Class: 10th

Subject: Biology

Chapter 12: Coordination and Control

Important MCQs:

1. Nervous coordination is brought about by the:

(a) Muscular system

(b) Endocrine system

(c) Nervous system ✅

(d) Circulatory system

2. Which type of coordination is found in both animals and plants?

(a) Nervous coordination

(b) Reflex coordination

(c) Hormonal coordination ✅

(d) Voluntary coordination

3. The sequence of a coordinated action begins

with:

(a) Receptor

(b) Stimulus ✅

(c) Effector

(d) Response

4. Organs or cells that detect specific stimuli are called:

(a) Effectors

(b) Coordinators

(c) Glands

(d) Receptors ✅

5. What acts as coordinators in nervous coordination?

(a) Endocrine glands

(b) Muscles

(c) Brain and spinal cord ✅

(d) Hormones

6. In chemical coordination, messages are carried

by:

(a) Electrical impulses

(b) Muscles

(c) Nerve cells

(d) Hormones ✅

7. Which of the following act as effectors in both systems?

(a) Skin

(b) Blood

(c) Muscles and glands ✅

(d) Nerves

8. Nervous coordination produces responses that are:

(a) Slow and long-lasting

(b) Immediate and short-lived ✅

(c) Permanent

(d) Delayed and weak

9. The nervous system in humans consists of:

(a) Brain and spinal cord only

(b) Cranial and spinal nerves only

(c) Central and peripheral nervous system ✅

(d) Forebrain and hindbrain

10. The unit of the nervous system is called:

(a) Nerve

(b) Brain cell

(c) Neuron ✅

(d) Dendrite

11. Axons conduct nerve impulses:

(a) Toward the cell body

(b) Toward the receptor

(c) Away from the cell body ✅

(d) Toward the dendrites

12. The fatty layer that covers the axon is called:

(a) Grey matter

(b) Node of Ranvier

(c) Myelin sheath ✅

(d) Neuroglia

13. Gaps between the myelin sheath on the axon are known as:

(a) Axon terminals

(b) Nodes of Ranvier ✅

(c) Dendrites

(d) Synapse

14. Which type of neuron carries impulses from receptors to CNS?

(a) Motor neuron

(b) Interneuron

(c) Sensory neuron ✅

(d) Mixed neuron

15. Interneurons are present in:

(a) Muscles only

(b) Brain and spinal cord ✅

(c) Glands

(d) Skin

16. Motor neurons carry impulses:

(a) From receptors to CNS

(**b**) From CNS to muscles and glands ✅

(c) Between sensory neurons

(d) Between brain hemispheres

17. A nerve is a bundle of:

(a) Dendrites

(**b**) Axons ✅

(c) Cell bodies

(d) Synapses

18. The part of the brain that controls skeletal muscles and intelligence is:

(a) Cerebellum

(b) Hypothalamus

(**c**) Cerebrum ✅

(d) Medulla

19. Which part of the brain links the nervous system and endocrine system?

(a) Thalamus

(b) Hypothalamus ✅

(c) Pons

(d) Midbrain

20. The medulla oblongata controls:

(a) Emotions and thinking

(b) Breathing and heart rate ✅

(c) Sense of smell

(d) Muscle coordination

21. Spinal cord is protected by:

(a) Cerebrospinal fluid

(b) White matter

(c) Vertebral column ✅

(d) Forebrain

22. The part of nervous system that controls voluntary actions is:

(a) Autonomic nervous system

(b) Central nervous system

(c) Somatic nervous system ✅

(d) Sympathetic system

23. The spinal cord is involved in:

(a) Emotions and memory

(b) Reflex actions ✅

(c) Blood circulation

(d) Hormone production

24. Organs that detect specific types of stimuli are called:

(a) Neurons

(b) Sense organs ✅

(c) Effectors

(d) Glands

25. Eyes are located in the skull portion called:

(a) Retina

(b) Orbit ✅

(c) Chamber

(d) Iris

26. Which part of the eye prevents dehydration and spreads tears?

(a) Eyelashes

(b) Eyelids ✅

(c) Cornea

(d) Iris

27. Which part of the eye gives it white color and maintains shape?

(a) Retina

(b) Iris

(c) Sclera ✅

(d) Choroid

28. Light enters the eye through:

(a) Pupil

(b) Cornea ✅

(c) Retina

(d) Lens

29. The size of pupil is controlled by:

(a) Cornea

(b) Retina

(c) Iris ✅

(d) Sclera

30. Pupil constricts in bright light when:

(a) Radial muscles contract

(b) Ciliary muscles relax

(c) Circular muscles contract ✅

(d) Lens becomes convex

31. The lens is connected to ciliary muscles through:

(a) Retina

(b) Optic nerve

(c) Suspensory ligaments ✅

(d) Pupil

32. The retina contains:

(a) Nephrons and cones

(b) Rods and cones ✅

(c) Glands and axons

(d) Muscles and fluid

33. The point on retina where no rods and cones are found is called:

(a) Fovea

(b) Optic disc ✅

(c) Pupil

(d) Lens

34. Rod cells are sensitive to:

(a) Dim light ✅

(b) Bright light

(c) Sound

(d) Temperature

35. The pigment found in rods is:

(a) Melanin

(b) Rhodopsin ✅

(c) Hemoglobin

(d) Chlorophyll

36. Vitamin A deficiency causes:

(a) Colour blindness

(b) Blind spot

(c) Night blindness ✅

(d) Myopia

37. Colour blindness is caused by a defect in:

(a) Rods

(b) Retina

(c) Cone cells ✅

(d) Iris

38. Myopia occurs due to:

(a) Shortened eyeball

(b) Elongated eyeball ✅

(c) Weak lens

(d) Lack of tears

39. Myopia can be corrected with:

(a) Convex lens

(b) Concave lens ✅

(c) Cylindrical lens

(d) Transparent disc

40. Hypermetropia is corrected by using:

(a) Concave lens

(b) Cylindrical lens

(c) Convex lens ✅

(d) Contact lens

41. Ibn al-Haytham is regarded as the father of:

(a) Surgery

(b) Genetics

(c) Optics ✅

(d) Astronomy

42. The three small bones in middle ear are called:

(a) Cochlea, semicircular canal, vestibule

(b) Pinna, canal, drum

(c) Malleus, incus, stapes ✅

(d) Lens, iris, pupil

43. Semicircular canals help in detecting:

(a) Light rays

(b) Muscle tension

(c) Movement of head ✅

(d) Smell

44. Hormones are secreted by:

(a) Neurons

(b) Blood vessels

(c) Endocrine glands ✅

(d) Kidneys

45. Endocrine glands are also called:

(a) Ducted glands

(b) Ductless glands ✅

(c) Nerve glands

(d) Sweat glands

46. The master gland of the human body is:

(a) Thyroid gland

(b) Pituitary gland ✅

(c) Adrenal gland

(d) Pancreas

47. Somatotrophin is also known as:

(a) Insulin

(b) Growth hormone ✅

(c) Adrenaline

(d) Estrogen

48. Excess production of growth hormone during childhood leads to:

(a) Dwarfism

(b) Acromegaly

(c) Gigantism ✅

(d) Diabetes mellitus

49. A person with large hands, feet, and jawbones after growth age suffers from:

(a) Gigantism

(b) Goitre

(c) Acromegaly ✅

(d) Hyperthyroidism

50. Vasopressin is secreted by:

(a) Anterior pituitary

(b) Posterior pituitary ✅

(c) Thyroid gland

(d) Pancreas

51. The hormone that increases reabsorption of water in nephrons is:

(a) Insulin

(b) Adrenaline

(c) Vasopressin ✅

(d) Oxytocin

52. Diabetes insipidus is caused due to:

(a) Lack of insulin

(b) Excess adrenaline

(c) Deficiency of vasopressin ✅

(d) Overproduction of thyroxin

53. Which hormone stimulates the uterus for

childbirth?

(a) Estrogen

(b) Oxytocin ✅

(c) Testosterone

(d) Calcitonin

54. Thyroxin is produced by the:

(a) Pancreas

(b) Thyroid gland ✅

(c) Pituitary gland

(d) Adrenal cortex

55. Goitre is caused due to:

(a) Excess insulin

(b) Iodine deficiency ✅

(c) High calcium

(d) Overeating

56. The hormone that increases blood calcium level is:

(a) Calcitonin

(b) Parathormone ✅

(c) Thyroxin

(d) Vasopressin

57. The emergency hormone is:

(a) Insulin

(b) Adrenaline ✅

(c) Estrogen

(d) Testosterone

58. Which hormone lowers blood glucose level?

(a) Glucagon

(b) Somatotrophin

(c) Insulin ✅

(d) Epinephrine

59. Paralysis is caused by damage to the:

(a) Endocrine system

(b) Respiratory system

(c) Central nervous system ✅

(d) Circulatory system

60. Which of the following is a vascular disorder of the nervous system?

(a) Epilepsy

(b) Paralysis ✅

(c) Alzheimer's disease

(d) Depression

61. Epilepsy is caused due to:

(a) Blood clotting

(b) Damage to muscles

(c) Excessive nerve impulses in brain ✅

(d) Iodine deficiency

62. A seizure in epilepsy is marked by:

(a) Memory loss

(b) Paralysis

(c) Convulsions ✅

(d) Vomiting

63. Medicines used to control epilepsy are called:

(a) Antibiotics

(b) Antivirals

(c) Anticonvulsants ✅

(d) Antiseptics

Exercise Short Questions:

1. Identify the two types of coordination in living organisms.

Answer:

The two types of coordination in living organisms are:

Nervous coordination (by the nervous system)

Chemical coordination (by the endocrine system)

2. Differentiate between the modes of nervous and chemical coordinations.

Answer:

Nervous coordination uses nerve impulses through neurons and produces quick but short-lived responses.

Chemical coordination uses hormones through blood and produces slow but long-lasting responses.

3. What are the main components of coordination?

Answer:

The five main components of coordination are:

1. Stimulus
2. Receptor
3. Coordinator
4. Effector
5. Response

4. Define reflex action and reflex arc.

Answer:

- Reflex action is a quick, involuntary response to a stimulus.
- Reflex arc is the pathway followed by nerve impulses during a reflex action.

5. Trace the path of a nerve impulse in case of a reflex action.

Answer:

Stimulus ⇒ Receptor ⇒ Sensory neuron ⇒ Interneuron (spinal cord) ⇒ Motor neuron ⇒ Effector ⇒ Response

6. Describe the pupil reflex in dim and bright light.

Answer:

- In bright light, circular muscles of the iris contract, causing the pupil to constrict.
- In dim light, radial muscles of the iris contract, causing the pupil to dilate.

7. How would you associate the role of vitamin A with vision and effects of its deficiency on retina?

Answer:

- Vitamin A helps form rhodopsin in rod cells, which is essential for dim light vision.
- Its deficiency causes night blindness due to the failure of rhodopsin regeneration.

8. Define the terms; hormone and endocrine system.

Answer:

- A hormone is a chemical messenger secreted by an endocrine gland that regulates body functions.
- The endocrine system is a system of ductless glands that secrete hormones directly into the bloodstream.

Important Short Questions:

1. What are the two main components of the human nervous system?

Answer:

The central nervous system (CNS) and the peripheral nervous system (PNS).

2. Name the two parts of the central nervous system.

Answer:

1. Brain
2. Spinal cord

3. What is a neuron?

Answer:

A neuron is the structural and functional unit of the nervous system that conducts nerve impulses.

4. What is the role of Schwann cells in neurons?

Answer:

Schwann cells form the myelin sheath around axons, which increases the speed of nerve impulses.

5. What are saltatory impulses?

Answer:

Saltatory impulses are "jumping" impulses that occur between nodes of Ranvier, increasing impulse speed.

6. Name the three types of neurons based on function.

Answer:

1. Sensory neurons
2. Interneurons
3. Motor neurons

7. What is a nerve?

Answer:

A nerve is a union of several axons covered by a lipid sheath.

8. Name the three types of nerves.

Answer:

1. Sensory nerves
2. Motor nerves
3. Mixed nerves

9. What are meninges?

Answer:

Meninges are the three protective layers that cover the brain and spinal cord.

10. What is the function of cerebrospinal fluid (CSF)?

Answer:

It provides nutrients, oxygen and protection to the brain and spinal cord.

11. What is the function of hypothalamus?

Answer:

It links the nervous system and endocrine system, and controls emotions and pituitary secretions.

12. Define the function of medulla oblongata.

Answer:

It controls breathing, heart rate, blood pressure, and reflexes like vomiting and coughing.

13. What is the role of spinal cord in coordination?

Answer:

It acts as a link between brain and body and also controls reflex actions.

14. What is autonomic nervous system?

Answer:

It controls involuntary actions and consists of sympathetic and parasympathetic systems.

15. What is a reflex arc?

Answer:

The reflex arc is the pathway followed by nerve impulses during a reflex action.

16. What are receptors? Give two examples.

Answer:

Receptors are organs or parts that detect specific stimuli. Examples: eyes detect light, ears detect sound.

17. Name the three layers of the human eye.

Answer:

1. Sclera (outer layer)
2. Choroid (middle layer)
3. Retina (inner sensory layer)

18. Differentiate between rods and cones.

Answer:

Rods: Sensitive to dim light

Cones: Sensitive to bright light and help in colour vision

19. What is the function of the iris and pupil?

Answer:

- The iris adjusts the size of the pupil.
- In bright light, pupil constricts.
- In dim light, pupil dilates.

20. What is the role of vitamin A in vision?

Answer:

Vitamin A helps in the formation of rhodopsin in rods. Its deficiency causes night blindness.

21. Define the terms 'fovea' and 'blind spot'.

Answer:

Fovea: Area of retina rich in cones, helps in sharp colour vision.

Blind spot: Where optic nerve enters retina; no rods or cones are present.

22. What is myopia and how is it corrected?

Answer:

Myopia is short sightedness; image forms in front of retina. Corrected by concave lens.

23. What is hypermetropia and how is it corrected?

Answer:

Hypermetropia is long sightedness; image forms behind retina. Corrected by convex lens.

24. Name the three parts of the human ear.

Answer:

1. External ear

2. Middle ear

3. Inner ear

25. How do ears help in maintaining balance of the body?

Answer:

Semicircular canals detect head movement and vestibule detects body posture, helping in balance.

26. What is a hormone?

Answer:

A hormone is a specific messenger molecule synthesized and secreted by an endocrine gland, which regulates various body functions.

27. What are endocrine glands?

Answer:

Endocrine glands are ductless glands that secrete hormones directly into the bloodstream.

28. Name two hormones secreted by the anterior lobe of the pituitary gland.

Answer:

Somatotrophin (Growth hormone)

Thyroid Stimulating Hormone (TSH)

29. What is the function of vasopressin (ADH)?

Answer:

Vasopressin increases the reabsorption of water from nephrons into blood and reduces urine production.

30. What causes diabetes insipidus?

Answer:

Deficiency of vasopressin (ADH) leads to diabetes insipidus, resulting in excessive water loss through urine.

31. Name the hormone responsible for childbirth and milk ejection.

Answer:

Oxytocin stimulates uterus contraction during childbirth and helps in milk ejection from breast.

32. What is the role of thyroxin?

Answer:

Thyroxin increases energy production through food oxidation and helps in body growth.

33. What is the cause and symptom of goitre?

Answer:

Cause: Iodine deficiency

Symptom: Enlargement of thyroid gland

34. What is the function of insulin and glucagon?

Answer:

Insulin: Lowers blood glucose by storing excess in liver.

Glucagon: Raises blood glucose by releasing it from liver.

35. What is the difference between positive and negative feedback mechanisms?

Answer:

- **Negative feedback** reduces the process to return to normal (e.g., insulin/glucagon).
- **Positive feedback** enhances the process (e.g., milk production during suckling).

36. What are the two main types of nervous system disorders?

Answer:

The two main types of nervous system disorders are:

1. Vascular disorders (e.g. paralysis)

2. Functional disorders (e.g. epilepsy)

37. What is paralysis and what are its main causes?

Answer:

Paralysis is the complete loss of function by one or more muscle groups.

It is usually caused by:

- Stroke (rupture of a blood vessel in the brain or spinal cord)
- Blood clotting
- Poisons from polio viruses

38. What are the types of paralysis in the human body?

Answer:

Paralysis can affect:

- The whole body (weak paralysis)
- One side of the body
- Lower limbs
- All four limbs

39. What is epilepsy and what causes it?

Answer:

Epilepsy is a functional disorder in which there is abnormal and excessive discharge of nerve impulses in the brain.

Causes include:

- Genetic or developmental factors (in young people)
- Brain tumors (in older individuals)
- Head trauma or infections at any age

40. How can epilepsy be treated or controlled?

Answer:

There is no permanent cure for epilepsy, but seizures can be controlled through daily use of anticonvulsant or antiepileptic drugs.

Important Long Questions:

🌟 **Q1: Describe the types of coordination and the components of a coordinated action.**

✳ **Introduction:**

Coordination is the ability of an organism to respond properly to changes in its environment. It ensures that all body parts work together efficiently. In living organisms, coordination is essential for survival.

Types of Coordination

There are two main types of coordination in organisms:

1. Nervous Coordination

- It is carried out by the nervous system.
- Involves nerve impulses that travel through neurons.
- Produces quick and short-lived responses.
- Found in animals only.

2. Chemical Coordination

- Carried out by the endocrine system.
- Involves hormones secreted by endocrine glands.
- Produces slow but long-lasting responses.
- Present in both animals and plants.

➤ **Note**: Animals have both types of coordination, while plants have only chemical coordination.

Components of a Coordinated Action

A coordinated action involves five major components:

1. Stimulus

A stimulus is any internal or external change in the environment that can trigger a response.

Examples: light, sound, touch, temperature, chemicals, infections.

2. Receptor

Receptors are specialized organs or cells that detect stimuli.

Examples:

- Eyes detect light
- Ears detect sound
- Nose detects smell
- Skin detects touch and temperature

3. Coordinator

A coordinator processes the information received from receptors and sends appropriate signals.

In nervous coordination: Brain and spinal cord are

coordinators.

In chemical coordination: Endocrine glands act as coordinators by releasing hormones.

4. Effector

- Effectors are organs, muscles, or glands that produce a response.
- They receive messages from coordinators and act accordingly.

Examples:

- Muscles contract or relax
- Glands secrete chemicals
- Organs like kidneys, liver, bones act on hormonal messages

5. Response

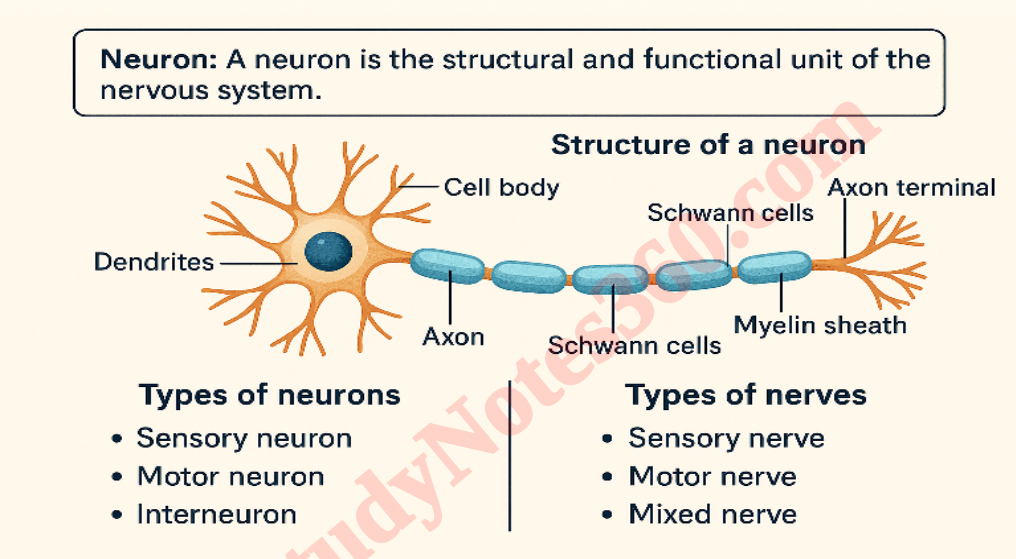
The action produced by an effector is called a response.

Examples:

- Pulling hand away from hot object
- Movement of sunflower towards sunlight

- Nervous responses are immediate and short-term.
- Hormonal responses are slow and long-term.

🌟 **Q2: Define neuron. Describe its structure and types. Also differentiate between different types of nerves.**



Definition of Neuron: A neuron is the structural and functional unit of the nervous system. It is a specialized cell that transmits nerve impulses from receptors to coordinators and from coordinators to effectors.

Structure of Neuron:

A neuron consists of the following parts:

Cell Body: Contains the nucleus and most of the cytoplasm. It controls the metabolic activities of the cell.

Dendrites: Short, branched extensions that receive impulses and conduct them toward the cell body.

Axon: A long, thin projection that conducts impulses away from the cell body.

Schwann Cells: Supporting cells located along axons. They produce the myelin sheath, a fatty insulating layer.

Myelin Sheath: Speeds up the transmission of impulses and insulates the axon. It has Nodes of Ranvier, which allow the impulses to "jump," making them travel faster (saltatory conduction).

Types of Neurons:

1. Sensory Neurons:

- Carry impulses from receptors to CNS.
- Have one dendrite and one axon.

2. Motor Neurons:

- Carry impulses from CNS to effectors (muscles or glands).
- Have many dendrites and one axon.

3. Interneurons:

- Found in brain and spinal cord.
- Interpret impulses and connect sensory and motor neurons.
- Have many dendrites and many axons.

🌟 **Q3: Write a detailed note on the major regions of the human brain and their functions.**

❖ **Introduction**:

The human brain is the control center of the body. It is protected by the skull (cranium) and surrounded by three protective layers called meninges. The brain consists of three major regions:

1. Forebrain:

Cerebrum:

- Largest part of the brain.
- Controls voluntary actions like movement,

intelligence, emotions, thinking, and memory.

- Has two cerebral hemispheres.
- Divided into lobes: contains grey matter (cell bodies) and white matter (myelinated axons).

Thalamus:

- Relay center between brain and spinal cord.
- Receives sensory impulses and sends them to cerebrum (except smell).
- Involved in consciousness and pain perception.

Hypothalamus:

- Located below thalamus.
- Links nervous system with endocrine system.
- Controls pituitary gland.
- Regulates emotions like pain, anger, pleasure, and hunger.

2. Midbrain:

- Acts as a bridge between forebrain and hindbrain.

- Transmits sensory information to the forebrain.
- Controls some reflexes like posture and response to sound.

3. Hindbrain:

Medulla Oblongata:

- Controls involuntary functions like heartbeat, breathing, and blood pressure.
- Coordinates reflexes like sneezing, coughing, and vomiting.

Cerebellum:

- Located behind medulla.
- Controls balance and coordination of muscles.

Pons:

- Located above medulla.
- Assists in breathing control and connects cerebellum with spinal cord.

🌟Q4: Differentiate between sympathetic and parasympathetic nervous systems. Write their major functions.

❖ Introduction:

The autonomic nervous system (ANS) is a part of the peripheral nervous system that controls involuntary functions in the body — like heartbeat, breathing, digestion, etc.

It is further divided into two branches:

1. Sympathetic Nervous System (SNS)

2. Parasympathetic Nervous System (PNS)

These two systems work in opposite directions to maintain homeostasis (balance) in the body.

🔹 1. Sympathetic Nervous System (SNS)

Function:

It prepares the body for emergency or stressful situations. This is called the "fight or flight" response.

Major Functions:

- Increases heart rate
- Increases breathing rate
- Dilates pupils (opens wide)

- Inhibits digestion (slows it down)
- Increases blood flow to muscles
- Releases stored glucose from liver for energy

🔹 2. Parasympathetic Nervous System (PNS)

Function:

It helps the body to relax and recover after stress. This is called the "rest and digest" response.

Major Functions:

- Slows down heart rate
- Slows down breathing
- Constricts pupils (makes them smaller)
- Stimulates digestion
- Promotes absorption of nutrients
- Stores energy

Summary:

- Sympathetic system activates the body during stress or danger.
- Parasympathetic system helps restore normal

body functions when stress is over.

🌟 **Q5: What is reflex action? Explain its types and reflex arc with an example.**

❖ **Definition**:

A reflex action is a quick, automatic, and involuntary response to a stimulus that does not involve conscious thought.

Types of Responses:

Voluntary Response: Controlled by higher brain centers; conscious.

Involuntary Response: Not under conscious control.

Reflex Action: A fast involuntary response processed by the spinal cord or lower brain centers.

Example of Reflex Action:

- When you touch something hot, your hand pulls away immediately.
- This action occurs without thinking, as a protection mechanism.

Reflex Arc: The pathway followed by the nerve

impulse in a reflex action is called the reflex arc.

Steps:

1. Stimulus (e.g., heat)

2. Detected by Receptors in the skin

3. Impulse sent via Sensory Neuron

4. Reaches Spinal Cord (Interneuron)

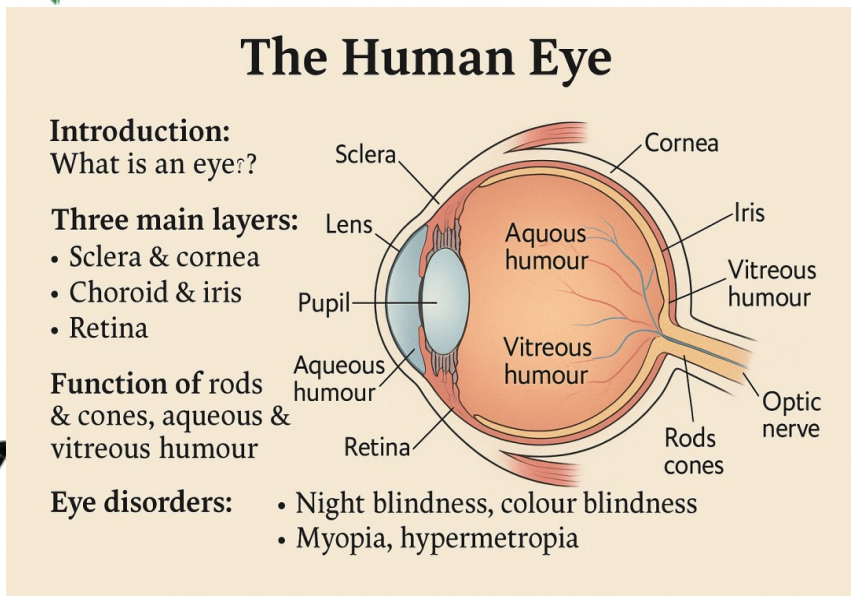
5. Impulse sent to Motor Neuron

6. Effector (muscle) responds — hand pulls back (response)

🌟 **Q6: Describe the structure and function of the human eye. Also explain the disorders of the eye.**

❖ **Introduction:**

The human eye is a complex and sensitive sense organ that enables the sense of vision. It detects light, forms images, and sends visual information to the brain. Eyes are located in eye sockets (orbits) and protected by eyelids, eyelashes, and tear secretions, which help to clean and moisturize the surface of the eye.



👁 Structure of the Human Eye:

The human eye is made of three main layers and internal structures that play essential roles in vision.

1. Outer Layer – Sclera and Cornea

Sclera: White, tough layer that maintains the shape of the eye and protects inner parts.

Cornea: Transparent front part of sclera. It admits and bends (refracts) light towards the inner eye for focusing on the retina.

2. Middle Layer – Choroid, Iris, and Pupil

Choroid: Dark-pigmented layer rich in blood vessels. It prevents internal reflection of light.

Iris: Coloured muscular ring that controls the size of pupil.

Pupil: The hole in the center of iris through which light enters the eye.

Bright light: Pupil constricts (circular muscles contract).

Dim light: Pupil dilates (radial muscles contract).

3. Inner Layer – Retina

Retina is the light-sensitive layer of the eye.

Contains photoreceptor cells:

Rods: Detect dim light, black & white vision; contain rhodopsin pigment.

Cones: Detect bright light and colours; contain iodopsin (3 types for red, blue, green).

Fovea: Small depression on retina with only cones; sharp central vision.

Optic Disc: Spot where optic nerve exits the eye; no photoreceptors, known as blind spot.

💧 **Fluids in the Eye:**

Aqueous Humour: Clear fluid in anterior chamber (between cornea and iris). Maintains pressure and nourishes cornea and lens.

Vitreous Humour: Jelly-like fluid in posterior chamber (between lens and retina). Maintains shape and supports retina.

🔬 Process of Image Formation:

1. Light passes through cornea ⇒ aqueous humour ⇒ pupil ⇒ lens ⇒ vitreous humour.

2. Lens focuses light rays onto retina.

3. Rods and cones detect the light and convert it into nerve impulses.

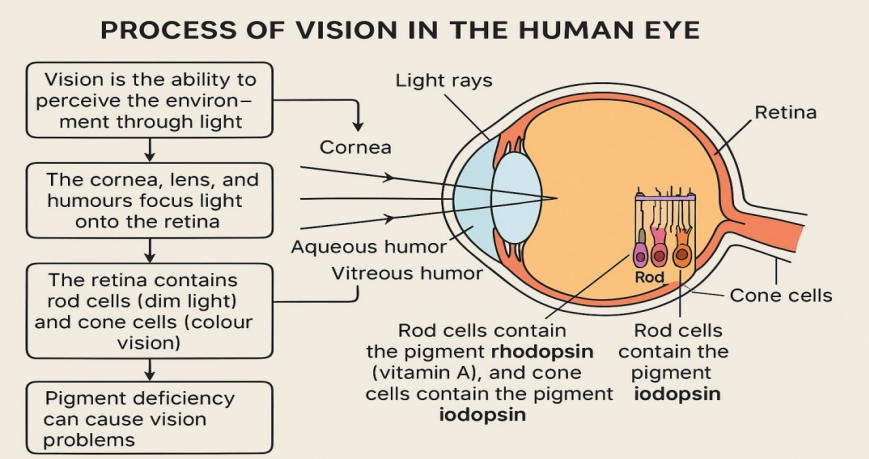
4. Impulses are carried by optic nerve to brain, where an image is formed.

🌈 Pigments and Their Role:

Rhodopsin (in rods): Breaks down in light to generate nerve impulse. Rebuilt in dark. Made from Vitamin A.

Iodopsin (in cones): Found in three types of cones, responsible for detecting red, green, blue light.

🌟 Q7: What is the process of vision in the human eye? Explain the role of rods and cones.



❖ Introduction: What is Vision?

Vision is the process by which we see objects.

Light rays from an object enter the eye, get focused on the retina, and a message is sent to the brain, which interprets it as a visual image.

🔹 Pathway of Light Through the Eye

Light enters the eye through the cornea, the transparent front part of the eye.

It then passes through:

- Aqueous humour (a clear fluid)
- Pupil (the opening in the iris)

- Lens (focuses light)
- Vitreous humour (a jelly-like substance)

Finally, light falls on the retina, which contains the sensory cells.

Role of Retina in Vision

- The retina is the inner light-sensitive layer of the eye.
- It contains two types of photoreceptor cells:

1. Rod cells
2. Cone cells

These cells convert light into nerve impulses, which are sent to the brain via the optic nerve.

Role of Rod Cells

- Rods are highly sensitive to dim light (night vision).
- They do not detect color.
- Rod cells contain a pigment called rhodopsin, which breaks down in light and generates nerve impulses.

- Vitamin A is required to produce rhodopsin. Its deficiency causes night blindness.

Role of Cone Cells

Cones work in bright light and are responsible for color vision.

There are three types of cone cells:

- Blue-sensitive cones
- Green-sensitive cones
- Red-sensitive cones
- Cone cells contain a pigment called iodopsin.

If one type of cone is missing or non-functional, it leads to color blindness.

Pigment-Related Vision Problems

- Rhodopsin deficiency (due to lack of Vitamin A) ⇒ Night blindness (poor vision in dim light)
- Faulty or missing iodopsin in cones ⇒ Color blindness (inability to distinguish some or all colors)

🌟 Q8: Describe the contributions of Muslim scientists in the field of eye and vision.

❖ Introduction:

- Muslim scientists made great contributions to the field of medicine and particularly to the science of the eye (ophthalmology).
- Their work laid the foundation of modern eye care, optics, and surgery.
- Two of the most well-known scientists in this field are Ali ibn Isa and Ibn al-Haytham.

🔹 1. Ali ibn Isa (950–1012 AD)

- A famous Arab physician and expert in ophthalmology (study of eye and its diseases).
- He is considered one of the first specialists in treating eye disorders.

His contributions include:

🧠 Major Achievements:

Authored three famous books on eye diseases and treatment.

Most famous work: "Tadhkirat al-Kahhalin" (Notebook of the Oculists).

This book was widely used in Europe for centuries.

💉 **Medical Expertise:**

- Described 130 eye diseases in detail.
- Prescribed 143 medicines to treat these diseases.
- Gave detailed instructions for eye surgeries and eye hygiene.

🔹 **2. Ibn al-Haytham (965–1039 AD)**

- Known as the “Father of Optics”.
- A brilliant Arab scientist, mathematician, and physicist.
- Wrote the famous book: "Kitab al-Manazir" (Book of Optics).

🔬 **Contributions in Optics:**

Proved that vision occurs when light rays enter the eye, not when rays come out of the eye (as was previously believed).

- Gave a correct explanation of image formation in the eye.
- Described how lens focuses light on the retina.

📷 **Principle of Camera:**

- Explained the working of pinhole camera (camera obscura).
- His studies helped develop the modern camera and lens technology.

🧪 **Contribution to Eye Structure:**

Described the parts of eye: cornea, lens, retina, optic nerve, etc.

- Explained the process of sight using experiments and observations.
- His research helped in improving eye surgery techniques.

🌟 **Q9: Define hormone. Describe the structure and function of pituitary gland. Also write its major disorders.**

🧠 **Definition of Hormone**

A hormone is a chemical messenger secreted by an endocrine gland directly into the bloodstream. It travels through the blood to specific target organs or tissues where it produces a particular effect, such as regulating growth, metabolism, or reproduction.

🧪 Ductless Glands (Endocrine Glands)

- Endocrine glands are ductless glands, which means they do not use tubes or ducts to release their secretions.
- Hormones are secreted directly into the blood, unlike exocrine glands (like sweat or digestive glands) which use ducts.

🧬 Pituitary Gland – The Master Gland

- It is a pea-sized gland located at the base of the brain, just below the hypothalamus.
- It is known as the "Master Gland" because it controls the activity of many other endocrine glands.
- The pituitary gland has two main lobes:

- Anterior Lobe
- Posterior Lobe

🔹 1. Anterior Lobe of Pituitary Gland

This lobe produces and releases many important hormones. Some act on other glands, while others act on body tissues.

📌 Important Hormones of Anterior Lobe:

🔸 a) Growth Hormone (GH) – Somatotrophin

- Stimulates growth of bones and muscles.
- Controls physical development during childhood and adolescence.

Disorders Related to GH:

Dwarfism: Caused by low production of GH during growing age. Person remains unusually short.

Gigantism: Caused by excessive GH production in growing age. Person becomes abnormally tall and large.

Acromegaly: Caused by excess GH after growth age. Body parts like hands, feet, and jaw become

enlarged.

🔸 **b) Thyroid Stimulating Hormone (TSH)**

Stimulates the thyroid gland to produce thyroxine (involved in metabolism and energy).

🔹 **2. Posterior Lobe of Pituitary Gland**

This lobe stores and releases hormones that are actually produced by the hypothalamus.

📌 **Important Hormones of Posterior Lobe:**

🔸 **a) Vasopressin (Antidiuretic Hormone - ADH)**

- Increases reabsorption of water in the kidneys.
- Maintains water balance and reduces water loss in urine.

Disorder: Diabetes Insipidus

- Caused by low secretion of vasopressin.
- Leads to excessive urination and dehydration due to poor water reabsorption.

🔸 **b) Oxytocin**

- Causes uterus contraction during childbirth.

- Helps in milk ejection from the breast in nursing mothers.

🌟 **Q10: What are the major types of nervous system disorders?**

🔷 **Introduction to Nervous System Disorders**

The nervous system controls and coordinates all the activities of the human body. When this system is damaged or disturbed, it leads to nervous system disorders. These disorders can affect brain function, movement, communication between nerves, and the body's ability to respond properly.

🔹 **Types of Nervous System Disorders**

Nervous system disorders are mainly classified into two types:

1. Vascular Disorders

2. Functional Disorders

🔹 **1. Vascular Disorders**

These are caused by problems in the blood supply to the nervous system, especially to the brain or spinal cord.

Example: Paralysis

- **Definition**:

Paralysis is the complete loss of muscle function in part of the body due to nerve damage.

- **Causes**:
  - Stroke (burst or blocked blood vessel in brain)
  - Blood clotting in brain or spinal cord
  - Polio virus (damages motor neurons)
- **Types of Paralysis:**

Hemiplegia: Paralysis of one side of the body

Paraplegia: Paralysis of lower limbs

Quadriplegia: Paralysis of all four limbs

General Weak Paralysis: All over the body

- **Effects:**
  - Inability to move affected limbs
  - Muscle weakness
  - Difficulty in speaking or walking (if brain is affected)

2. Functional Disorders

These disorders occur due to abnormal generation or transmission of nerve impulses in the brain.

Example: Epilepsy

- **Definition**:

Epilepsy is a brain disorder where abnormal electrical signals cause seizures or convulsions.

- **Causes:**
  - Genetic factors (common in children)
  - Head injury or trauma
  - Brain infections
  - Brain tumors (in older people)
- **Symptoms:**
  - Sudden unconsciousness
  - Shaking of limbs (convulsions)
  - Strange sensations or behaviors
  - Temporary confusion
- **Treatment:**

- No permanent cure
- Controlled by anticonvulsant medicines
- Lifelong medication often needed

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

Author: Muhammad Asghar

Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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