulate blood sugar levels
- Exocrine function includes the secretion of enzymes to break down proteins, lipids, carbohydrates, and nucleic acids in food
- Insufficient insulin production from the pancreas results in diabetes

Adrenal Gland:

- Present in pairs above each kidney
- Size decreases with age
- Secretes adrenaline, a hormone facilitating the flight and fight response
- Additionally secretes noradrenaline

Gonads:

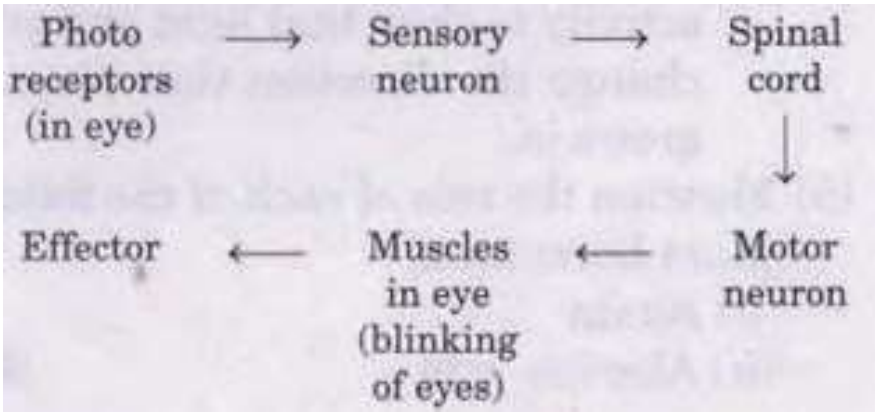
- Gonads are gamete-producing organs: testes in males, ovaries in females
- Testes produce testosterone (male hormone), while ovaries produce oestrogen and progesterone (female hormones)
- Testosterone and oestrogen contribute to gamete production and influence the sexual characteristics of males and females, respectively
- Progesterone serves as the pregnancy hormone

ToP 7 questioNs

1. What are hormones?

Hormones are the chemical substances secreted in trace amounts by specialised tissue called endocrine glands.

2. Trace the sequences of events through a reflex arc which occur when a bright light is focused on your eyes.



3.(a) What is reflex arc?
(b) What are the components of reflex arc?
(c) How do muscle cells move?

a. The process of detecting the signal or the input and responding to it by an output action might be completed quickly. Such a connection is commonly called reflex arc.

b. Stimulus " Receptors " Sensory neurons " Spinal cord " Motor neurons " Effector.

c. Muscle cells have special proteins that change their shape and arrangement in the cell in response to electrical impulse. This leads the muscle cells shortening.

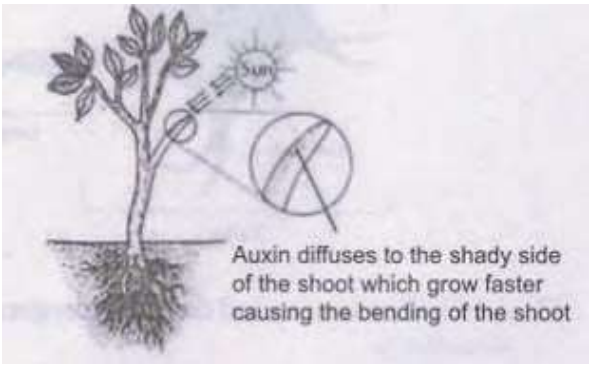
4. What are hormones? Name the hormone produced by thyroid gland and state its function.

Chemical coordination in animals occurs through chemicals called hormones which are secreted by endocrine glands.
Thyroxin hormone.

It regulates metabolism of carbohydrates, fats and proteins. It is advisable to consume iodized salt in our food as iodine is required by our thyroid gland to produce thyroxin hormone. If it lacks in our body goiter may occur due to enlargement of thyroid in the neck region.

5. Name the hormone synthesised at the shoot tips. How does it help the plant to respond to light?

Auxin is synthesised at the shoot tips when growing plant detects light and helps the cells to grow longer. When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot. This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light.



6. State how concentration of auxins stimulates the cells to grow longer on the side of shoot which is away from light?

Auxin form in the shoot tip but diffuse toward the part which is in shade/away from the light. The concentration on shady part increase stimulation cells in this part to elongate. The side of shoot on this side grows longer than the part in light hence bend towards light.

7. 1. Name the endocrine gland associated with brain.

2. Which gland secretes digestive enzymes as well as hormone?

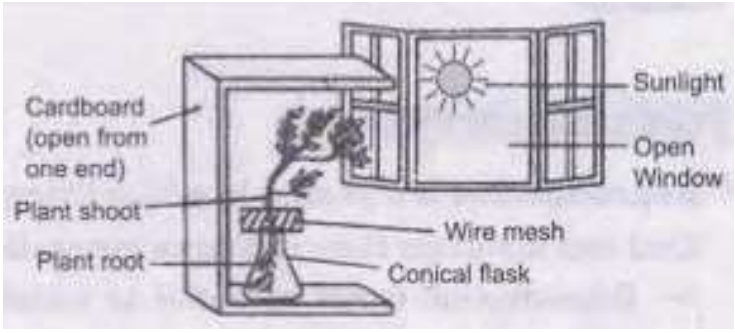
3. Name the endocrine gland associated with kidneys.

4. Which endocrine gland is present in males but not in females?

5. Which hormone is responsible for changes in females during puberty?

6. Iodine is necessary for the synthesis of which hormone?

1. a. Pituitary gland,
2. b. Pancreas,
3. c. Adrenal gland,
4. d. Testes,
5. e. Oestrogen,
6. f. Thyroxine.



Geotropism: Growth of roots downward towards the earth hence positively geotropic whereas stem grows upward, away from earth, hence it is negatively geographic.

b. Auxins: Synthesized at the shoot tip, helps the cells to grow longer. Abscisic acid: Inhibits growth, causes wilting and falling of leaves.

Competency-Based Questions

1. If the body design in the squirrel relied only on electrical impulses via nerve cells, the range of tissues instructed to prepare for the coming activity would be limited. On the other hand, if a chemical signal were to be sent as well, it would reach all cells of the body and provide the wideranging changes needed. This is done in many animals, including human beings, using a hormone called adrenaline that is secreted from the adrenal glands.

i) which is the target organ for the adrenaline hormone?
Ezoic
Ans: Heart is the target organ for the adrenaline hormone which increases the heartbeat rate.

ii) Which hormone is released by thyroid gland?
Ans: Thyroxine is released by thyroid gland.

iii) What is the function of thyroxine hormone?
Ans: It regulates carbohydrate, protein and fat metabolism in the body and promote the best balance for growth.

iv) Name the hormone released by ovary?
Ans: Estrogen and progesterone.

V) Name the three hormonal glands located in the brain?
Ans: Pineal, pituitary and hypothalamus

2. Some plants like the pea plant climb up other plants or fences by means of tendrils. These tendrils are sensitive to . When they come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it. More commonly, plants respond to stimuli slowly by growing in a particular direction. Because this growth is directional, it appears as if the plant is moving.

i) How many type of tropism are shown by plants? Name them.
Ans: Generally there are 6 type of tropism namely phototropism, gravitropism, chemotropism, thigmotropism, thermotropism and hydrotropism.

ii) The me not plant is an example of which tropism?
Ans: it is an example of thigmotropism.

iii) give one example of chemotropism?
Ans: growth of pollen tubes to wheels is one example of chemotropism.

iv) Name the plants hormone which promotes cell division?
Ans: Cytokinins promotes cell division in plants.

v) Name the plant hormone which inhibits growth?
Ans: Abscisic acid