Etege Menen Girls' Boarding School
Biology Department
Grade 10

Content

Unit 3: Human biology and healthy

- **Nervous system**
  - **Sense organ**
- **Endocrine system**

Prepared by: Genene Teshome (2012)

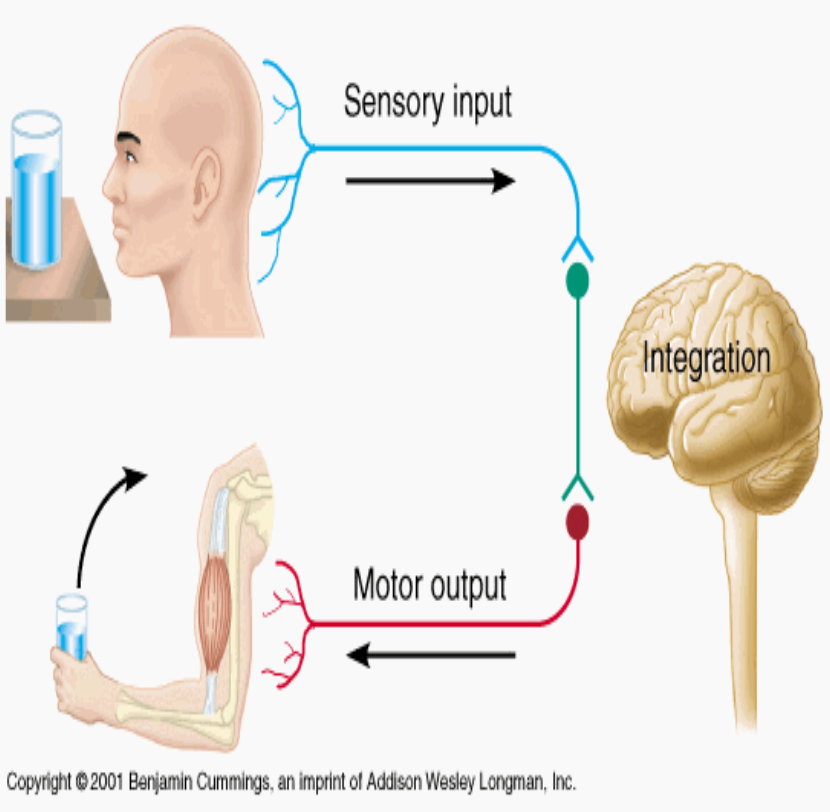
Unit 3
Human biology and health

The nervous system has two main systems.

- **The central nervous system (CNS)** is made up of your brain and spinal cord.
- **The peripheral (body) system (PNS is** made up of the **neurons** (nerve cells) and the **sensory receptors.**
- Have two nerves that connect CNS to all part of the body. These are;
  - **Cranial nerves** the nerves that come out of the brain**.** They go mainly head and neck, like your eyes, tongue and jaws
  - **Spinal nerves** the nerves come out of the spinal cord**.** They go to the arms, the legs and the trunk (the rest of body)

For nervous coordination three things are necessary

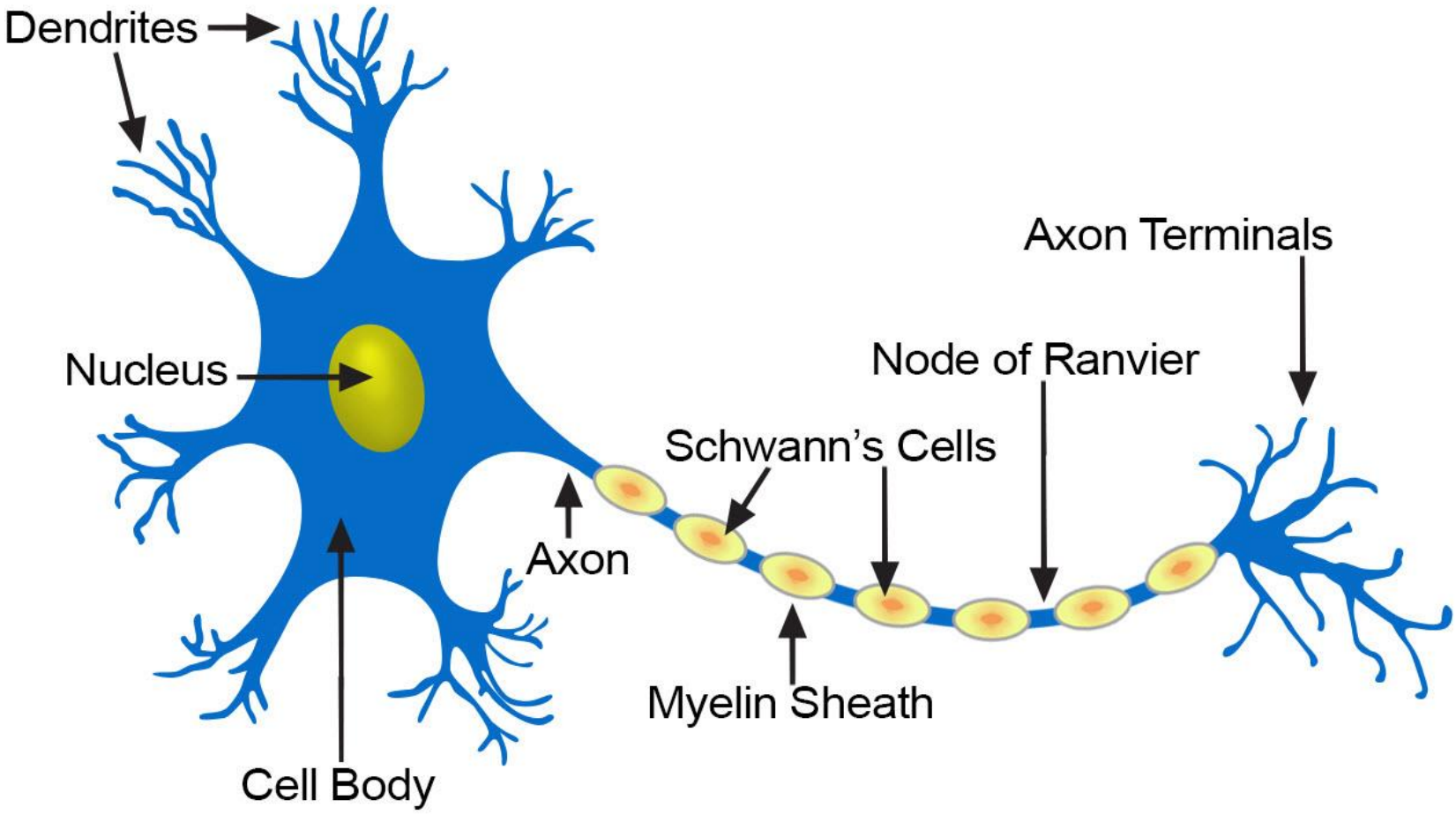
- **Sensory receptors** -nerve endings that can sense stimuli, e.g. pressure, pain, temperature
- **Coordinator (**brain and spinal cord) process information coming from sensory receptors
- **Effectors** (muscle and gland) the part of the body which give response to stimuli



Neurons (nerve cell)
the basic unit of nervous system, it contains 3 parts;

- **Cell body** that contains nucleus, mitochondria, and other organelles.
- **Dendrites** slender finger-like projection
  - Receive impulse axon ending of another neuron and conduct to cell body
  - Join one neuron with other
- **Axon (nerve fiber)**
  - Extensively long and thin nerve fiber
  - Carry nerve impulse away from cell body .
  - The axon membrane changes its permeability to sodium ions to create an electrical impulse
- **Myelin sheath** fatty insulating sheath that grows around many nerves
  - It helps the nerve impulse travels as fast as possible.

Structure of a Typical Neuron

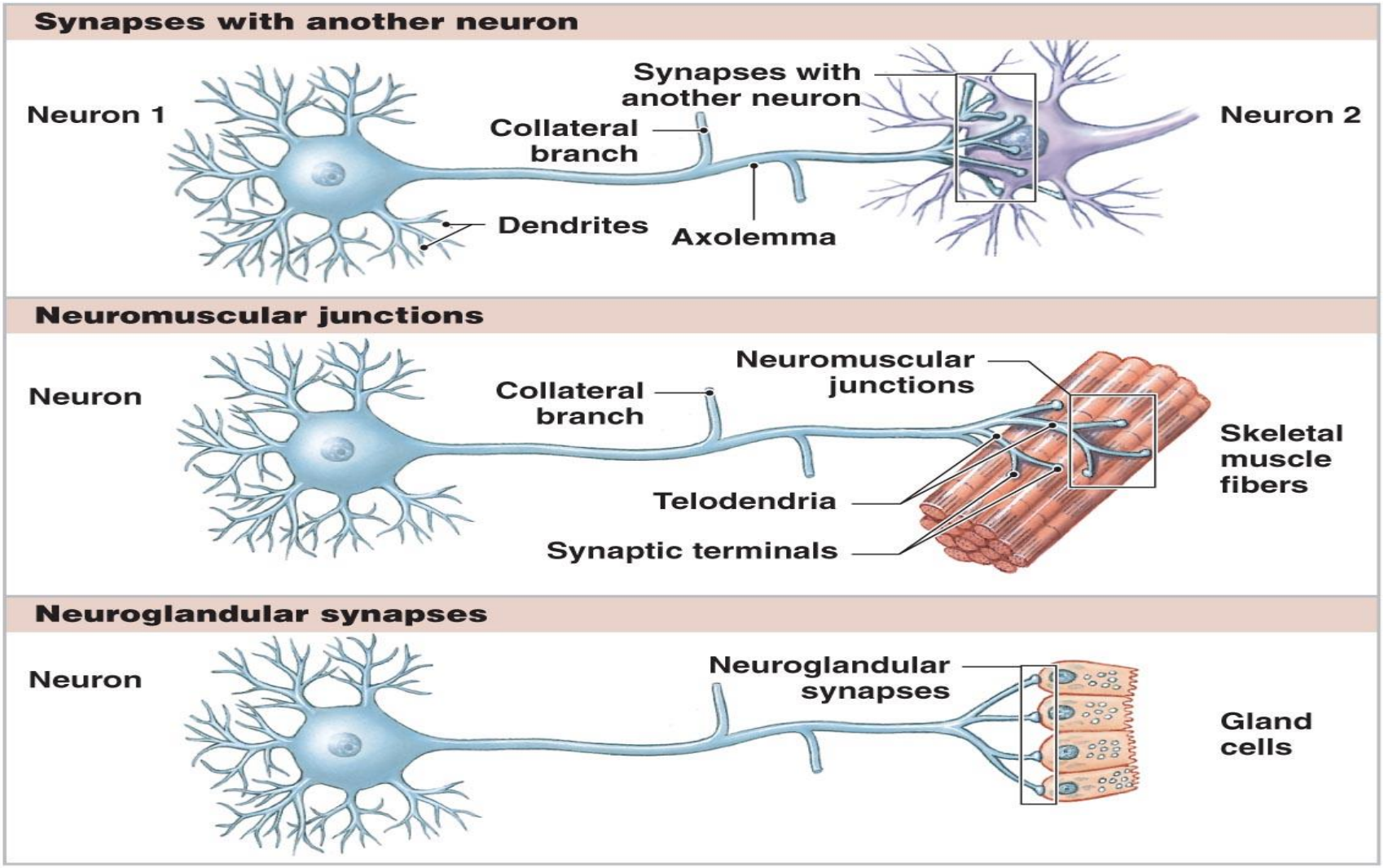


Synapse

- **Synapse** is the junction (gap) between neurons, neuron and muscle fiber, neuron and gland; 3 types

1. **Neuron-neuron junction** is the junction between two neurons (axon-to-dendrite)
2. **Neuromuscular junctions** is the junction between an axon terminal of a motor neuron and a muscle fiber
3. **Neuroglandular junctions** is the junction between an axon terminal of a motor neuron and a gland

The types of synapses



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Type of neuron

Affector, afferent, Sensory neuron

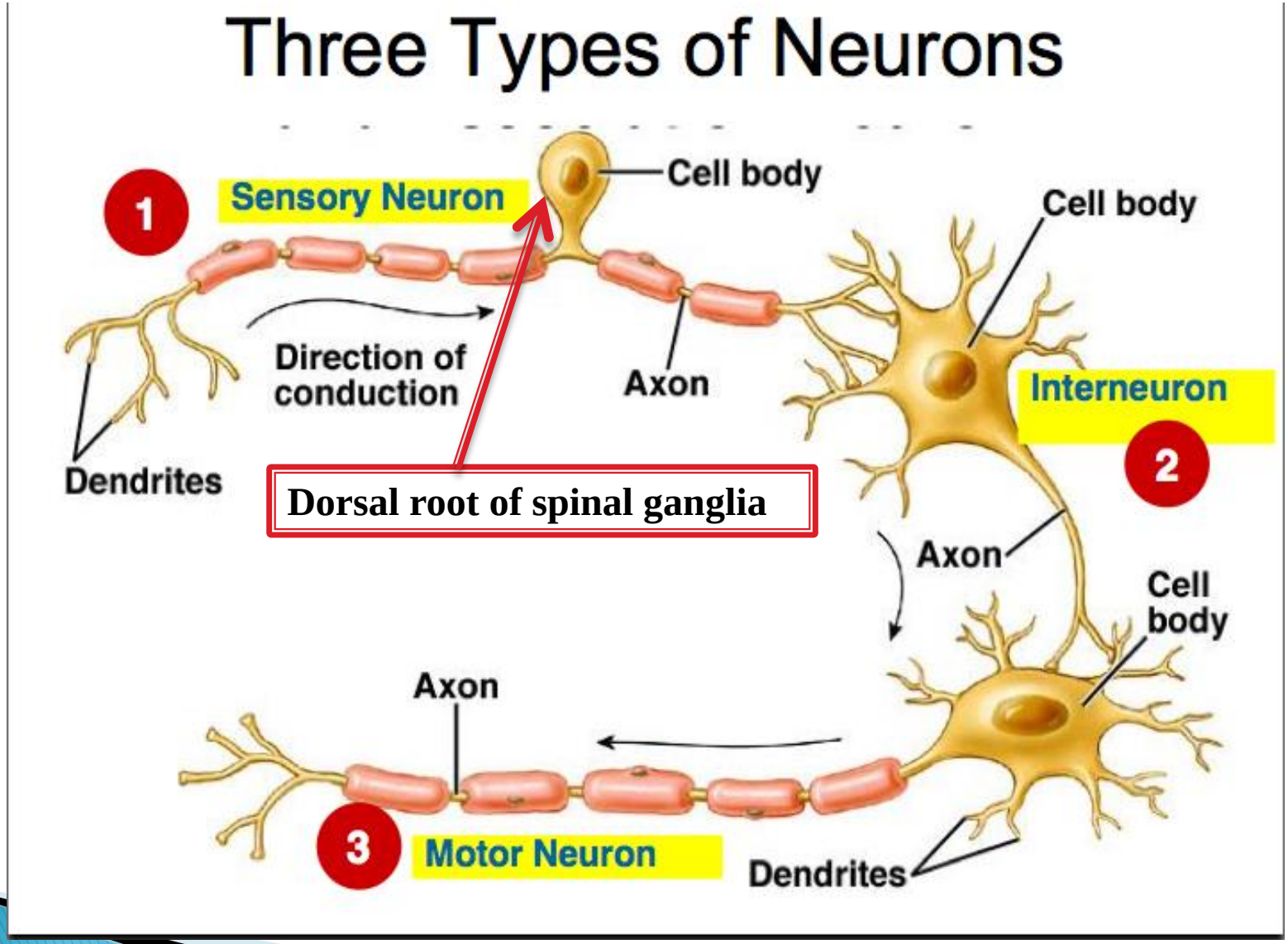
- Carry impulses from receptor to spinal cord and brain (CNS)
- Cell body are located in the **spinal ganglia of dorsal root** of spinal cord

Effector, Efferent, Motor neuron

- Carry impulses/instruction/ from the brain and spinal cord to the effectors organs (muscles and gland)
- Cell body of motor neuron found in the **grey matter of spinal cord**.

Relay (inter neuron)

- Found in central nerve system
- Connect sensory and motor neuron
- Transfer incoming neuron from sensory to motor neuron


Three Types of Neurons
1
Sensory Neuron
Cell body
Cell body
Direction of conduction
Axon
Interneuron
2
Dendrites
Dorsal root of spinal ganglia
Axon
Cell body
Axon
3
Motor Neuron
Dendrites

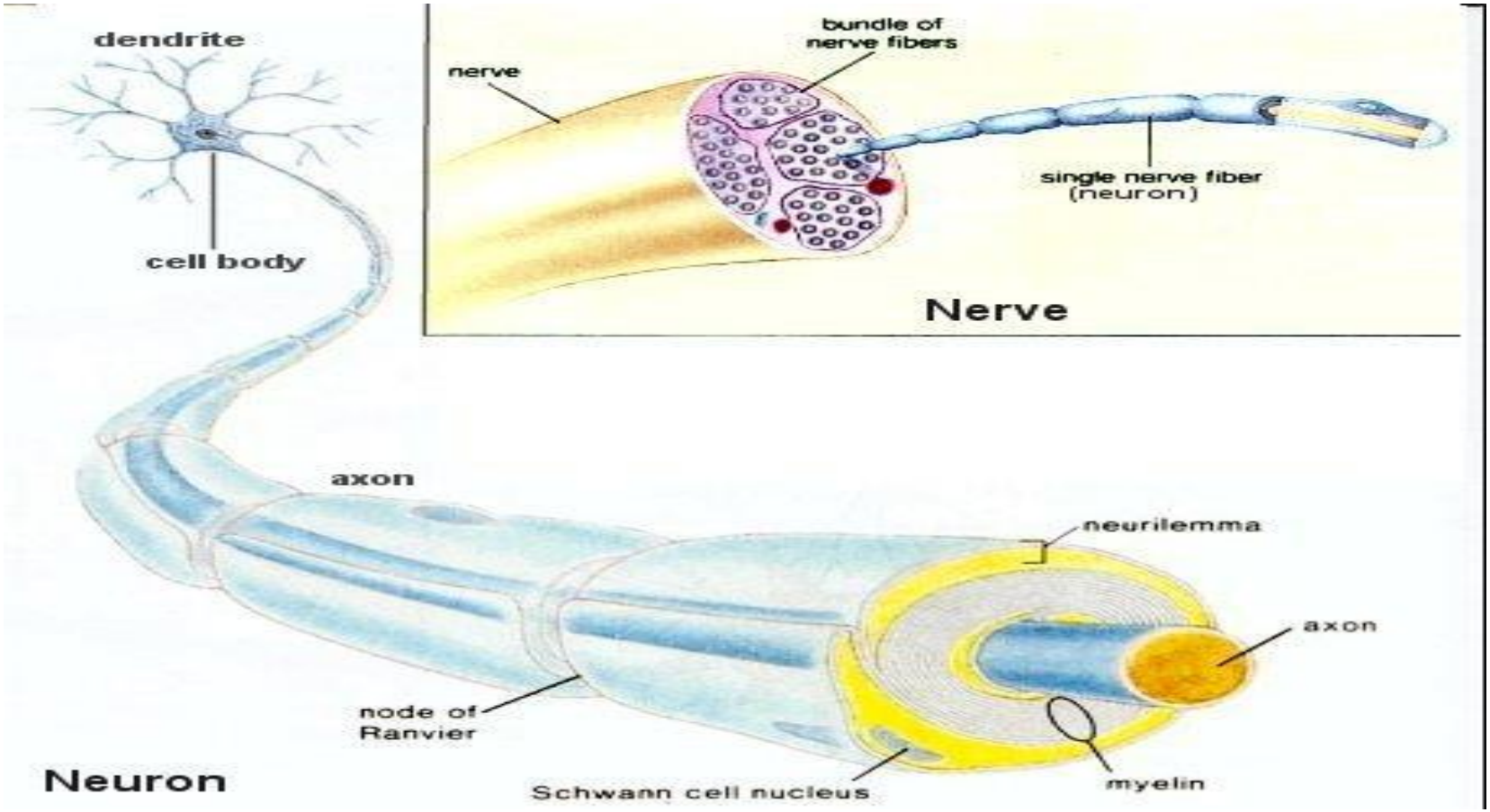
Nerve and neurons

Nerves are bundles of fiber.

3 different type of nerve

- **Effectors nerves,** carry only effectors neurons
- **Affecter nerves**, carry only affecter neurons
- **Mixed nerves.** carry a mixture of effectors and affecter neurons

Nerve and neuron



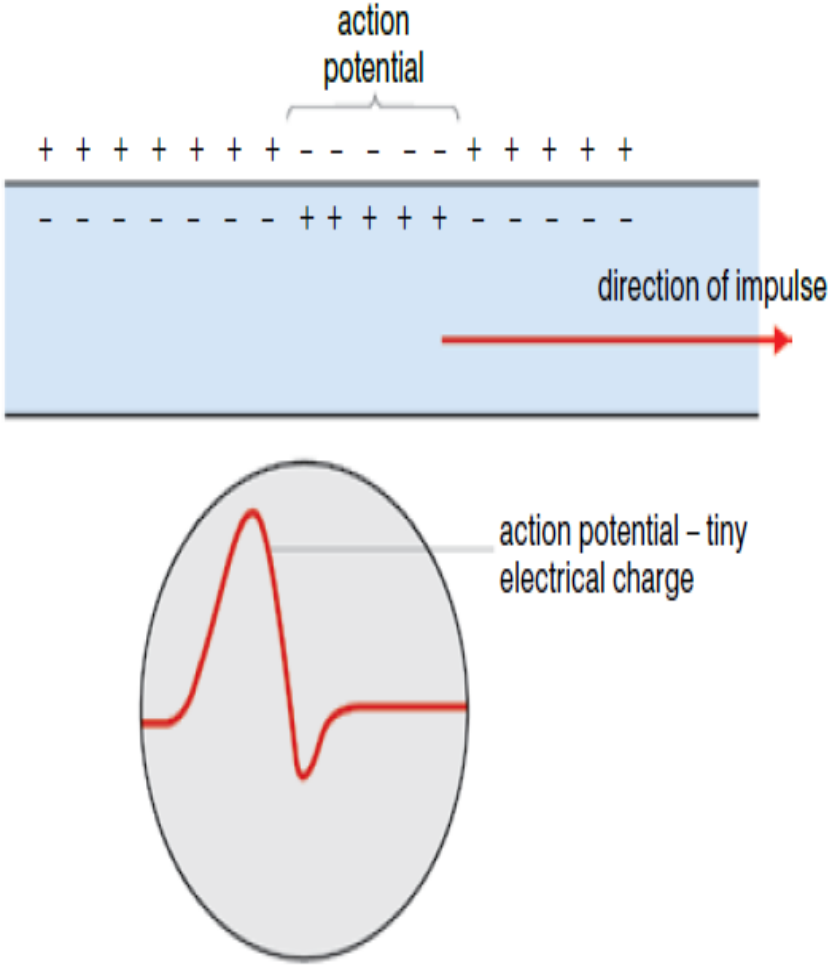
Nerve impulse transmission

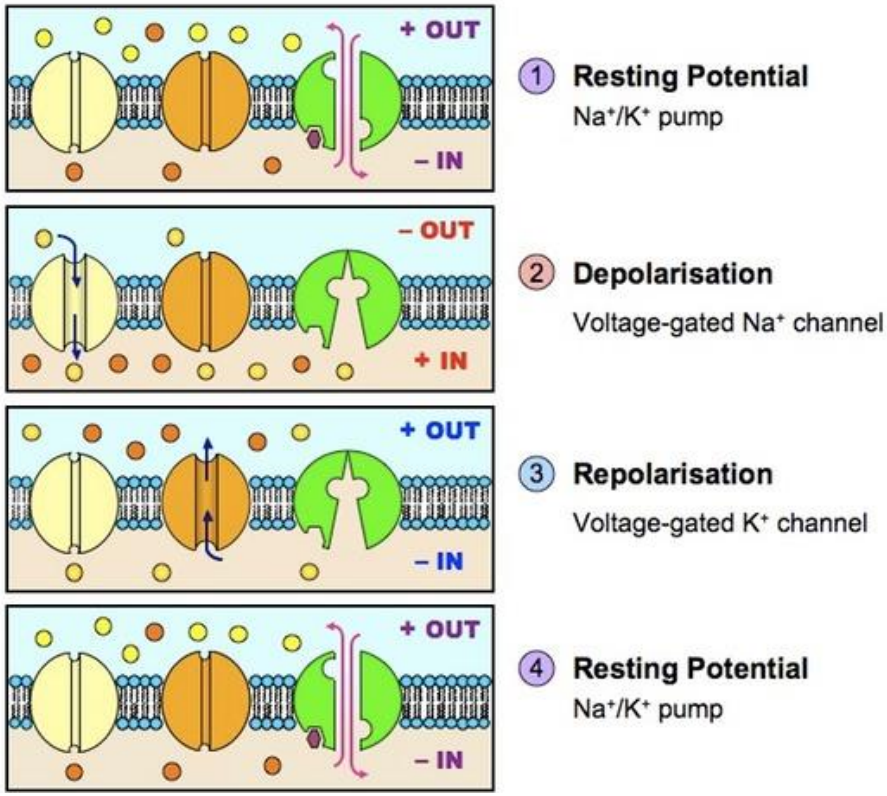
- Nerve impulse is an **electrochemical signal** that travel along the membrane of neuron
- **Resting potential**
  - Outside of the cell membrane of neuron has positive charge and inside is negative
  - The potential difference is known as membrane potential
  - Potential in neuron at rest that is not producing impulse is called **resting potential** and the neuron is said to be **polarized**

Nerve impulse…

- **Action potential**
  - When impulse transmit, the outer membrane become negative the inner membrane become positive
  - A neuron during action potential is called **depolarization**
  - This change of electric potential on the surface of neuron when it is stimulated known as the **action potential.**
  - **Action potential** is a wave of depolarization across a neuron**.**
- When membrane return its resting state is celled **repolarization**

Nerve impulse transmission





Neurotransmitter

- When impulse reach the end of axon at synapse, it cause the release and diffusion of chemicals called **neurotransmitter**
- The electrical impulses cannot jump **synapse** or the gap.
- An impulse transmits across the synapse by means of chemical transmission called **neurotransmitters.**
- Neurotransmitter move across synapse, causing new electrical impulse to be produced and travel along a neuron
- The neurotransmitter can be **inhibitory** or **excitatory** chemical.
- For example **acetylcholine** has **excitatory effect on skeletal muscle** but **inhibitory effect on cardiac muscle.**

A number of well-known poisons work by affecting synapses with acetylcholine

- **Botulinus toxin**
  - Affects the first membrane and stops the release of acetylcholine.
  - No transmission of impulses across synapses prevents
  - The nervous system from working and causes death.
- **Strychnine and organ phosphorus**
  - Compounds deactivate the enzymes on the second membrane
  - Prevent the breakdown of acetylcholine.
  - The nerves fire continuously and the muscles contract all the time causing rigid paralysis.
- **Curare**
  - Stops the second membrane from responding to the chemical transmitter.
  - This causes paralysis as the muscles can no longer be stimulated by the nerves

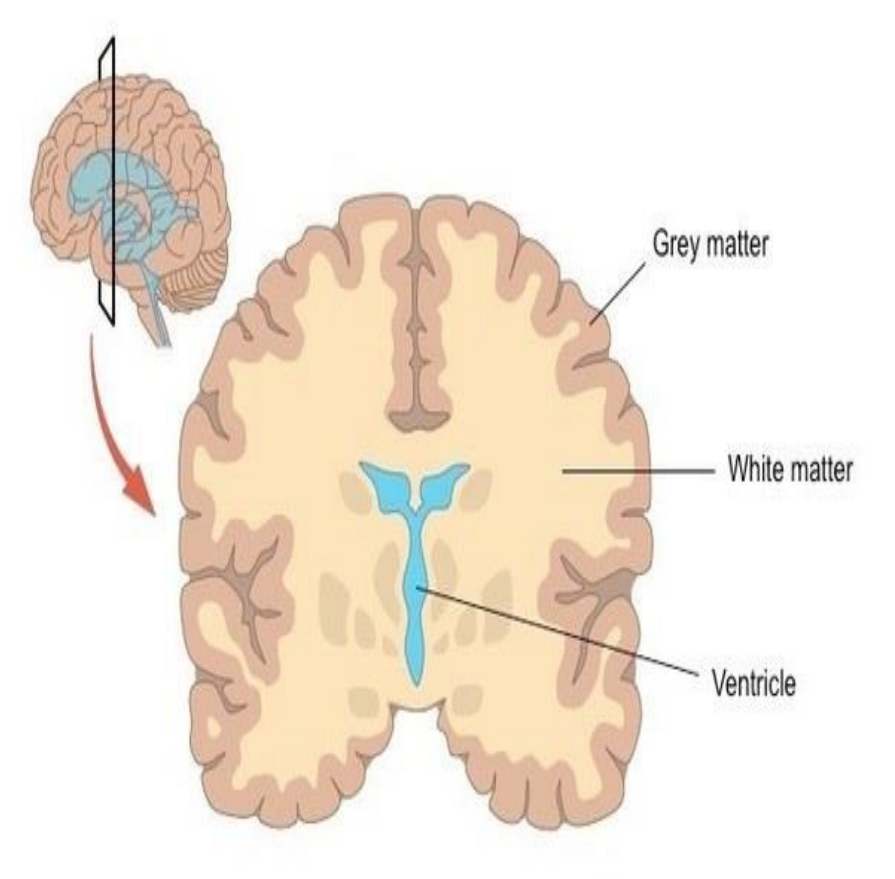
Central nervous systems; the brain and the spinal cord

The Brain

- Brain is enclosed in membranes and protected by the bones of **skull** and **meanings** (a membrane that surround the brain)
- Each side of your body is controlled by the opposite side of your brain
  - The **left-hand side of brain** is good at processing information and largely controls **speech,**
  - While the **right- hand side** is better at special awareness and **recognizing faces.**
- If the right-hand side of your brain is damaged you may be unable to recognize even your closest family

Cross section of the brain

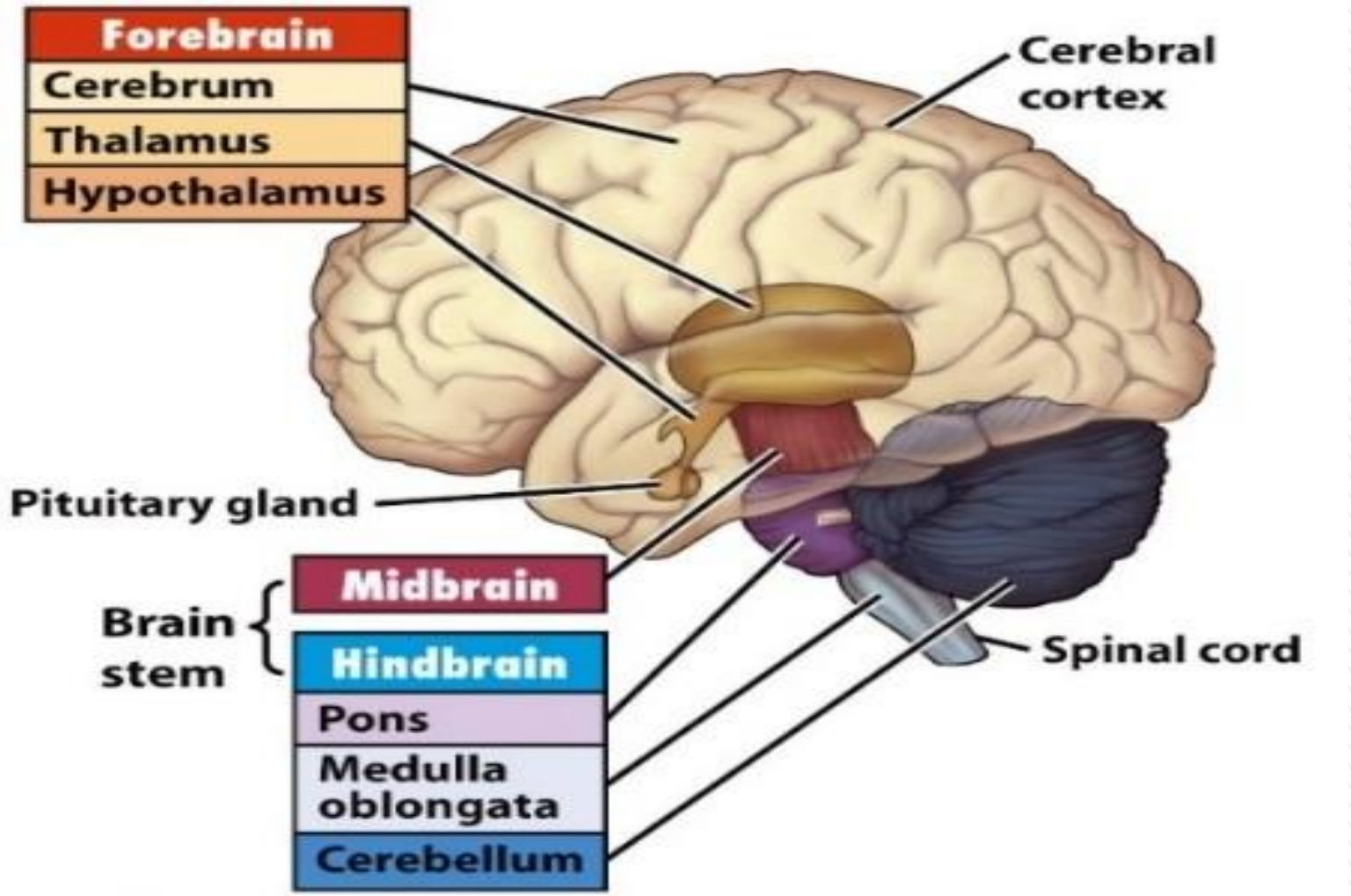
- **Grey matter** the bulk of the brain– contains cell bodies of neurons and the synapses that connect neurons.
- **White matter** is Inside the brain -the axons that lead into and out of the brain



Parts of the brain

1. **The fore brain** consists
   - **The cerebral hemispheres**
     - Involved in speech, intelligence, thought
     - dealing with coordination of sensory and motor function
   - **Hypothalamus** regulation of temperature, hunger, thrust, sleep, emotion and reproductive behaviour
2. **The mid brain** that deal with vision (the optic lobes)
3. **Hind brain** consists;
   - **Cerebellum** deal with balance and orientation
   - **Medulla** regulate respiration, breathing, circulation and salivation

Parts of the brain



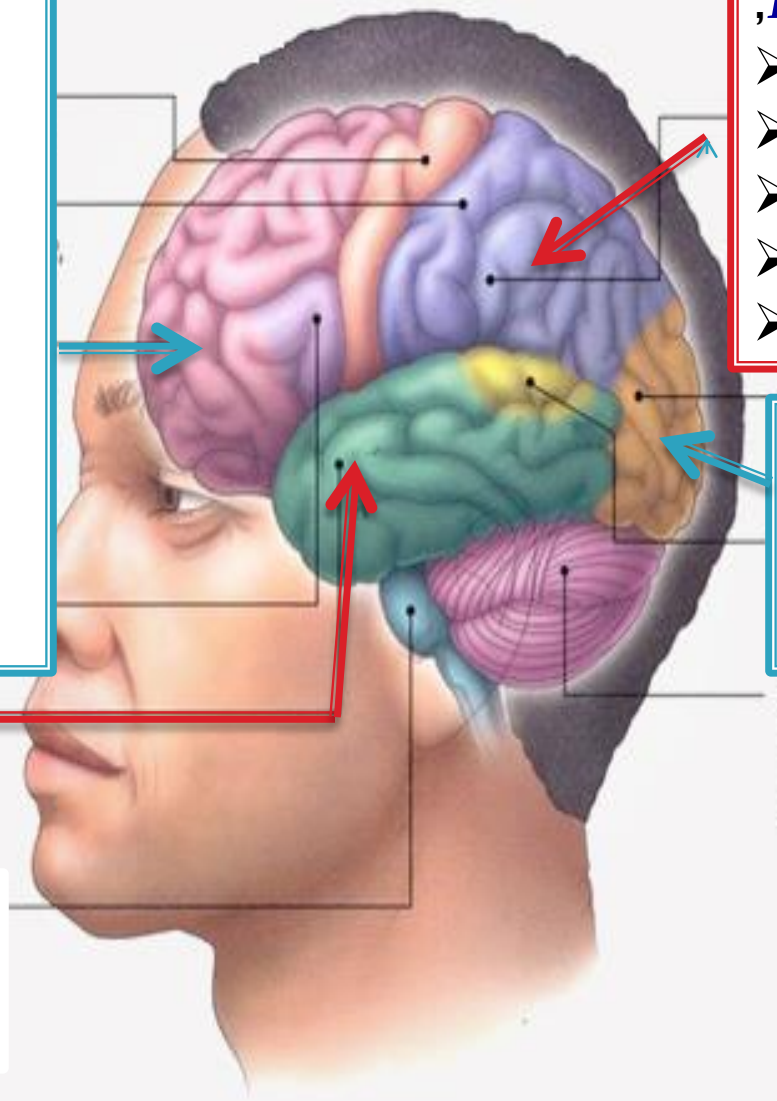
Four important lobes of cerebral hemisphere

Frontal lobe

- *Movements*
- *Problem solving*
- *Concentrating*
- *Thinking*
- *Behaviour*
- *Personality mood*

,Parietal lobe

- *Sensation*
- *Language*
- *Perception*
- *Body awareness*
- *Attention*



Occipital lobe

- *Vision*
- *Perception*

Temporal lobe

- *Hearing*
- *Language*
- *Memory*

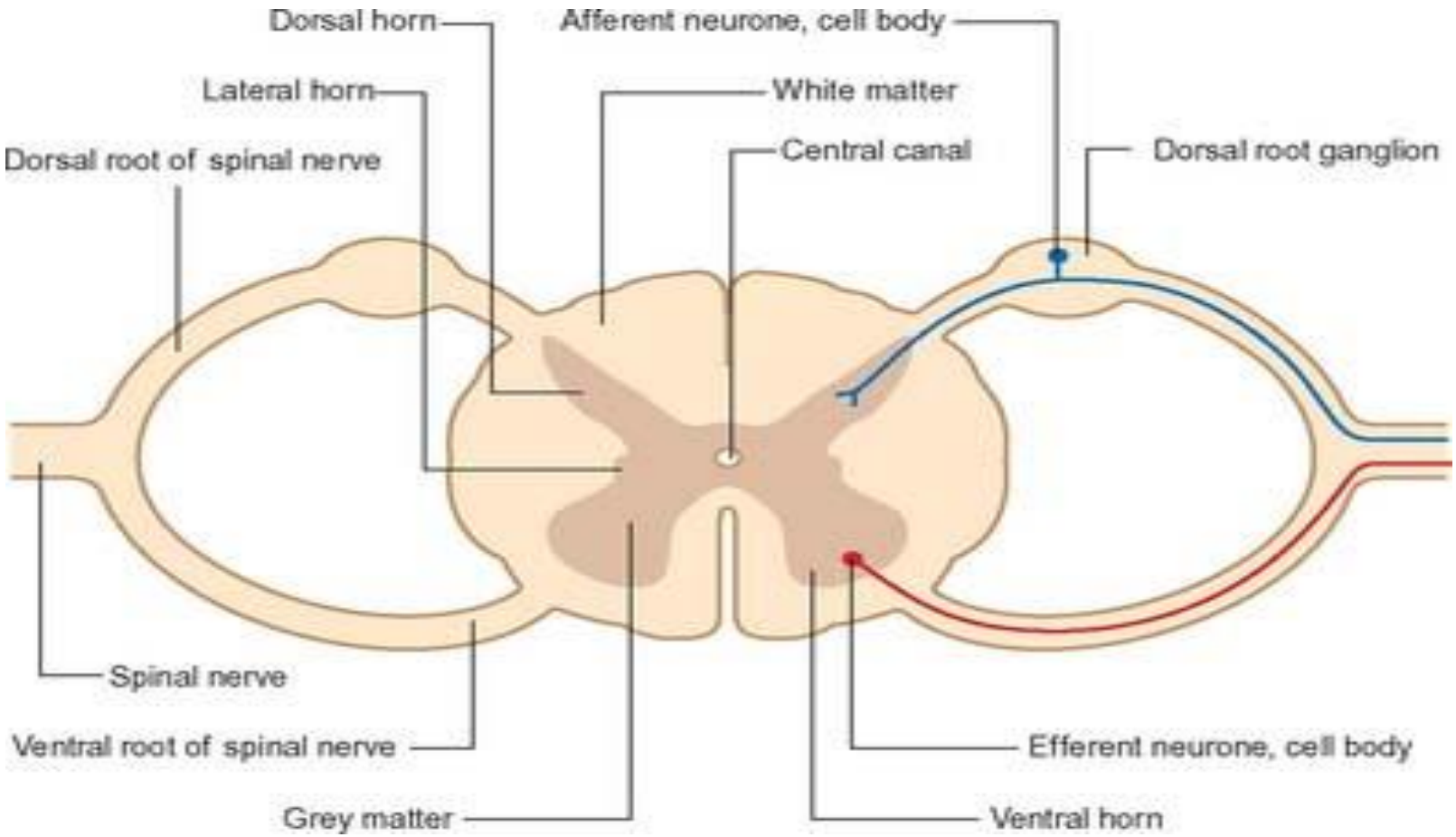
The spinal cord

- Runs out from your brain down your body.
- It is encased and protected by the vertebrae

The cross section of spinal cord

- The **grey matter** are in the middle contain cell bodies of motor neuron and short relay neurons
- The **white matter** is on the outside.

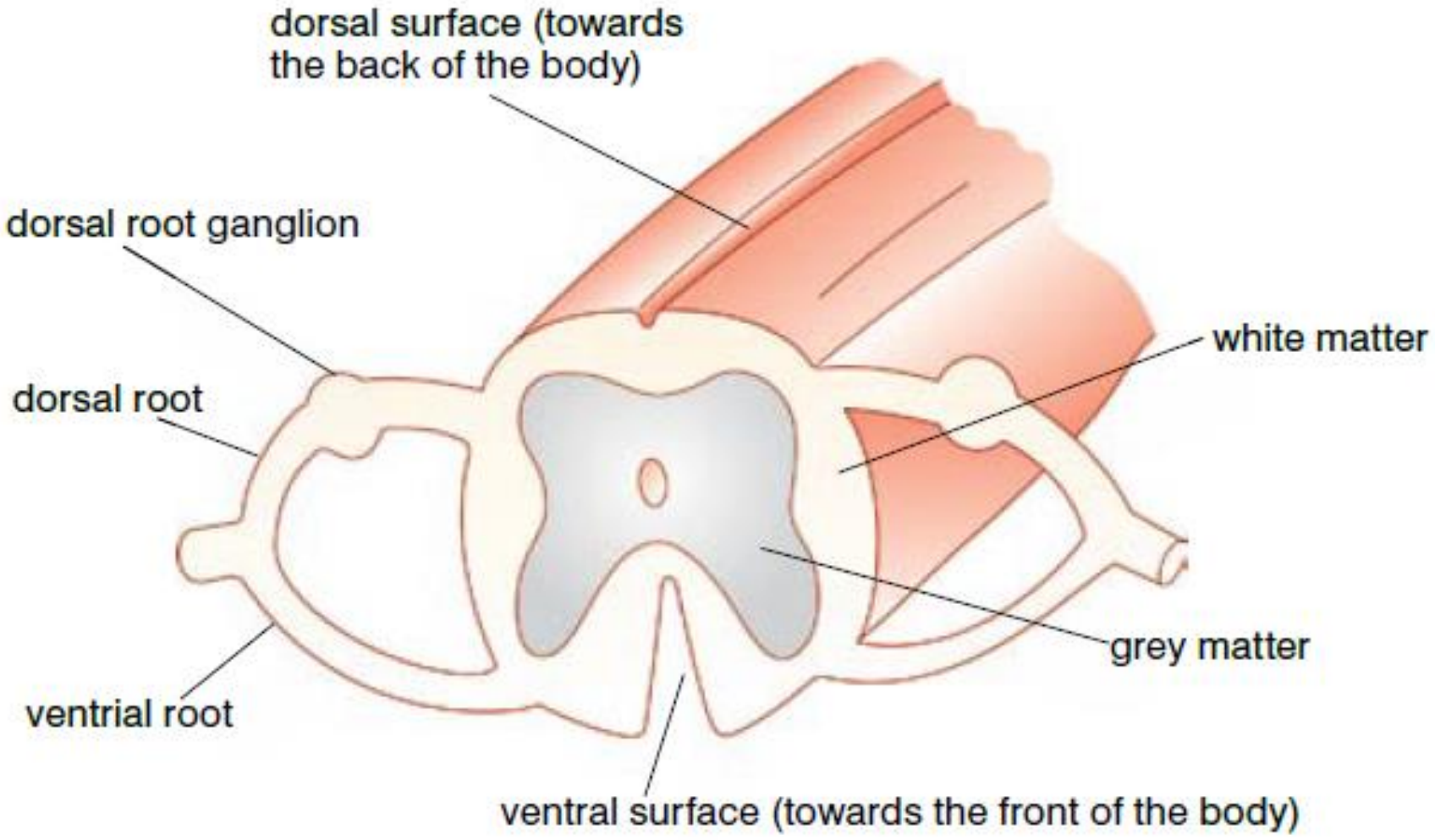
Cross section of spinal cord



Root of spinal cord

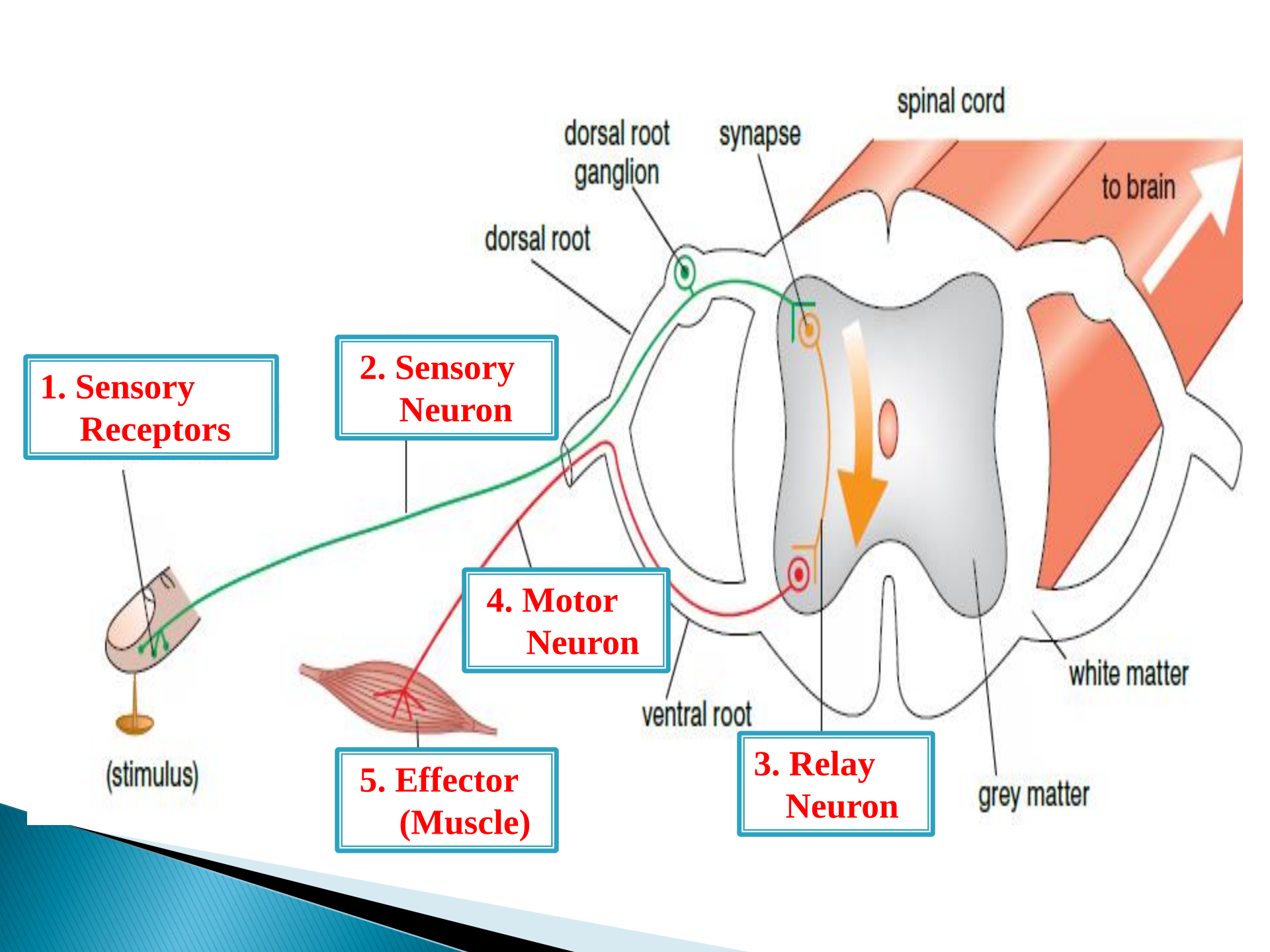
- **Dorsal root** at the back of the spinal cord
  - Sensory impulse through afferent neuron enter the cord
  - Contain sensory (affector) neuron
- **Ventral root** at the front of the spinal cord
  - Impulse that travels from CNS to the effectors organ starts
  - Contain motor (effector) neuron

Dorsal and ventral root of spinal cord



Reflexes (Reflex action)

- Is sudden ,automatic, and uncontrolled response part of the body or the whole body to stimuli
- It is important for the body by providing a means of protection and homeostatic reaction.
- **Reflex arc** is the neural pathway during reflex. It involves;
- **5 essential component of reflex arc**
  1. **Sensory receptor** detect stimuli
  2. **Afferent neuron**
  3. **Coordinator center (relay neuron)**
  4. **Efferent neuron**
  5. **Effectors (muscle and gland**) gives response
- There are two type of reflex action
  - Simple reflex action
  - Conditioned reflex action


spinal cord
dorsal root ganglion
synapse
to brain
dorsal root
1. Sensory Receptors
2. Sensory Neuron
4. Motor Neuron
white matter
ventral root
(stimulus)
5. Effector (Muscle)
3. Relay Neuron
grey matter

There are two type of reflex action

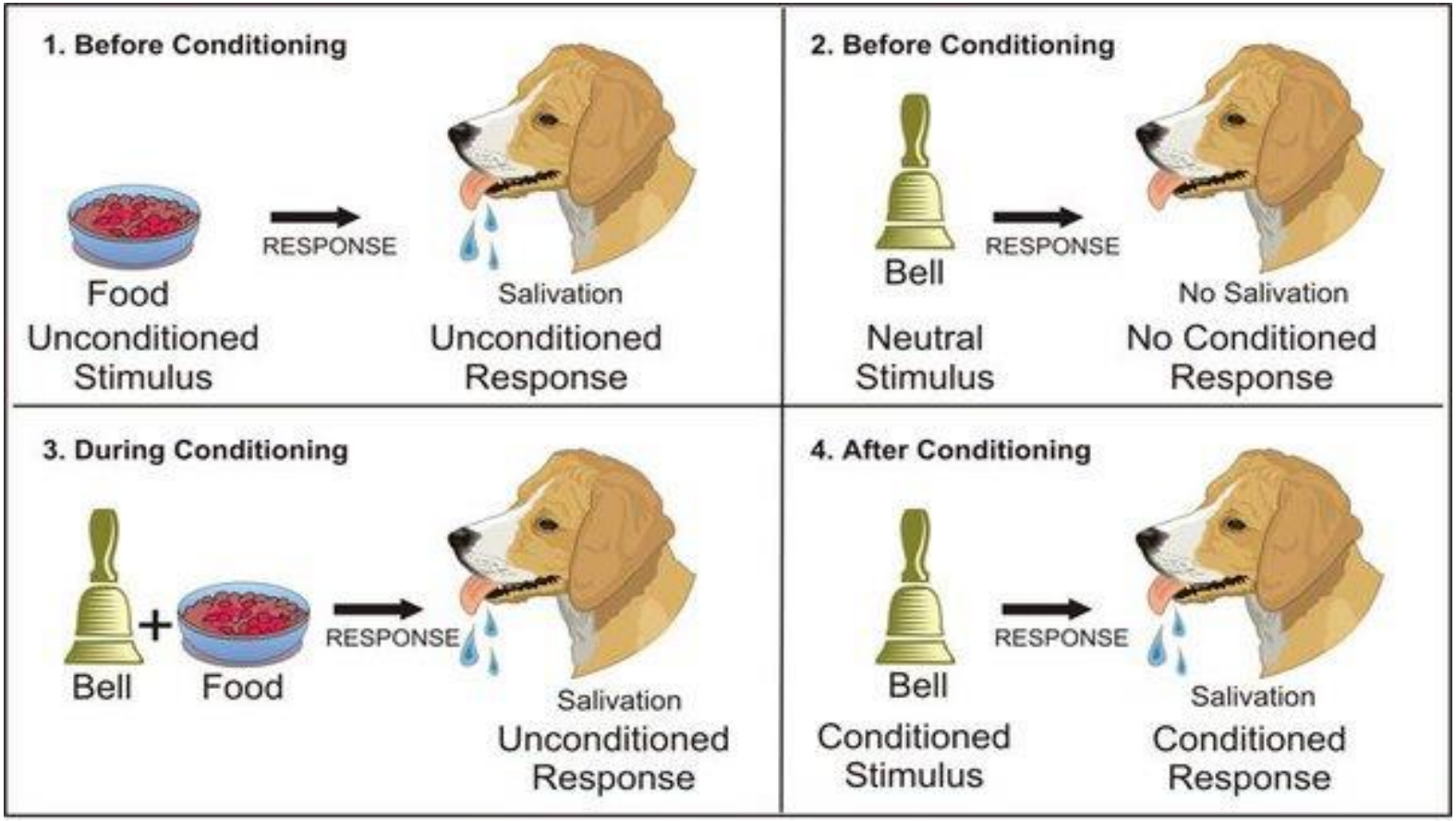
Simple reflex

- A very **rapid, involuntary, automatic** response to stimuli
- Example of simple reflex action
  - Knee-jerk reflex
  - Withdrawal from heat
  - Blinking of the eye
  - Sneezing
  - Coughing

Conditioned reflex

- It is not inborn
- It is dependent on past experience and training
- Example Pavlov's experiment

Pavlov's Conditioned reflex



Classical Conditioning

The difference between reflex and voluntary action

Reflex action	Voluntary action
➢ Is an involuntary action in response to impulse initiated by stimulus	➢ Are responses to stimuli that are consciously controlled by the brain
➢ It is not under the control of the will	➢ It is under the control of the will
➢ E.g. blinking of the eye, salivation, coughing, peristalsis, secretion, heart beat	➢ E.g. Writing, Dancing, Eating, Driving, singing, Walking

Drug abuse

- **A drug** is a substance which alters the way in which mind, or body, or both, works. .
- In Ethiopia caffeine, nicotine, khat and alcohol are the legal recreational drugs.
- **Drug abuse** is use a substance to the point of excess and/or dependence.
- **Drug dependence** is use a drug again and again and become addicted.
  - **Psychological dependence** – the need to keep using it becomes a craving or compulsion.
  - **Physical dependence**; where your body no longer works properly without added chemical extras.

Withdrawal symptoms

Withdrawal symptoms. an addict tries to stop using their drug

- Feel very unwell,
- often experiencing combinations of aches and pains,
- Shaking, sweating, headaches,
- Cravings for the drug
- Even fevers as the body reacts –

Alcohol, khat and tobacco are legal drugs in Ethiopia but cannabis is illegal.

Smoking

- The addictive drug in cigarette smoke is nicotine, physically addictive.
- Smoking increases your risk of the following diseases:

Coronary Heart Disease

- The chemicals in the tobacco smoke affect the walls of arteries.
- They make the blood vessels supplying oxygen to the heart narrow.
- Reduces the blood supply to the heart and other areas of the body.
- Tend to damage the smooth lining of the arteries, **atherosclerosis** will occur.

Smoking increase the risk …

Strokes

- The blood vessels taking blood to the brain damage or blocked
- which may lead to paralysis, memory loss and even death.

Lung Disease

- Tar and other chemicals in tobacco smoke damage the tissues of the lungs and lead to a greatly increased risk of developing chronic obstructive pulmonary disease (COPD) and lung cancer.

Cancers (lip, mouth, throat, pancreas, bladder and kidney)

- Many of the chemicals in cigarette smoke are carcinogenic (cancer causing)

Alcohol

- Alcoholics people who are addicted to alcohol may develop **cirrhosis of the liver** disease destroys liver tissue. They can also get liver cancer
- Drinking alcohol have social and economic impact on people

Khat

- The drug **cathinone** from the khat leaves is absorbed into the bloodstream and affect the body

Cannabis (marijuana)

- It is a dangerous hallucinogen drug that contain a chemical called **cannabinoids**
- **Delta-9 tetrahydrocannabinoid** (THC).
  - THC affect the brain cells responsible for memory, emotion and motivation.
- Hallucinogens are drugs that produce vivid waking dreams

LSD (lysergic acid diethylamide)

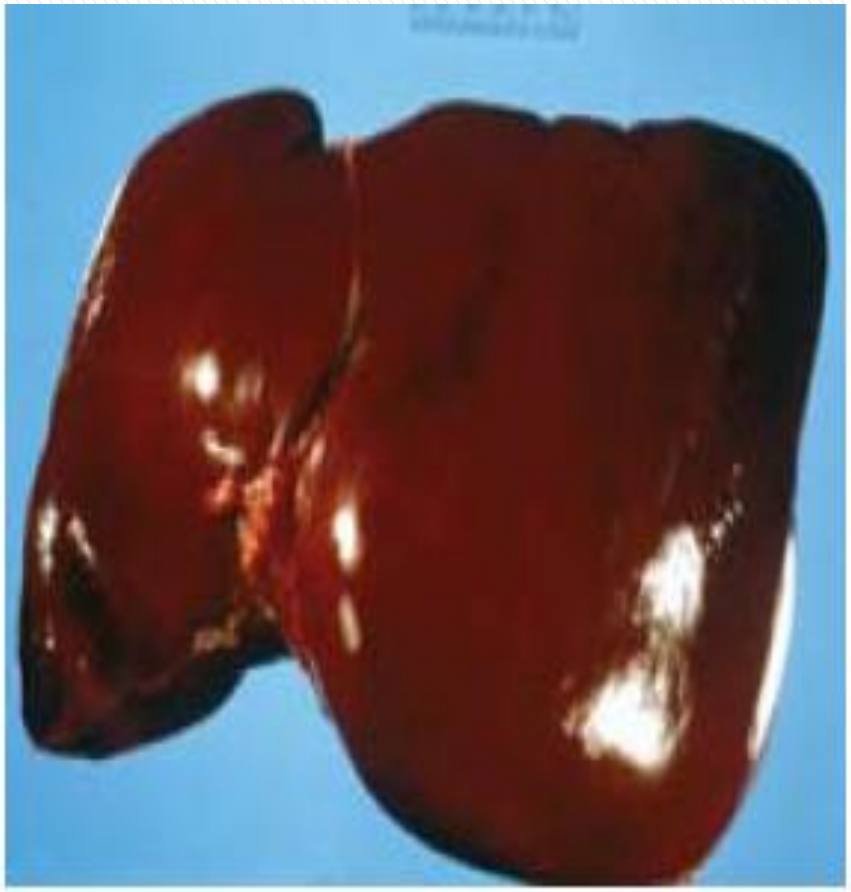
- This is a very strong hallucinogenic drug made in the laboratory.

Cocaine

- It is a highly powerful stimulant drug that is finalized by depression.

Heroin

- Heroin is medically as very good painkillers and as recreational drugs,
- Increase the risk of liver diseases such as hepatitis, heart and brain damage.



Healthy liver



Liver with cirrhosis

3.2 Sense organs

- Sense organ contain sensory receptor that detect a particular stimulus,
- A sensory organ is an organ that contains a large number of sensory receptor cells and the human eye is a good example
- Sensory receptors can change energy of the stimulus into electrical energy in nerve impulse

Different receptors different Energy stimuli

Receptor	Energy
❖ **Eye** (retina, provides vision)	❖ Light
❖ **Ear (cochlea**, organ of hearing)	❖ Sound
❖ **Ear (semi-circular canals,** organ of balance)	❖ Movement (kinetic)
❖ **Tongue (taste buds**, enable us to taste)	❖ Chemical
❖ Nose (olfactory organ or organ of smell)	❖ Chemical
❖ **Skin** (touch, pressure and pain)	❖ Movement (kinetic)
❖ **Skin** (temperature receptors)	❖ Heat
❖ **Muscles**(stretch receptors)	❖ Movement (kinetic)
❖ **Arteries and brain** (chemo receptors responding to pH and carbon dioxide levels)	❖ Chemical

THE HUMAN EYE

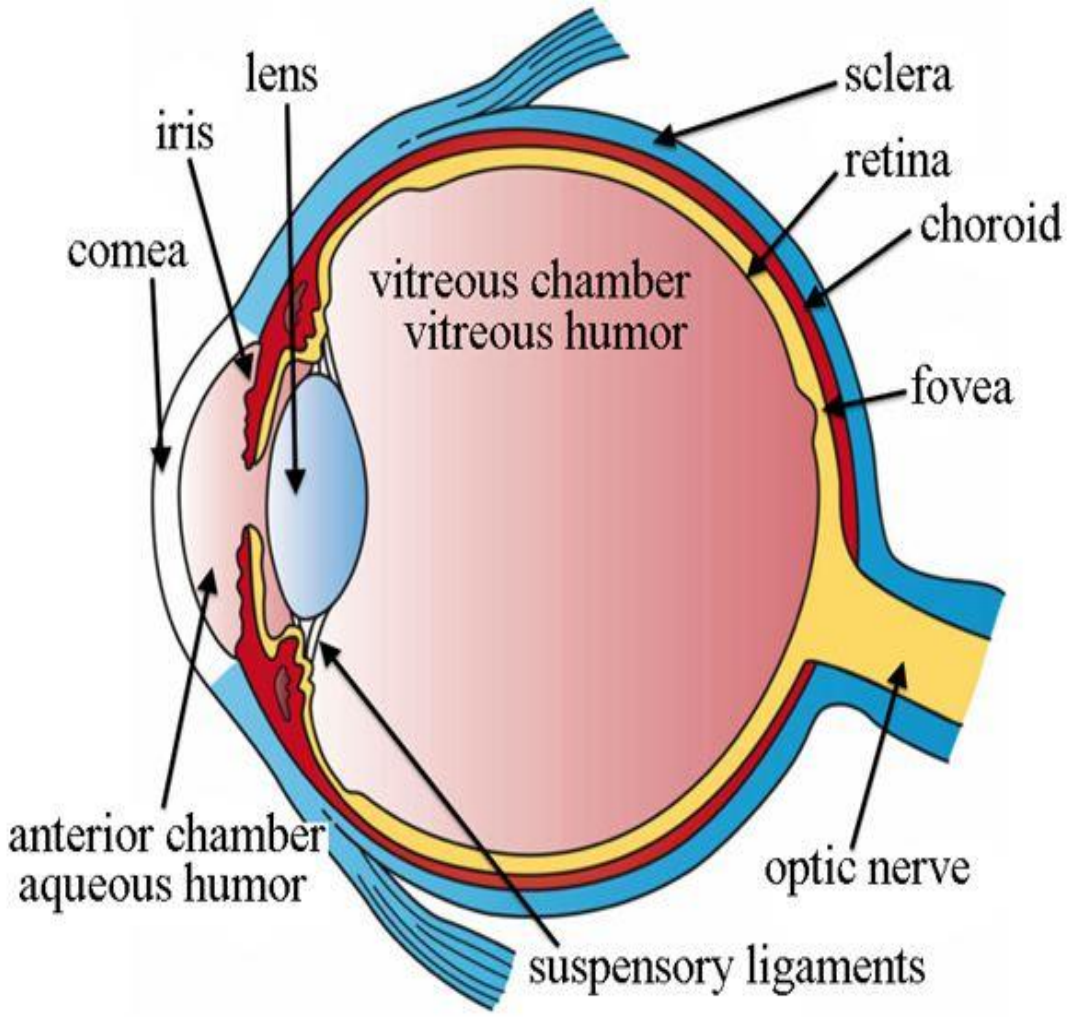
Eye protection

- **Sockets** the cavity in the skull in which eye is situated.
- **Eyelids**, **eye brow, eye lash** protect the eye from the entry of material like dust, sand
- **The conjunctiva;** transparent mucus membrane covering the front of eye ball
- **Tear;** a salty solution contain an enzyme called **lysosome** that kill some bacteria.
  - Tear is secreted by tear gland or lachrymal gland.

Parts of the eye

- **The sclera** white part of eye the tough, opaque external covering of the eye.
  - Important to protect and maintain the shape of eye ball
- **Cornea** transparent front part of sclera ,
  - important to bend light ray toward retina
- **Choroid** the middle pigmented layer of the eye. rich in blood vessel that supply nutrient and oxygen to the cell of retina
- **Pupil;** is a hole in the centre of the iris, through which light enter the eye

Parts of the eye



Human eye have two chamber

1. **Aqueous humor** (anterior chamber
2. **Vitreous humor**

Human eye have three layer

1. **Sclera**
2. **Choroid**
3. **Retina**

5. Iris

5. Iris is the colored part of the eye.

- It contain two set of muscle called **circular** and **radial**
- Responsible for controlling the amount of light entering the eye to the retina

In dim light

- The **radial muscles contract**
- The **circular muscles relax**
- The **pupil dilates** (pulled open wide).

In bright light,

- the **circular muscles contract**
- the **radial muscles relax**,
- **Pupil constricts** (very small).

circular muscles contract



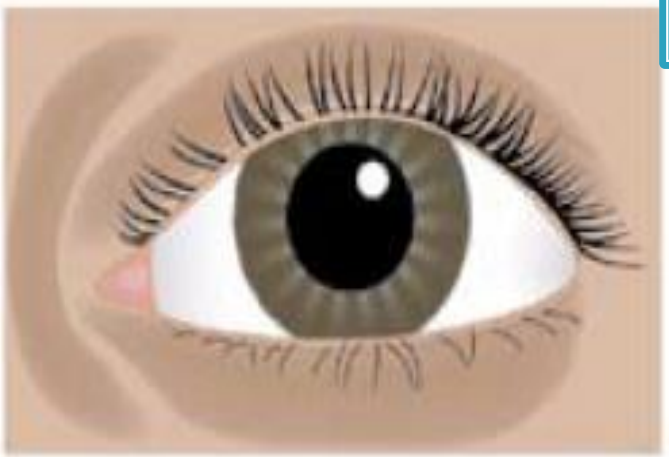


Bright light

- circular muscles contract
- radial muscles relax
- pupil constricts

radial muscles contract





Dim light

- circular muscles relax
- radial muscles contract
- pupil dilates

Con’ t

6. **The lens**, a flexible disc that helps focus light on the retina
   - The lens is **held in place** by **suspensory ligaments** and the **Ciliary muscles**.
7. **Suspensory ligaments** elastic-like structures that suspend the lens and pull lens into shape for focusing distant objects into the retina
8. **Ciliary muscles** eye muscles that automatically contract and change the shape of the lens by changing the tension of suspensory ligaments

9.Retina; the inner layer of the eye it contains special light-sensitive photoreceptors called roads and cones

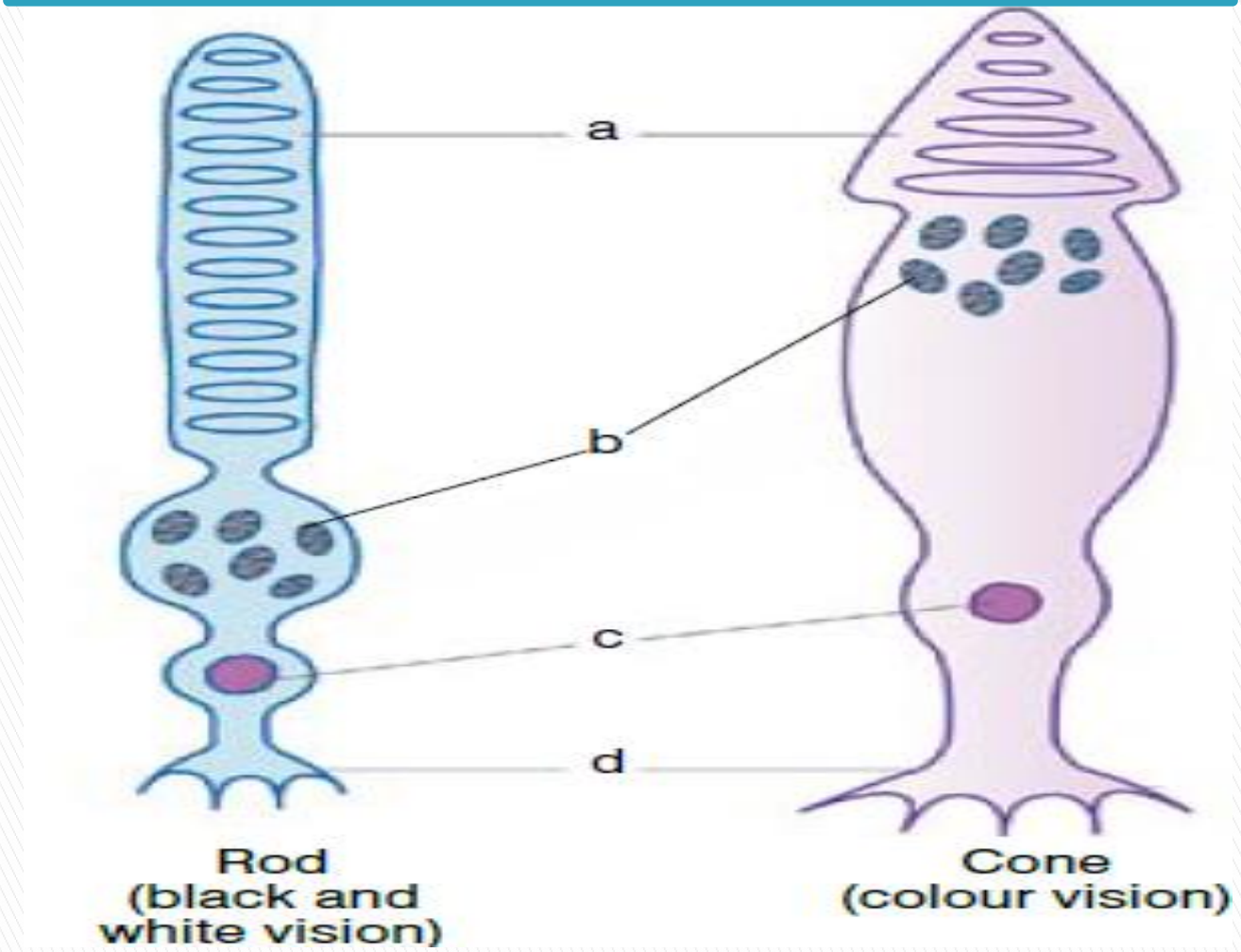
Rods

- Respond to relatively **low light** levels,
- **do not** give a **very clear image**
- They **do not respond to different colors**, everything looks **black and grey**
- **Distributed evenly on retina except fovea**
- Fewer in number on retina
- The pigment in the rods that respond to light based on vitamin A
- The **lack of vitamin A** in diet cause **night blindness**

Cones

- Responsible for **bright light** color
- They **give a very clear, defined image**
- Responsible for **color vision**
- More **concentrated in and around fovea**
- Occur greater on retina
- **Color blindness**; the genetic disorder inability to distinguish colors such as red, blue and green

a) Light sensitive pigments
b) Mitochondria to supply energy
c) Nucleus
d) Synapse with optic nerve



Con’ t

Fovea (yellow spot)

- The most sensitive part of retina
- It contain cones,
- Most light ray are focused on it
- Forms clear image

Blind spot

- The point where optic nerve leave the eye
- There is no cones and rods on blind spot
- The light ray falls on blind spot do not form image

Con’ t

10. Aqueous humor; is a watery fluid that fill the front chamber of the eye.

- maintain the shape of eye ball

11. Vitreous humor ;is jelly like (semi solid) substance that fill the area behind the lens

- maintain the shape of eye ball

12.Optic nerve; the bindle of nerve fibers that transport nerve impulse from retina to brain

Accommodation; the ability of the eye focusing near and distance object

a) **Focusing on a distant object**

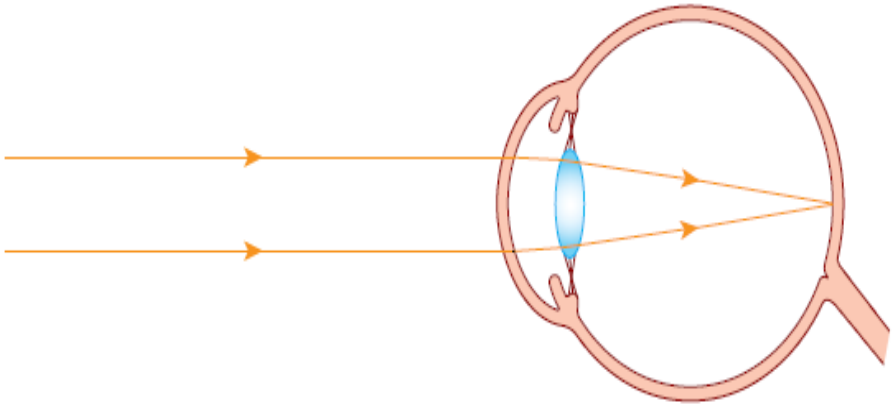
- Ciliary muscles relax
- Suspensory ligaments pulled tight
- lens ‘flat’ and less convex (flatter)

b) **Focusing on a nearby object**

- Ciliary muscles contract
- Suspensory ligaments slacked off
- Lens more rounded and more convex (rounded)

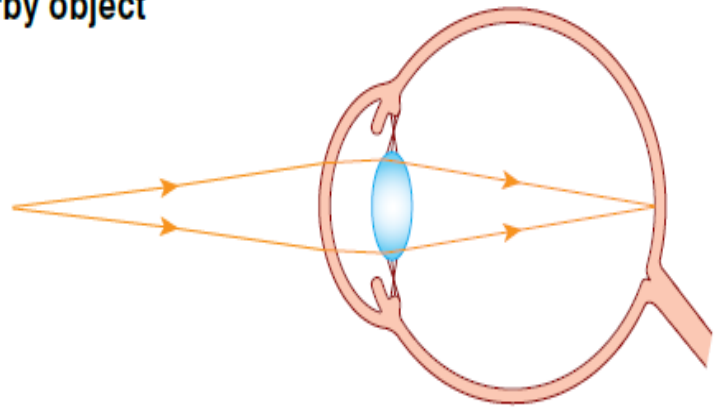
Accommodation

a) Focusing on a distant object



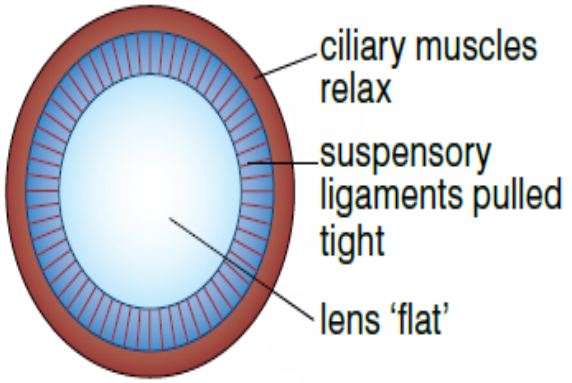
lens less convex (flatter)

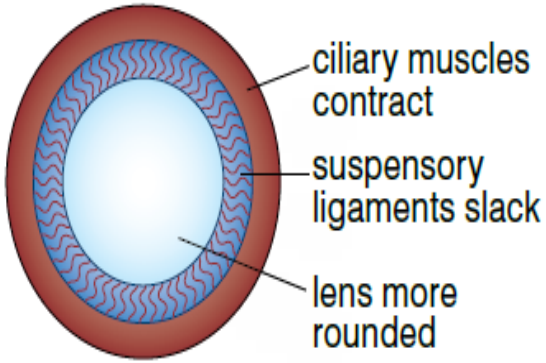
b) Focusing on a nearby object



lens more convex (rounded)

front view of lens, ciliary muscles and suspensory ligaments





Common eye defects

Short sight (myopia)

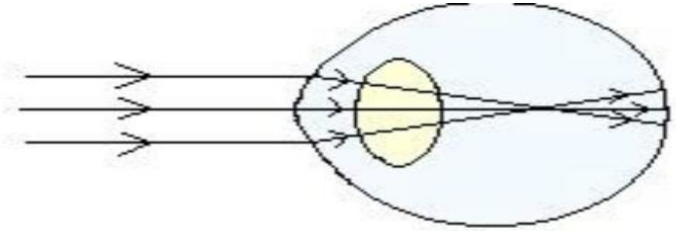
- The condition where the eye can only sea near object
- Cannot sea objet from long distance
- Image of far objet formed in front of retina

Caused by

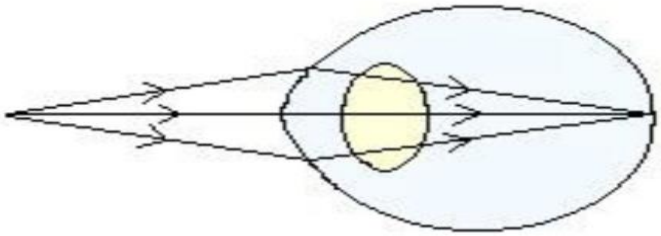
- Longer eye ball then normal
- Lens is ‘too strong’ and curved while cillary muscle relaxed

Corrected by wearing **diverging (concave)** lens

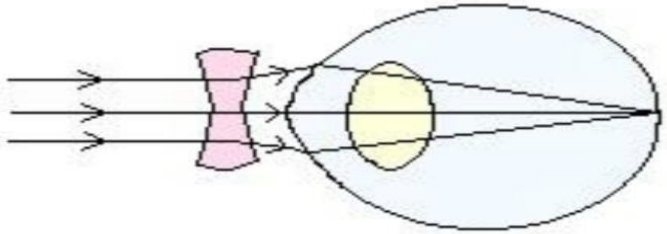
Short sight (myopia)



Blurred distant objects
Close objects are in focus



Short sight is corrected with a concave lens



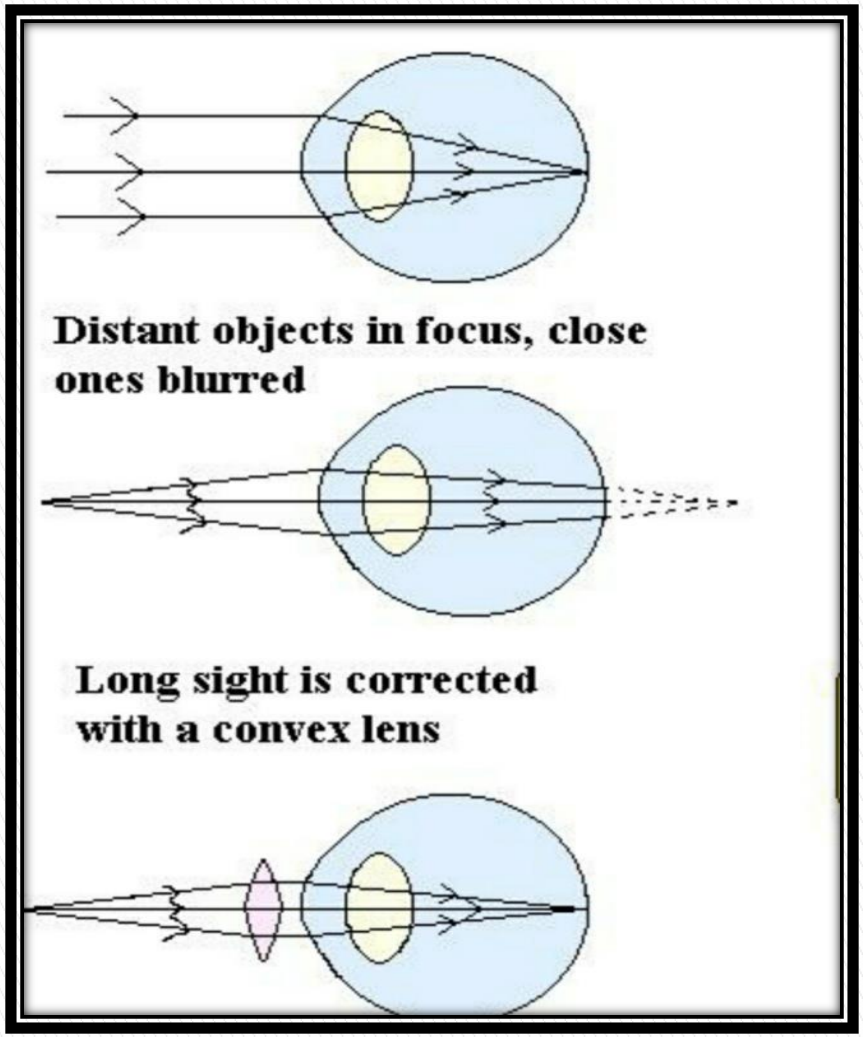
Long sight (hypermetropia)

- **Long sight** a condition where the eye only see far object
- Nearby object cannot see clearly
- Image of near object focused behind retina

Caused by

- Short eye ball then normal
- A lens is ‘too weak’ and flat while cillary muscle Contracted

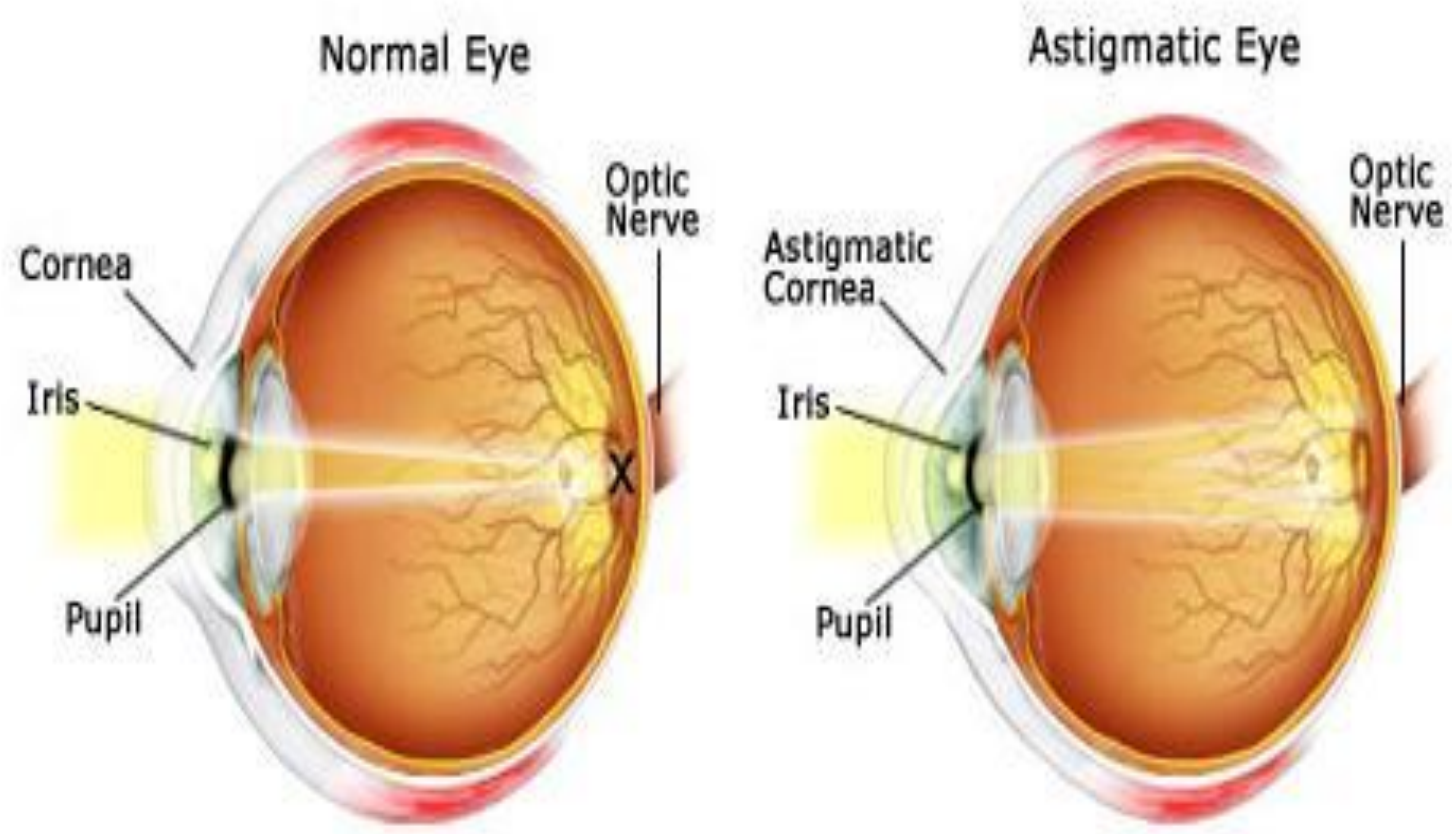
Corrected by; wearing converging (convex) lens



Astigmatism

- **Astigmatism**: is a type of refractive error in which the eye does not focus evenly on retina
- **Caused by;** The egg shaped eye instead of round
  - The cornea is curved asymmetrically and this affects the way light is focused on retina.
- **Corrected by**; irregular lens

Astigmatism



THE EAR

The human ear are responsible for

- Hearing
- Balance and position

The ear divided into three regions

Outer(external ear)

Pinna; direct sound wave into ear canal

- Helps to know the direction of sound

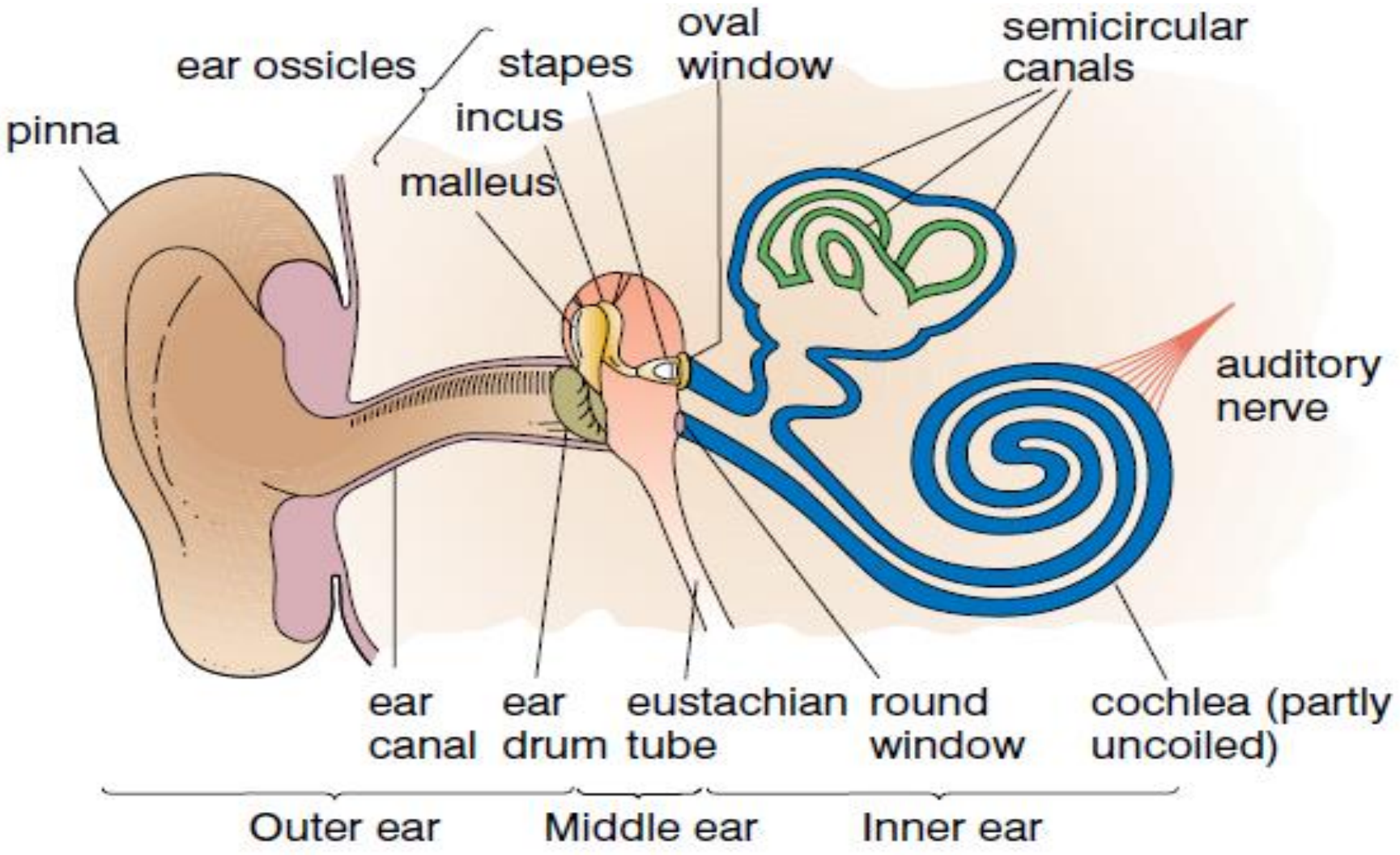
Ear canal

- Used to direct sound wave to eardrum
- Have gland to produce wax inside ear canal
- Wax use;
  - Trap dust and germs
  - Lubricate the ear drum

Ear drum (tympanum)

- A tiny and delicate membrane

THE EAR


pinna
ear ossicles
stapes
oval window
semicircular canals
incus
malleus
auditory nerve
ear canal
ear drum
eustachian tube
round window
cochlea (partly uncoiled)
Outer ear
Middle ear
Inner ear

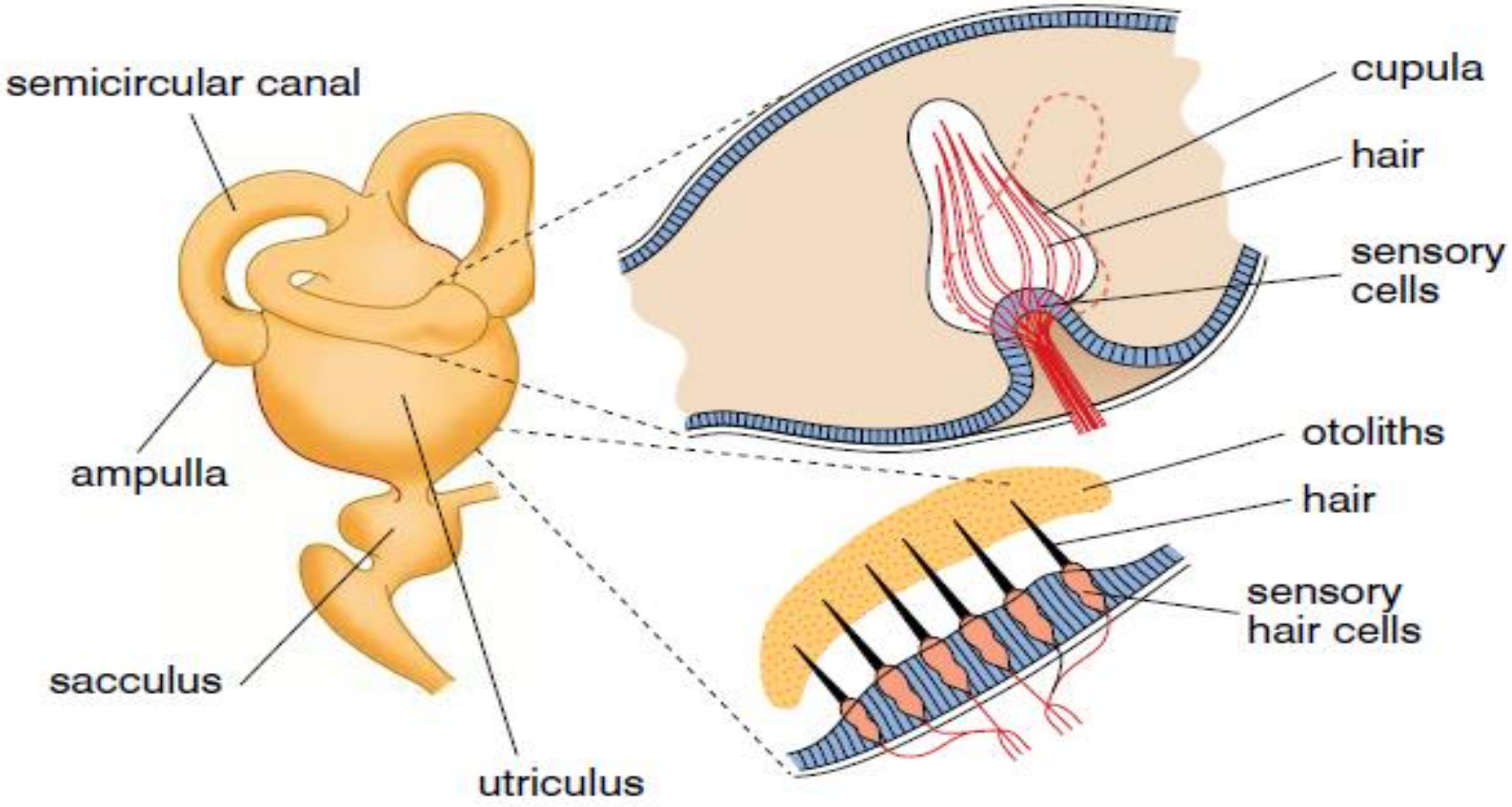
The middle ear (air filled cavity)

- It contain three tiny bones **(ossicles)**
  - **Hummer /malleus/** attach to ear drum
  - **Anvil /incus/**
  - **Stirrup /Stapes/** attach to oval window
- **Eustachian tube;** helps to equalize air pressure between outer and middle ear

The inner ear / fluid filled cavity/ consists;

- **Cochlea** a coiled tube
  - Contain nerve ending of auditory nerve
  - It is sensitive to sound vibration
- **Semi circular canal;** consists of cell that are sensitive to the motion of body.
- the sensory cells of semicircular canals in the inner ear stimulated to initiate a nerve impulse by **tilting of cupula**
- **Utricullus and sacculus;** are concerned with the balance and posture.
- the sensory cells of utricullus and sacculus in the inner ear stimulated to initiate a nerve impulse by **tilting of otoliths** in opposite direction to the head.
- The sense of balance is also affected by **vision** and **stretch receptors in the muscles**, which constantly help you to be aware of your position

The of the balance organ of the ear



Common disorder of the ear

- Partial hearing loss is called **hearing impairment**
- The total loss of hearing is called **deafness**
- Some of the common cause of hearing impairment and deafness are;
  - Obstruction of auditory passage
  - Inflammation
  - Loud noise
  - Infection

TASTE AND SMELL

Tongue

- Have sensory receptors **sensitive to dissolved substance**
- The sensory receptors of taste are located on the upper surface of the tongue known as **taste bud.**
- The five different types of taste buds spread evenly across the tongue
- The receptors for smell are located in the upper parts of the nasal passages.
- There are five basic taste sensations are **sweet, sour, bitter and salt** recently discovered a fifth taste called **umami** .
- **Umami** is a very savory flavor found in foods such as meat, cheese, broth and mushroom.

The nose

- Smell is caused by **chemical stimuli**
- Smell receptor are called **olfactory cells** which are located in the roof of nasal cavity
- The specialized cell of smell are similar to taste however, **nose detects dissolved chemical at distance**

THE SKIN AS A SENSE ORGAN

- Human skin are sensitive to five type of stimuli touch, temperature ,pain and pressure. Due to the following receptors
  I. **Meissners corpuscles;** Touch
  II. **Pacinin corpuscles;** pressure
  III. **Thermo receptors;** Temperature
  IV. **Nocireceptors;** pain

Importance of the skin

- It forms a waterproof layer around body tissues,
- It protects from the entry of bacteria and other pathogens.
- It protects from damage by UV light from the sun.
- It is an excretory organ (nitrogenous wastes are lost in your sweat).
- It is vital in controlling body temperature.

Skin has three main layers.

Hypodermis; the **lower layer**,

- Contains fatty tissue which helps:
  - **to insulate the body against heat loss.**

Dermis; the **middle layer contains:**

- **Blood vessels, Sweat glands, Sensory receptors and Hair follicles.**

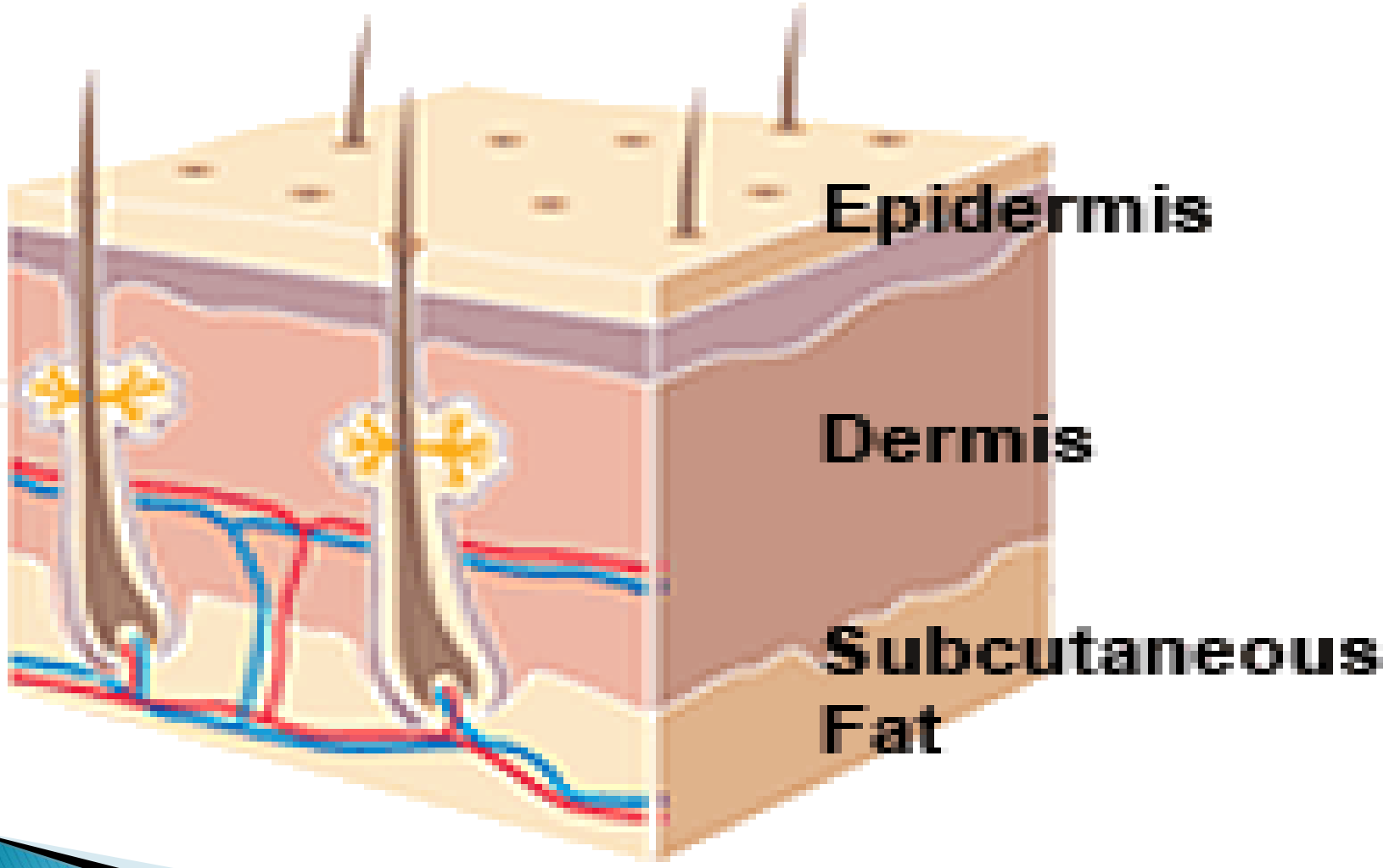
- Closely involved in temperature control in homeostasis.

Epidermis; the **upper layer** and made up of dead cells.

Helps:

- Stop water loss
- protect against the entry of pathogens.
- involved in the homeostatic mechanisms of the skin

Part of the skin



Endocrine system

- There are two different systems that have a role in co- ordination and control of the body.

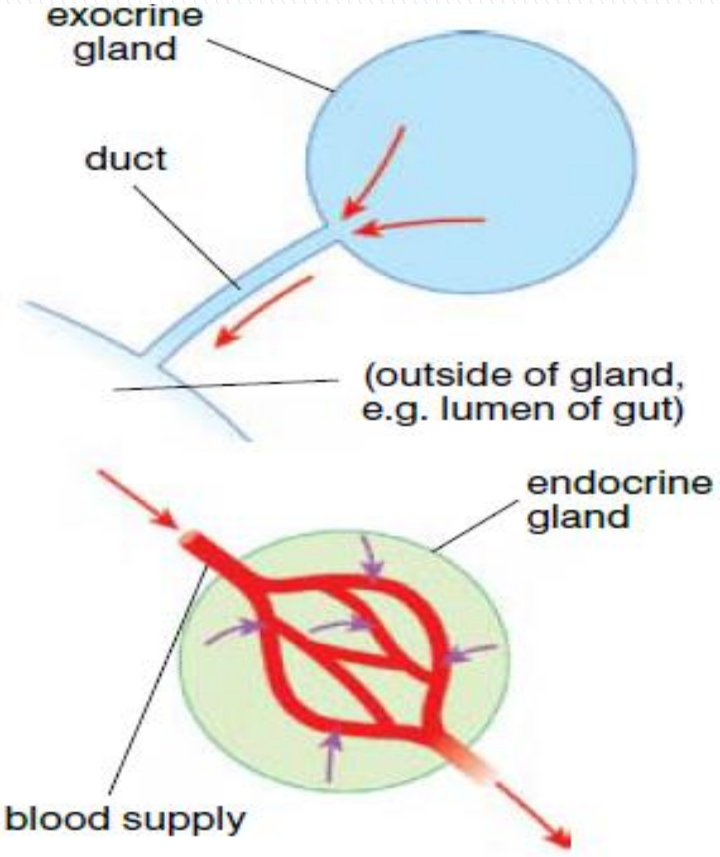
Nervous system	Endocrine /hormonal/
❖ It use electrochemical coordination	❖ It is chemical coordination
❖ Messages travel fast through nerve cell	❖ Hormone transported through blood
❖ Messages usually have rapid effect	❖ Often take longer to have an effect.•
❖ Origin of message are receptors	❖ Origin of message are endocrine gland
❖ Destination of message are effector	❖ Destination of message are target cell

THE ENDOCRINE GLAND

- Glands are structures that produce hormone and other useful substance.
- There are two types of glands

EXOCRINE GLAND

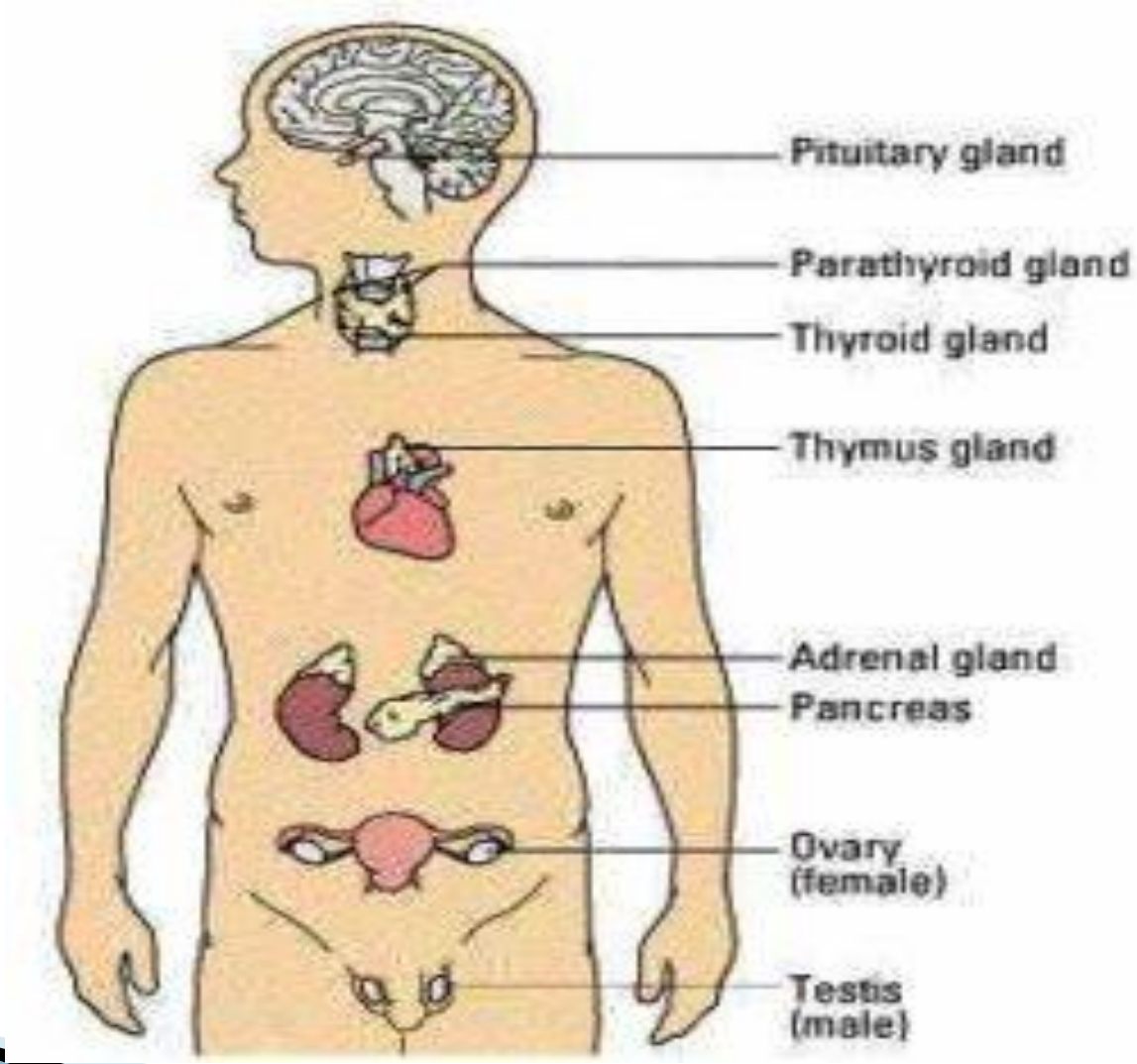
- Release its secretion in to its ducts
- Some example of exocrine gland
  - **Salivary gland**
  - **Sweat gland**
  - **Mammary gland**
  - **Pancreatic gland**
  - **Intestinal gland**



ENDOCRINE GLAND (ductless gland)

- Gland without duct
- Transport there secretion through **blood vessels**
- Produce a chemical called **hormones**
- **Hormones** are chemical messenger which carries information from one part of the body to other.
- Hormone exert their influence on certain body called **target organs**
- **Harmon able to find target cell using** specific receptor to the hormone found in the target cell
- Hormone have a long term effect on the body such as **growth, development, metabolism and reproduction**
- Some examples of endocrine gland;

Endocrine glands



PITUTARY GLAND

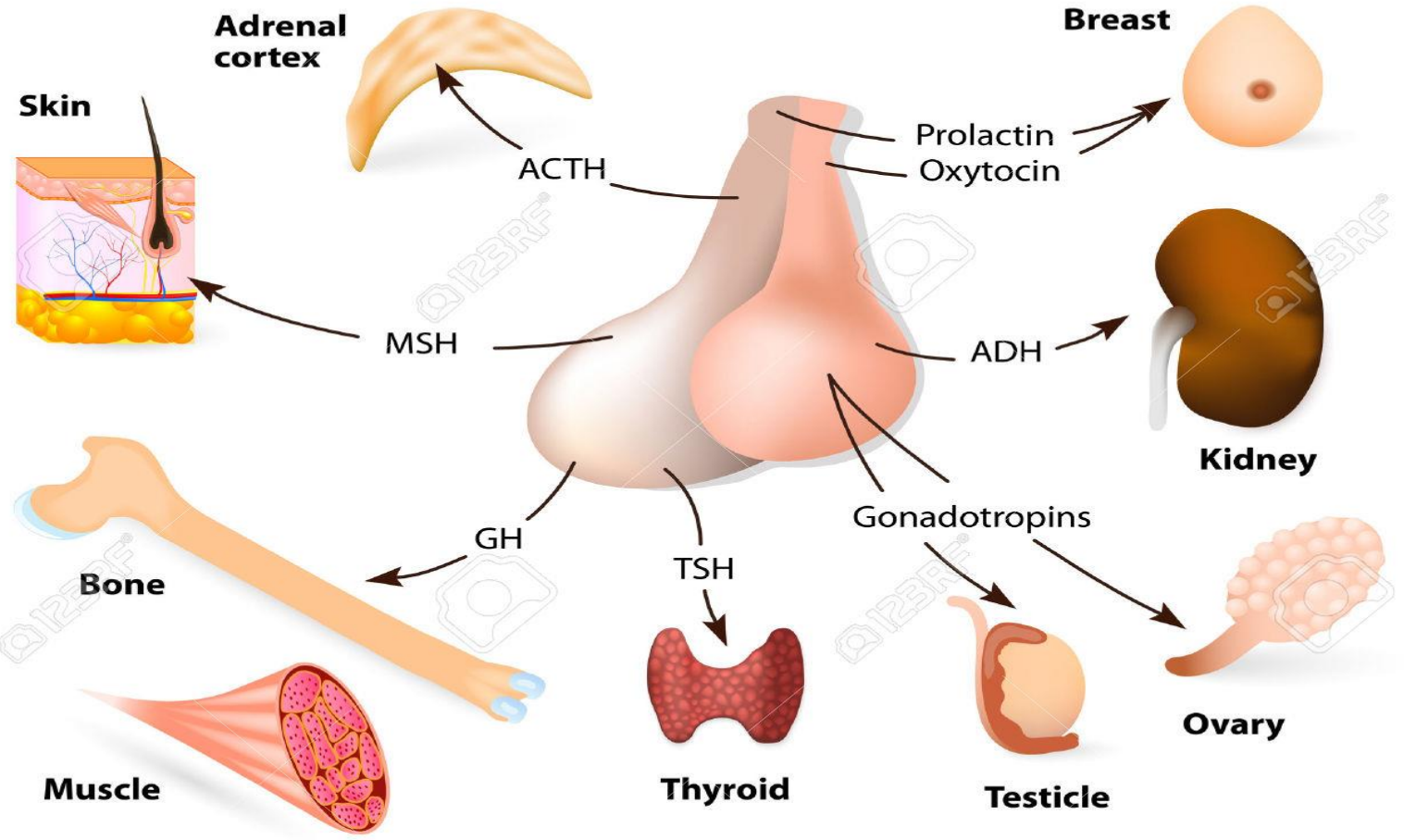
Found in the brain

- Control the activity of other endocrine glands. Thus, it is called **master gland or an endocrine orchestra**

Pituitary gland secret the following hormone

- **Growth hormone** regulate the development of bone and muscle
  - Low secretion **dwarfism (very short)**
  - High secretion **gigantism (Very tall)**
- **Thyroid stimulating hormone (TSH)** stimulate thyroid gland to produce thyroxin hormone
- **Gonadotrophic hormone(GTH)**
  - **Follicular stimulating hormone(FSH)** stimulate the development of egg in ovary
  - **Luteinizing hormone(LH)** stimulate the production of progesterone in female and testosterone in male
- **Antidiuretic hormone** stimulate reabsorption of water by kidney tubules
- **Oxytocin hormone** initiate uterus contraction to cause birth

PITUITARY GLAND



THYROID GLAND

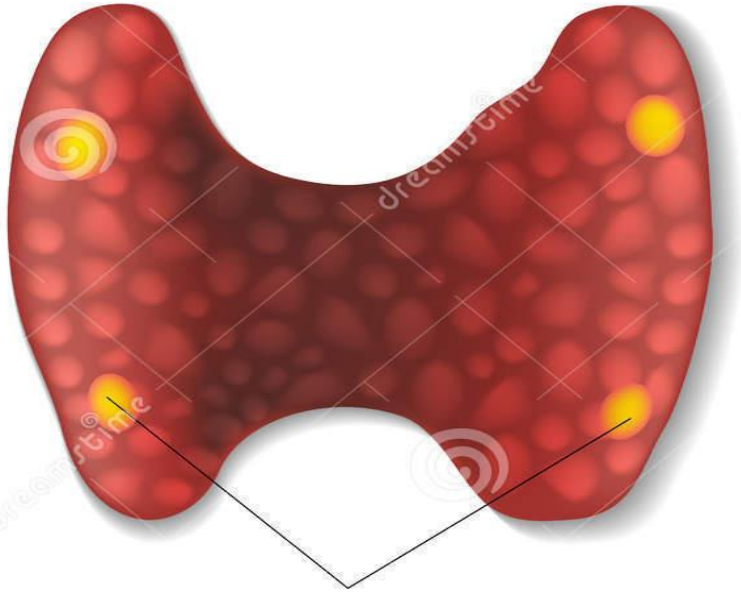
- Found in neck region in front of wide pipe
- Secret iodine contain hormone called **thyroxin**
- It involve in regulation of:
  - rate of metabolism
  - stimulate the conception of oxygen by most cell
  - development of brain in children

THYROID AND PARATHYROID

Thyroid gland
(front view)



Thyroid gland
(back view)



Parathyroid glands

Too much thyroxin

- Metabolic rate will rise
- Heart beat and blood pressure rises
- People with this condition may have
  - Loss of weight (Thin body)
  - Irritable or restlessness
  - Heavy sweat

Low level of thyroxin

- Metabolic rate decrease
- People with low thyroxin;
  1. People feel tired
  2. Lack of energy
  3. Weight gain
  4. Miscarriage in pregnant women
  5. Reduce mental and physical development in children known as **cretinism**
- The deficiency of thyroxin in adult human results thyroid gland enlarges. This condition is known as **goiter**
- **Goiter prevented** by including **more iodine in our diet**

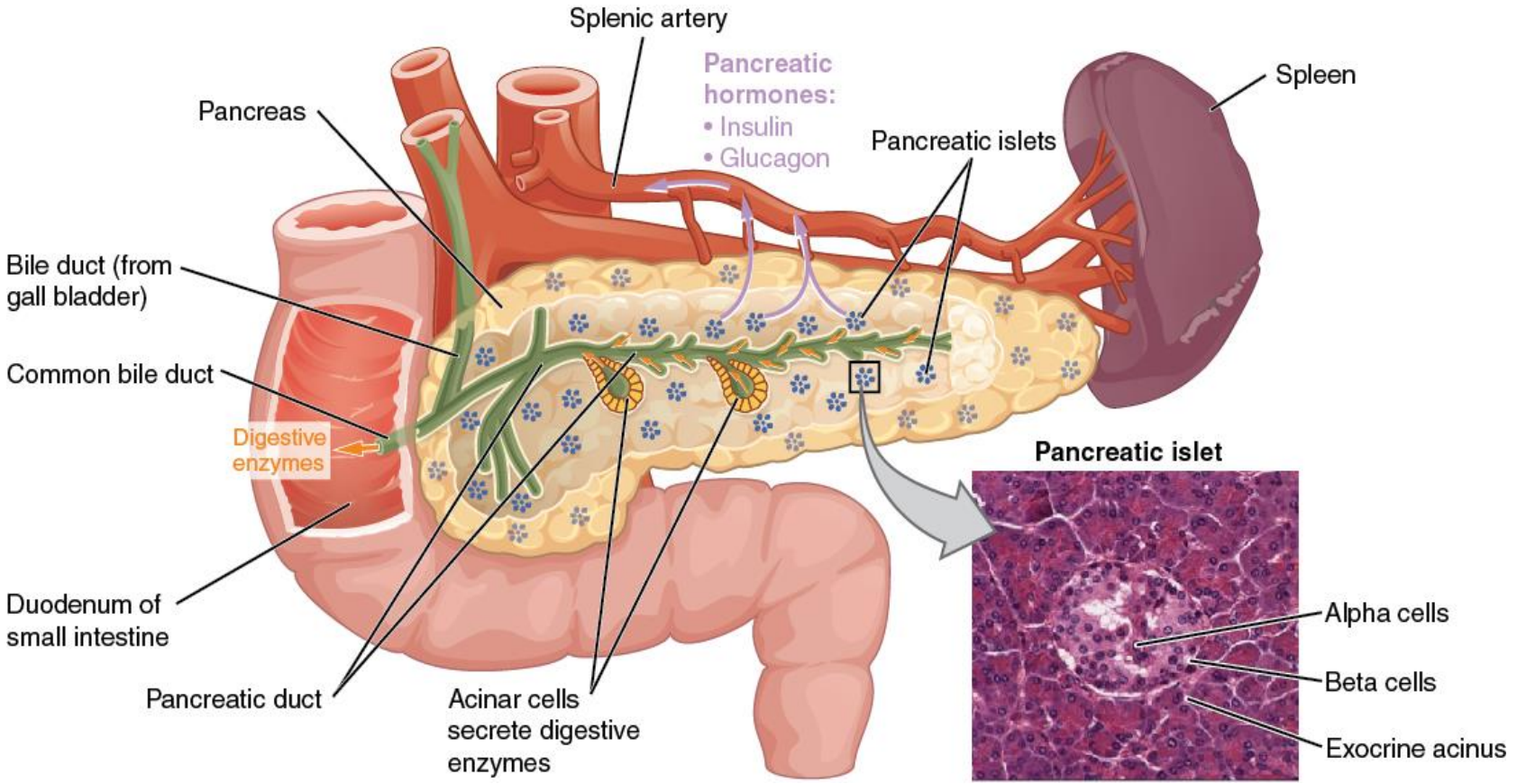
3. PARTHYROID GLAND

- Four tiny structure found at the back of thyroid gland
- Produce a hormone called **parathyroid hormone (Parathormon)**
- Parathyroid hormone **control the amount of calcium ion in body fluids**
- Calcium ion necessary for bone formation .
- Parathyroid hormone increase calcium ion in body fluid using:;
  - the release of calcium ion from bone
  - Absorption of calcium ion from food in small intestine
  - Re-absorption of calcium ion from kidney tubules

4. PANCREASE

- Pancreases is **both endocrine** and **exocrine** gland
- Pancreatic exocrine gland (acinar cells) secret digestive enzymes.
- Pancreases also contain endocrine gland called '**islets of Langerhans**'
- Pancreatic islets secretes two hormone known as **insulin** and **glucagon**
- Insulin and Glucagon control blood glucose level in the body
- **Insulin and glucagon** are **antagonistic hormones** because they have opposite effect on glucose level.

PANCREASE


Splenic artery
Pancreatic hormones:
• Insulin
• Glucagon
Spleen
Pancreas
Pancreatic islets
Bile duct (from gall bladder)
Common bile duct
Digestive enzymes
Pancreatic islet
Duodenum of small intestine
Alpha cells
Beta cells
Exocrine acinus
Pancreatic duct
Acinar cells secrete digestive enzymes

INSULINE- in regulation of blood glucose level

- **Secretes** when blood glucose level **rises above the ideal range.**
- **Decrease blood glucose level by;**
  - Glucose is removed by cellular respiration
  - Increase the take up of glucose by cells
  - Glucose is converted into glycogen in liver and muscle cell (**glucose** $\longrightarrow$ **glycogen)**
  - Glucose converted to fat for storage

GLUCAGON-in regulation of blood glucose level

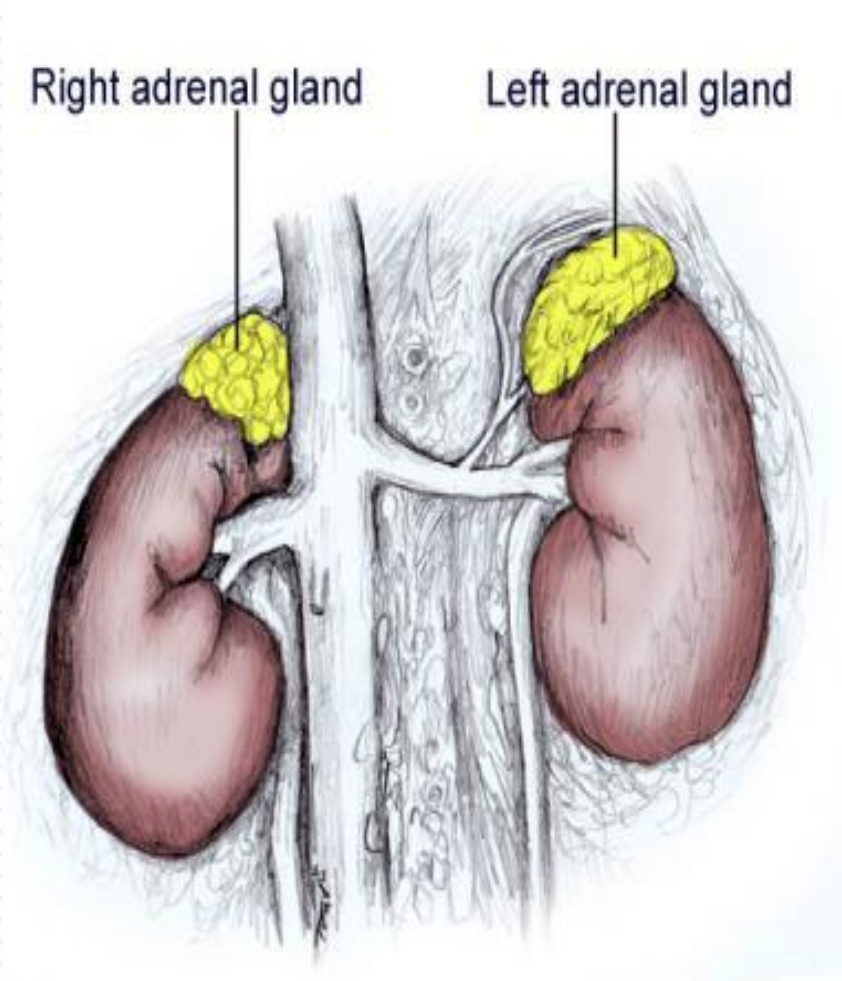
- **Secretes** when blood glucose level **falls below the ideal range.**
- **Increase blood glucose level by;**
  - Stimulate the conversion of glycogen into glucose
  - Stimulate the formation of glucose from amino acid and fat
- The deficiency of insulin and glucagon cause the disease called **diabetes**

Type 1 diabetes : appeared in children, It is inherited ,can not be avoid

Type 2 diabetes: appeared in person life, can be linked , being obese

5. ADRENAL GLAND

- Found on the top of kidney
- Adrenal gland have two separate and independent parts
  - **Adrenal cortex (outer layer)**
  - **Adrenal medulla (Inner layer)**



Adrenal gland have two separate and independent parts

Adrenal medulla

- Produce a hormone called **adrenalin (fight and flight hormone)**
- Secret under **stress, emergency, excited, freighted** situation
- Important for preparing the body for action
- The main change produce by adrenalin
  - Increase heart rate
  - Increase breathing rate
  - Pupil dilates
  - Body hair stand

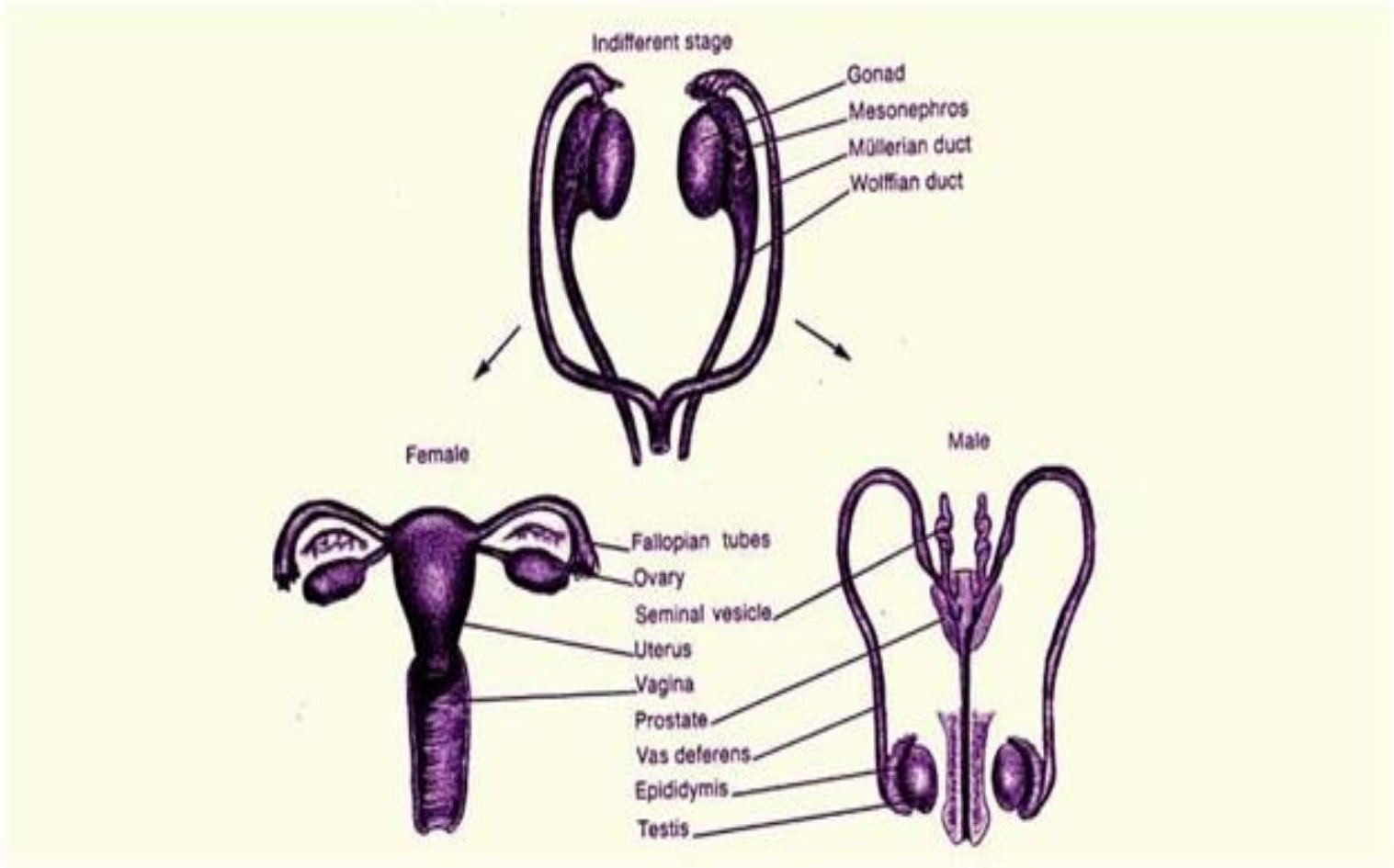
Adrenal cortex

- Secret complex steroid hormone called **corticoids**
- Control certain phase carbohydrate, fat and protein metabolism
- Another hormone release by adrenal cortex is **aldosterone**
- This hormone **promotes the re-absorption of sodium and chloride ion in the kidney tubules**, Therefore affect water and salt balance in the blood

6. The Gonads /Sex gland/

- **Testes** produce male sex hormone **testosterone**
- Control male secondary sexual characteristics such as:
  - The whole body growth spurt
  - Tests began to produce sperm
  - Pubic, body and facial hair began to produce sperm
  - Voice deepens
  - Body become more muscular

sex gland


Indifferent stage
Gonad
Mesonephros
Müllerian duct
Wolffian duct
Female
Male
Fallopian tubes
Ovary
Seminal vesicle
Uterus
Vagina
Prostate
Vas deferens
Epididymis
Testis

B. Ovaries

- Produce female sex hormone called **progesterone** and **estrogen**

Estrogen

- Cause the development of female secondary sexual characteristics such as;
  - The whole body under goes growth spurt
  - Brest develop
  - External genital enlarges
  - Widening of hip
  - Ovaries began to produce egg
  - Menstruation begins
  - Pubic hair grows
  - Voice become thinner

Progesterone

- Preparing uterus for the implantation of a fertilized ovum.
- Stops the development of additional egg while the women is pregnant
- Prevent menstruation during pregnancy

So it helps to maintain pregnancy

Menstrual cycle

- **Menstruation**; monthly discharge of blood and cell shed from endometrium
- **Menstrual cycle** is a sequence of events which takes place approximately every four weeks
- Menstrual cycle occur between two coordinated events

Ovary

- Graffian follicle ripens and burst releasing the mature egg into the fallopian tube. This condition is called **ovulation**

Uterus

- Prepare uterine wall to receive zygote (fertilized egg)
- After ovulation the follicle changes into **corpus luteum**
- **Corpus luteum produce** a hormone called **progesterone**

Menstrual…

If the egg is fertilized progesterone stimulate:

- The wall of uterus thicken
- The uterus develop new blood vessels
- Stop further ovulation
- The egg moves down the oviduct by muscular contraction of the oviduct wall

If the egg is not fertilize, the ovum dies and the wall of uterus breakdown and menstruation occur

Hormones involve in menstrual cycle

- **Produce by pituitary gland**

  Follicular stimulating hormone FSH)

  - Stimulate the development of egg in ovary
  - Stimulate the ovary to produce estrogen

  Latinizing hormone (LH)

  - Stimulate the release of egg from ovary
  - Stimulate the ovary to produce progesterone

- **Produce by ovary**

  Estrogen

  - Responsible for the development of feminine trait

  Progesterone

  - Prepare the uterus for implantation of fertilized egg

- Both estrogen and progesterone decrease after ovulation.

Change in hormone level influence events in menstrual cycle

