THE NERVOUS SYSTEM

Central Nervous System
- Brain
- Spinal cord

Peripheral Nervous System
- Ganglion
- Nerve
Nervous System

The nervous system has three overall functions:

- **Sensory function** – sensory receptors detect the changes in the external environment and the environment within the organism.
- **Integrative function** – the central nervous system integrates this information.
- **Motor function** – effectors (muscles and glands) bring about a response.

For example: you are riding a bicycle and see that the traffic light has turned red (sensory function). Your central nervous system integrates this information (red light means ‘stop’ – integrative function), and you use your muscles to apply your brakes to stop the bicycle (motor function).
smell
Sight
touch
taste
1. Receptor
2. Afferent or sensory neuron
3. Integration center
4. Efferent or motor neuron

Stimulus
Regulation of temperature

**Negative feedback**

- **Warming**
  - Vasoconstriction
  - Hypothalamus
  - External factors

- **Cooling**
  - Diaphoresis (sweating)
  - Cooling
  - External factors

**Vasodilation**

- Hypothalamus
- External factors

**Shivering**

- Hypothalamus
- External factors
The Nervous System

Two main components:

(1) Central Nervous System (CNS): Brain + Spinal Cord

(2) Peripheral Nervous System (PNS): nerves outside the CNS
There are 6 functions of the Brain

1. Thinking or Cognition
2. Perception or Sensing
3. Emotion or Feeling
4. Behaviour
5. Physical or Somatic
6. Signaling (being responsive and reacting to the environment)
Functions of the brain

- We have found out that there are five main regions of the brain:
  - Cerebrum
  - Cerebellum
  - Medulla
  - Hypothalamus
  - Pituitary gland

- Each of these parts have a different function.
# Central Nervous System

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrum</td>
<td>Voluntary or conscious activities of the body—learning, judgment</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>Coordinates and balances the actions of the muscles</td>
</tr>
<tr>
<td>Medulla Oblongata (Brain Stem)</td>
<td>Controls involuntary actions like blood pressure, heart rate, breathing, and swallowing</td>
</tr>
<tr>
<td>Spinal Cord</td>
<td>The main communications link between the brain and the rest of the body</td>
</tr>
</tbody>
</table>
Spinal Cord Functions

1. Conduct nerve impulse along nerve tracts

Two Nerve Tracts:

A. Ascending: sensory to brain
B. Descending: motor impulse to organ/gland

2. Center for spinal reflexes
Nerve

Neuron

Myelin sheath
Three Types of Neurons

1. Sensory Neuron
   - Dendrites
   - Cell body
   - Axon
   - Direction of conduction

2. Interneuron
   - Cell body
   - Axon
   - Cell body

3. Motor Neuron
   - Dendrites
   - Cell body
   - Axon
nerve impulse from pain sensor

pain sensor

motor neurone forms synapse inside muscle

muscle

sensory neurone

sensory neurone cell body

sensory neurone (neurone axons)

white matter (neurone cell bodies)

spinal cord

grey matter

relay neurone

motor neurone
Ear
Nose

- Septum
- Mucous Membrane
- Nostril
- Olfactory Receptors
How we smell

- Brain
- Olfactory bulb
- Olfactory cilia
- Odor molecules

Odor molecules inside nasal cavity
Eye
How we see

Object → Light rays → Lens → Retina
Skin

- Epidermis
- Dermis
- Free nerve endings (pain, heat, cold)
- Merkel disks (touch)
- Krause end bulbs (touch)
- Root hair plexus (touch)
- Meissner corpuscles (touch)
- Pacinian corpuscles (pressure)
- Ruffini endings (pressure)
(a) Epiglottis, Palatine tonsil, Lingual tonsil, Fungiform papillae, Tastebuds
(b) Circumvallate papilla, Surface of the tongue, Gustatory hairs (microvilli) emerging from a taste pore
(c) Epithelium of tongue, Taste bud, Connective tissue, Gustatory (taste) cell, Supporting cell, Basal cell, Sensory nerve fiber
Health issues involving the nervous system
CAUSES OF BLINDNESS

- Cataract - Leading Cause Accounts for 62.6% of Blindness in India

82% of People with Blindness are Over 50 years

India's Blind Population Totals a Whopping 12 MILLION
Deafness

Conductive hearing loss occurs when sound waves do not reach the inner ear.

Sensorineural hearing loss occurs when sound waves are not processed correctly.
How the implant works

A cochlear implant tries to replicate the functions of the outer, middle and inner ear by collecting and transmitting sound signals to the auditory nerve, which sends the signals to the brain.

1. The microphone collects sound signals and presents them to the speech processor.

2. The speech processor analyzes the sound signal from the microphone and transforms it into a coded electrical signal that is sent to the transmitter.

3. The externally worn transmitter sends the coded signal across the skin to the implanted receiver, using a special radio frequency signal.

4. The implanted receiver decodes the signal and sends a corresponding pattern of very rapid, tiny electrical pulses to the individual electrodes on the electrode array that winds through the cochlea.

5. These electrical pulses travel along the hearing nerve and on to the brain, where the brain can categorize the sound and assign meaning.

Source: Med-El Co. International, Innsbruck, Austria

— Karsten Ivey/staff
What causes short-sightedness?

**Normal vision**
- Light focused on the retina

**Cornea**
- Light

**Retina**
- Nerve

**Short-sighted**
- Light focuses in front of retina, so the eye interprets a blurred image

**Cornea**
- Front of eyeball has outgrown correct size

Source: Bupa
Drug and alcohol abuse
Drug abuse
What are the Effects of Long Term Alcohol Abuse on the Body?

Liver: Cirrhosis and swelling

Heart: Enlarged, abnormal or increased palpitation

Kidney: It absorbs toxin leading to frequent urination

Brain: Loss of coordination, poor judgment

Intestines: Abnormal bowel movement