

# COORDINATION AND CONTROL

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Q.No.1 Encircle the correct option from the given multiple choices.

### COORDINATED ACTIONS

- (1) Chemical coordination is present in \_\_\_\_\_.  
(a) Multi cellular only (b) Unicellular only (c) Colonial only (d) Both a & b.
- (2) Heat, cold, pressure, sound waves and microbial infections are example of \_\_\_\_\_.  
(a) Stimuli (b) Responses (c) Both a & b (d) All of following
- (3) In quick responses \_\_\_\_\_ is coordinator usually.  
(a) Brain (b) Spinal cord (c) Endocrine gland (d) All of above
- (4) For many hormones \_\_\_\_\_ act as effectors, which (Hormones) travel through \_\_\_\_\_.  
(a) Muscle, blood (b) Bones and liver, blood (c) Bone and liver, CSF (d) All of above
- (5) Mark the correct sequence from coordination.  
(a) Stimuli → Receptor → Effectors  
(b) Receptor → Respons  
(c) Stimula → Receptor → Coordinators → Effectors → Response  
(d) None

### NERVE CELL OR NEURONE

- (6) A nerve impulse is \_\_\_\_\_.  
(a) Electromagnetic wave (b) Electrochemical wave (c) Magnetic wave (d) All of above
- (7) Nucleus and most of cytoplasm is present in \_\_\_\_\_.  
(a) Dendrites (b) Axons (c) Cell body (d) Neuroglial cells.
- (8) Non-mylinated Neurons lack \_\_\_\_\_.  
(a) Dendrites (b) Axons (c) Mylin-sheath (d) All of above

### BRAIN

- (9) Our brain is made of \_\_\_\_\_ Neurons which have many dendrites and axons  
(a) Sensory (b) Motor (c) Inter (d) All of above
- (10) Fluid within ventricles and central canal is called \_\_\_\_\_.  
(a) Plasma (b) Water (c) CSF (d) CFI

- (11) If a person can remember previous events but cannot remember new ones as memory, then its \_\_\_\_\_ part is damaged  
 (a) Cerebrum (b)  Hippocampus (c) Medula oblangata (d) All of above
- (12) Growth hormone releasing factor which controls the growth hormone from pituitary is released from \_\_\_\_\_.  
 (a) Cerebrum (b) Cerebellum (c) PONS (d)  Hypothalamus
- (13) The white matter of nervous system consist of \_\_\_\_\_.  
 (a) Non-mylinated axons (b)  Mylinated axons  
 (c) Mylinated axons+cell body (d) All of above
- (14) Temporal lobe of cerebrum is concerned with \_\_\_\_\_.  
 (a) Speech (b) Pain (c)  Hearing and smell (d) All of above
- (15) Breathing rate and blood pressure is controlled by \_\_\_\_\_.  
 (a) Medula oblangata (b) PONS (c) Cerebellum (d) All of above

**SPINAL CORD**

- (16) Sensory axons and ganglion are located in \_\_\_\_\_ route of Spinal cord.  
 (a) Ventral route (b)  Dorsal route (c) Carved route (d) Straight route
- (17) Cranial nerve are \_\_\_\_\_.  
 (a) Sensory (b) Motor (c) Mixed (d)  All of above
- (18) Fight and flight responses are observed in \_\_\_\_\_ system.  
 (a) Sympathetic (b) Parasympathetic (c) Somatic (d) All of above

**EYE**

- (19) Contraction of Pupil, Increased digestion and slowing of heart beat are responses of \_\_\_\_\_.  
 (a) Sympathetic system (b)  Parasympathetic (c) Somatic (d) All of above
- (20) If a drug like (Adrenaline) act on \_\_\_\_\_ receptors it can increase heart rate.  
 (a) Cholinergic (b)  Sympathetic (c) Parasympathetic (d) GABA receptors
- (21) The pathway followed by nerve impulses for producing reflex action is called \_\_\_\_\_.  
 (a) Dorsal route (b) Ventral route (c)  Reflex arc (d) Somatic route
- (22) The black, brown and blue colour of eyes is due to \_\_\_\_\_.  
 (a) Cornea (b) Lenses (c)  Iris muscles (d) Rcuna
- (23) There are no rods and cons at \_\_\_\_\_.  
 (a) Optic disk (b) Blind spot (c) Retina (d)  Both a & b



- (24) A person with convex lense in his glasses can see clearly \_\_\_\_\_.  
 (a) Near objects      (b) Far objects      (c) Both a & b      (d) Can see clearly

**EAR**

- (25) Auditory Canal ends in \_\_\_\_\_ in ear.  
 (a) Pinna      (b) Three bones      (c) Eustacian tube       (d) Ear drum
- (26) Other name of Vasopressin is \_\_\_\_\_.  
 (a) Antiduretic hormone (b) Growth hormone (c) Pitutary hormone      (d) All of above

**ENDOCRINE SYSTEM**

- (27) More energy production, increased heart beat, frequent sweating and shivering of hands are examples of \_\_\_\_\_.  
 (a) Hypothyroidism       (b) Hyperthyroidism      (c) Goitre      (d) Shivering
- (28) Epinephrine is also called \_\_\_\_\_.  
 (a) Nor-epinephrine       (b) adrenalin      (c) Nor-adrenaline      (d) all above

**DISORDERS**

- (29) Deficiency of insulin can cause \_\_\_\_\_.  
 (a) Diabeties Mellitus (b) Diabeties Insipidus (c) B.PT      (d) All of above
- (30) Anticonvulsant drugs like valproic acid are used in \_\_\_\_\_.  
 (a) Cancer       (b) Epilepsy      (c) Paralysis      (d) All of above

**ANSWER KEY**

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1	d	11	b	21	c
2	a	12	d	22	c
3	b	13	b	23	d
4	b	14	c	24	a
5	c	15	a	25	d
6	b	16	b	26	a
7	c	17	d	27	b
8	c	18	a	28	b
9	c	19	b	29	a
10	c	20	b	30	b



**Q.No.2 Answer these questions. Answer to each part should not exceed three to four lines.**

**COORDINATED ACTION**

**Q.1 Write any one example show coordination in body?**

**Ans:** One familiar example of coordination is the-way in which muscles work together during movement. When a boy runs to catch a ball, he uses hundreds of muscles to move his arms, legs and back. His nervous system uses information from his sense organs and coordinates these muscles. Due to this coordination, the muscles contract in the correct sequence, power and length of time. But that is not all. Such activities involve many other kinds of coordination. For example; breathing and heartbeat rates are increased, blood pressure is adjusted and extra heat is removed fast from the body.

**Q.2 Differentiate between Receptors and effectors?**

**Ans: Receptors**

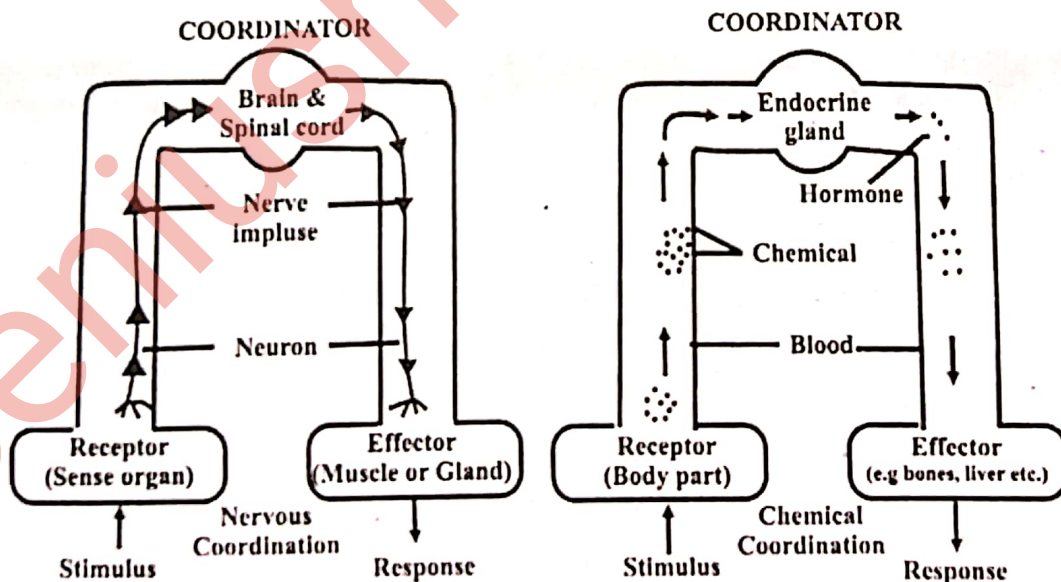
Stimuli are detected by special organs, tissues or cells of body. For example sound waves are detected by ears, light is detected by eyes, chemicals in air are detected by nose and so on. The organs, tissues or cells which are specifically built to detect particular type of stimuli are called receptors.

**Effectors**

These are the parts of body which receive messages from coordinators and produce particular responses. In nervous coordination, neurons carry messages from coordinators (brain and spinal cord) to muscles and glands, which act as effectors. In chemical coordination, particular hormones carry messages from coordinators (endocrine glands) to particular target tissues, which act as effectors. For some hormones, nephrons act as effectors. Similarly, bones and liver act as effectors for many hormones.

**Q.3 Draw the routs of Nervous and chemical coordination**

**Ans:**



**Figure 12.1: Nervous and chemical coordination**

Chapter-12

**NERVE CELL OR NEURONE**

**Q.4 Differentiate between Neuron and Nerve and their types?**

**Ans:** Nerve cell or Neuron

Nerve cell or neuron is the unit of the nervous system. The human nervous system consists of billions of neurons plus supporting (neuroglial) cells. Neurons are specialized cells that are able to conduct nerve impulses from receptors to coordinators and from coordinators to effectors.

Neurons are of three types;

- (i) Sensory neurons
- (ii) Interneurons
- (iii) Motor neurons

Nerve

A nerve means the union of several axons that are enveloped by a covering made of lipid.

- (i) Sensory nerves
- (ii) Motor nerves
- (iii) Mixed nerves

**BRAIN**

**Q.5 How Brain is protected?**

**Ans:** Brain is situated inside a bony cranium (part of skull). Inside cranium brain is covered by three layers called meninges.

**Q.6 What are meninges? Discuss their role?**

**Ans:** Brain is covered by three layers called meninges. Meninges protect brain and also provide nutrients and oxygen to brain tissue through their capillaries.

**Q.7 What is CSF?**

**Ans:** Fluid within ventricles and central canal is called cerebrospinal fluid (CSF).

**Q.8 What is difference in thalamus and hypothalamus?**

**Ans:**

Thalamus	Hypothalamus
<p><b>Location:</b> It lies just below cerebrum</p> <p><b>Function:</b> It serves as a relay centre between various parts of brain and spinal cord. It also receives and modifies sensory impulses (except from nose) before they travel to cerebrum. Thalamus is also involved in pain perception and consciousness (sleep and awakening).</p>	<p><b>Location:</b> It lies above midbrain and just below thalamus</p> <p><b>Function:</b> One of the most important functions of hypothalamus is to link nervous system and endocrine system. It controls the secretions of pituitary gland. It also controls feelings such as rage, pain, pleasure and sorrow.</p>



**Q.9 What are olfactory bulbs? Discuss its functions?**

**Ans:** The anterior parts of cerebral hemispheres are called **olfactory bulbs** which receive impulses from olfactory nerves and create the sensation

**Q.10 What is difference in grey and white matter of Brain, Also tell how Cerebral cortex is amazing?**

**Ans:** The grey matter of nervous system consists of cell bodies and non-myelinated axons. Beneath this layer is present the white matter. The white matter of nervous system consists of myelinated axons.

Cerebral cortex has a large surface area and is folded in order to fit in skull. So that's why it is amazing.

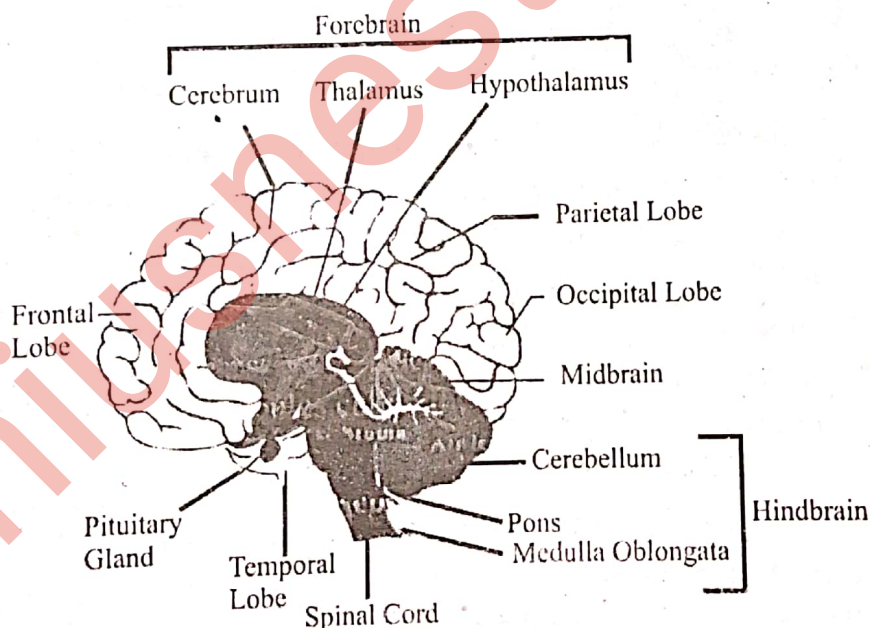
**Q.11 Discuss the functions of four lobes of Cerebrum?**

**Ans:**

Lobe	Function
Frontal	Controls motor functions, permits conscious control of skeletal muscles and Coordinates movements involved in speech
Parietal	Contains sensory areas that receive impulses from skin
Occipital	Receives and analyzes visual information
Temporal	Concerned with hearing and smell

**Q.12 Draw the label diagram of Brain?**

**Ans:**



**Figure 12.3: Structure of human brain**

**Q.13 How the organs of Brain stem play their involuntary functions.**

**Ans:**

**(a) Mid Brain**

Midbrain lies between hindbrain and forebrain and connects the two. It receives sensory information and sends it to the appropriate part of forebrain. Midbrain also controls some auditory reflexes and posture.



(b) **Medulla oblongata**

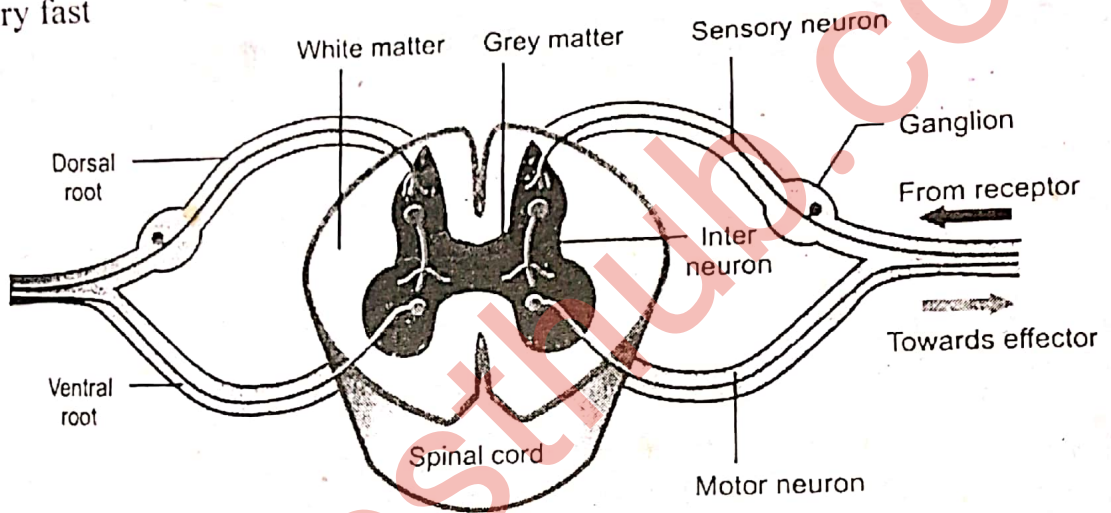
Lies on the top of spinal cord. It controls breathing, heart rate and blood pressure. It also controls many reflexes such as vomiting, coughing, sneezing etc. Information that passes between spinal cord and the rest of brain pass through medulla.

(c) **PONS**

Is present on top of medulla. It assists medulla in controlling breathing. It also serves as a connection between cerebellum and spinal cord.

**Q.14 How structure of Spinal cord is coordinated with its reflex function?**

**Ans:** As all the nerves which arise from spinal are cord mixed nerves so at junction with spinal cord, spinal nerves make two roots one dorsal and second one is ventral so during reflex action, the same nerve carry and transmit the impulse so that speed of reflex action become very fast



**Figure 12.4: Spinal Cord and Spinal Nerves**

**Q.15 Which peripheral nerves control involuntary function and how?**

**Ans:** Autonomic nerves control the involuntary function of body. These are of two types. Sympathetic and Parasympathetic.

**Sympathetic nervous system** prepares body to deal with emergency situation, this system takes necessary actions. For example; it dilates pupils, accelerates heartbeat, increases breathing rate and inhibits digestion. When stress ends, the **parasympathetic nervous system** takes action and normalizes all the functions. It causes pupils to contract, promotes digestion, and slows the rate of heartbeat and breathing rate.

**Q.16 How Reflex arc is produced?**

**Ans:** When impulses are not passed to the higher centres of brain, it results in responses which are not under conscious control. Such responses are called involuntary actions. Sometimes, the involuntary response produced by the CNS is very quick. Such a response is called reflex action. The pathway followed by the nerve impulses for producing a reflex action, is called **reflex arc**.

**EYE**

Q.17 Draw the label diagram of Eye?

Ans:

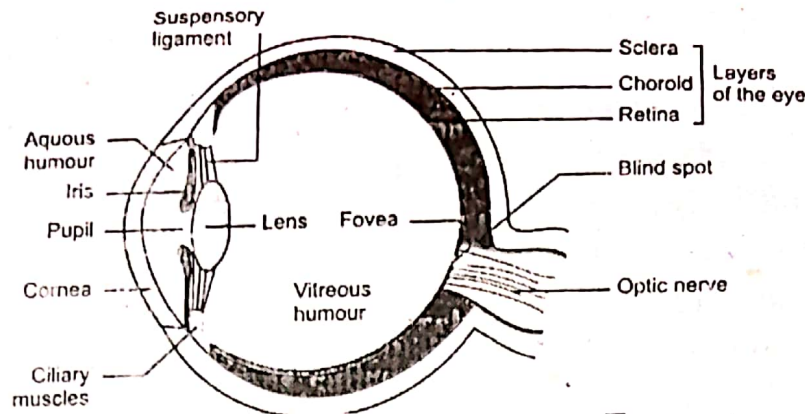


Figure: Structure of Human Eye

Q.18 Define the following terms.

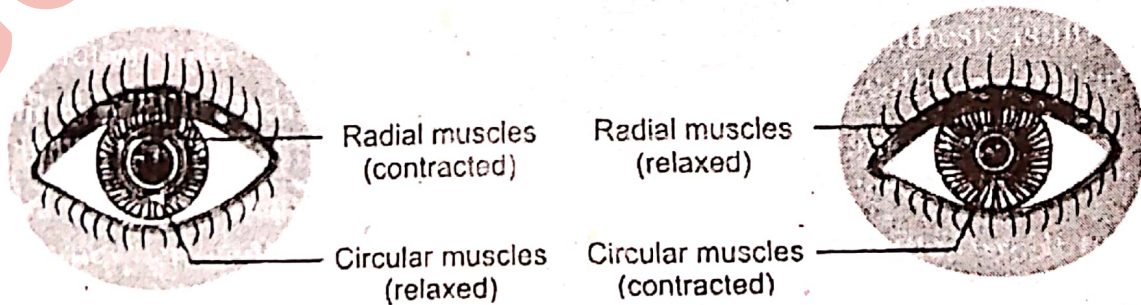
- (a) Sclera
- (b) Cornea
- (c) Iris
- (d) Pupil

Ans:

- (a) **Sclera** gives eye most of its white colour. It consists of dense connective tissue and protects the inner components of eye and maintains its shape.
- (b) **Cornea** In the front, sclera forms the transparent cornea. Admits light to the interior of eye and bends light rays so that they can be brought to a focus.
- (c) **Iris** behind cornea, choroids bends to form a muscular ring, called iris.
- (d) **Pupil** there is round hole called pupil. The size of pupil is adjusted by the muscles of iris. Pupil constricts in bright light when the circular muscles of iris contract. Similarly, pupil dilates in dim light when the radial muscles of iris contract

Q.19 How size of pupil is changed in bright and dark light?

Ans: The size of pupil is adjusted by the muscles of iris. Pupil constricts in bright light when the circular muscles of iris contract. Similarly, pupil dilates in dim light when the radial muscles of iris contract.





**Q.20** Without Retina there is no vision, discuss?

**Ans:** The **inner layer** is sensory is called as **retina**. It contains the photosensitive cells called rods and cones and associated neurons. **Rods** are sensitive to dim light while **cones** are sensitive to bright light and so distinguish different colours. Retina has two points i.e. fovea and optic disc. **Fovea** is a dip in retina, directly opposite to lens and is densely packed with cone cells. It is largely responsible for colour vision and sharpness. **Optic disc** is a point on retina where the optic nerve enters retina. There are no rods and cones at this point, that is why it is also referred to as the **blind spot**. Above all discussion tell without retina there is no vision.

**Q.21** Differentiate between following

(a) Aqueous humour

(b) Vitreous humour

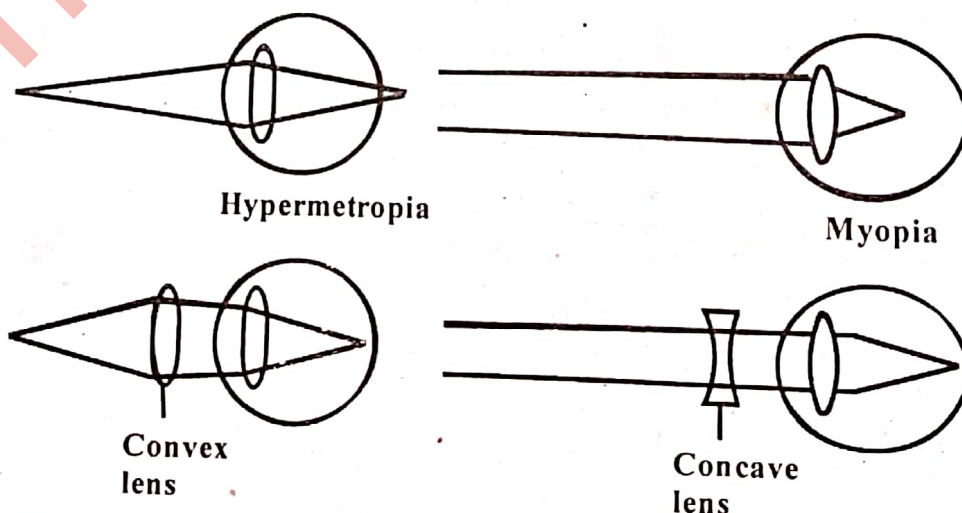
**Ans:** The anterior chamber contains a clear fluid known as **aqueous humour** while the posterior chamber contains a jelly-like fluid known as **vitreous humour**. It helps maintain the shape of eye and suspends the delicate lens.

**Q.22** Differentiate between following Rhodopsin and Iodopsin

Rhodopsin	Iodopsin
Rods contain a pigment called <b>rhodopsin</b> . When light falls on rhodopsin, it breaks for generating a nerve impulse. In the absence of light, the breakdown products are again converted into rhodopsin	Body synthesizes rhodopsin from <b>vitamin A</b> and that is why the deficiency of vitamin A causes poor night vision. This problem is called <b>night blindness</b> . Ions also contain pigment are three types of cones each type has a specific Iodopsin.

**Q.23** Can lenses improve our vision if it is weak discuss?

**Ans:** Yes, During Myopia when a person is not able to see distant objects clearly, concave lenses can be used. And In case of Hypermetropia when a person are not able to see near objects, convex lenses are used





**Q.24 Write role of any two Muslim Scientist in the field of ophthalmology?**

**Ans:** **Ali ibn Isa** (950- 1012) was a famous Arab scientist. He wrote three books on ophthalmology (study of the diseases and surgery of eyes). He described 130 eye diseases and prescribed 143 drugs to treat these diseases.

**Ibn al-Haytham** (965- 1039), an Arab scientist, made significant contributions to the principles of eye and vision. He is regarded as the father of optics (study of the behaviour of light). His "Book of Optics" correctly explained and proved the modern theory of vision. He discussed the topics of medicine and eye surgery in his book. He made several improvements to eye surgery and accurately described the process of sight, the structure of eye, image formation in eye and visual system. Ibn-al-Haytham also described the principles of pinhole camera.

**Q.25 Discuss the following terms.**

(i) **Eustachian tube**

(ii) **Auditory canal**

(iii) **Ear drum**

**Ans:** **Auditory canal.** There are special glands in the walls of auditory canal, which produce wax. The wax and the hairs in auditory canal protect ear from small insects, germs and dust. In additions to this, they help to maintain the temperature and dampness of auditory canal. Auditory canal ends in **ear drum**.

This thin membrane separates external ear from middle ear.

Middle ear also communicates with the **nasal cavity** through **Eustachian tube**. This tube regulated the air pressure on both sides of ear drum.

## **EAR**

**Q.26 How you can hear?**

**Ans:** The pinna of the external ear focuses and directs sound waves into auditory canal. The sound waves strike ear drum and produce vibrations in it. From ear drum, the vibrations strike middle ear and produce further vibrations in malleus, incus and then stapes. From stapes, the vibrations strike the oval window and then reach the fluid-filled middle duct of cochlea. The fluid of cochlea is moved and receptor cells are stimulated. The receptor cells generate a nerve impulse, which travels to brain and is interpreted as sound.

**Q.27 What is Deafness? What are factor which aggrayate it?**

**Ans:** Deafness is a state in which hearing is not possible. The defect of ear drum, cochlea, middle ear ossicles, or auditory nerve may cause deafness. Infection in Eustachian tube may spread to middle ear too. Ear drum may be damaged by an infection in auditory canal. Excessive noise, strong blows on cheek, pointed objects entering auditory canal and attack from insects may also affect hearing.

**Q.28 After having Swings, Children some time fall down, but soon they become stand how?**

**Ans:** After having Swing, the position of head and body is disturbed , which is immediately sensed by neuron coming from semicircular canal and vestibule, and carry nerve impulses to cerebellum which then maintain their position and able to stand on their feet.



**Q.29** What is Hormone, How it acts.

**Ans:** A hormone is a specific messenger molecule synthesized and secreted by an endocrine gland. These glands are ductless and release their secretions (hormones) directly into bloodstream. Blood carries the hormones to target organs or tissues, upon which they act.  
E.g Adrenalin.

### ENDOCRINE SYSTEM

**Q.30** Discuss the functions of Growth hormone and discuss effects if its rate of production is disturbed?

**Ans:** Somatotrophin (growth hormone). It promotes the growth of body. If the production of this hormone is diminished during growing age, the rate of growth decreases. This condition is called **Boldit**. If this hormone is excessively produced during growing age, it leads to **boldit** (very tall and overweight). If somatotrophin is excessively produced after growing age, internal organs and body extremities alone grow large. This condition is known as **boldit**. Such persons will have large hands, feet and jawbones.

**Q.31** What is relationship between ADH and Diabetes insipidus?

**Ans:** **Vasopressin or ADH** increases the rate of reabsorption of water from nephrons. When we have low amount of water in body fluids, pituitary gland secretes vasopressin and so more reabsorption of water occurs from nephrons into blood. In this way, body retains water and less amount of urine is produced. On the other hand, when body fluids have more than normal water, there is a decline in the secretion of this hormone. If pituitary gland does not secrete this hormone in the required amount, less water is reabsorbed from nephrons and there is excessive loss of water through urine. This condition is known as **diabetes insipidus**.

**Q.32** How production of thyroxin

**Ans:** **thyroxin**. Iodine is required for the production of this hormone. If a person lacks in diet, thyroid gland cannot make its hormone

(a) Is mineral dependant?

(b) Also differentiate between Hyper and Hypothyroidism

Hypothyroidism	Hyperthyroidism
Hypothyroidism is caused by the under-production of thyroxin. It is characterized by low energy production in body and slowing down of heart-beat.	Hyperthyroidism is caused by over-production of thyroxin. Its symptoms are increase in Energy production, increased heart-beat, frequent sweating and shivering of hands. The thyroid gland produces another hormone called <b>calcitonin</b> . It decreases the level of calcium ions in blood and promotes the absorption of calcium from blood into bones



**Q.33** How parathormone and Calcitonin act as functional antagonist?

Ans:

Parathormone.	Calcitonin
It increases the level of calcium ions in blood when there increase parathormone production more calcium are absorbed bone to blood.	It decrease the level of calcium ions in blood and promotes the absorption of calcium from blood in to bone so why there are functional antagonist.

**Q.34** How Adrenal gland helps us in emergency condition

Ans: Adrenal medulla secretes a hormone called **epinephrine** or **adrenaline** in response to stress. It prepares our body to overcome emergency situations. Therefore, adrenaline is also termed as 'emergency hormone'

The adrenal cortex secretes many hormones called **corticosteroids** which maintain the balance of salts and water in blood which is also required in emergency situation.

**Q.35** What is Diabetes? How you can check a person that either he is diabetic or rolls?

Ans: If a person's pancreas does not make normal quantity of **insulin**, the blood glucose concentration rises and we say that the person has **diabetes mellitus**. Persons with diabetes have loss of body weight, weakening of muscles and tiredness.

Diabetes can tested by following test.

Blood Glucose Concentration (BGC) Test:

The amount of glucose in blood is measured by this test. It is used to diagnose diabetes. Blood glucose may be measured on a fasting basis (collected after an 8 to 10 hour fast), randomly (anytime) and after a meal. The results of some BGC tests are given here.

Blood Glucose After 8-10 hours fast

Blood Glucose 2 hours after a 75 gram Glucose drink

## DISORDERS

**Q.36** What are Gonads? Discuss then functions in male and female?

Ans: Testes (Singular. testis) and ovaries are the male and female reproductive organs i.e. gonads. In addition to producing gametes, gonads also secrete hormones, called sex hormones. Testes secrete hormones e.g. **testosterone**, which is responsible for the development of male secondary sex characters such as growth of hair on face and coarseness of voice etc.

Ovaries secrete estrogen and progesterone, which are responsible for the development of female secondary characters such as the development of breast etc.

**Q.37** Discuss Negative feedback mechanism along with example.

Ans: In negative feedback, the output of a process decreases or inhibits the process. This mechanism works to return a condition towards its normal value. For example; when the blood glucose concentration Decline rises pancreas secrete insulin. It decreases blood glucose concentration. In the blood glucose concentration to a normal set-point inhibits the secretion of insulin. Similarly, when blood glucose concentration drops below normal, pancreas secretes glucagons. It raises the blood glucose concentration. In this case, rise in the blood glucose concentration to a normal set-point inhibits the secretion of glucagons. In other words, the blood glucose concentration (output) controls the process i.e. the secretion of insulin and glucagons.



**Q.38** What is Paralysis? Discuss its types?

**Ans:** Paralysis is the complete loss of function by one or more muscle groups. It is most often caused by damage to the central nervous system (brain or spinal cord). The damage may be due to stroke (rupture in a blood vessel of brain or spinal cord), blood clotting in these blood vessels, or poison produced by polio viruses.

**Types:** Patient may have weak paralysis throughout his/her body or have paralysis in one side of body. There may also be paralysis in the lower extremities or in all four limbs.

**Q.39** What is Epilepsy? Also discuss its treatment?

**Ans:** Epilepsy is a nervous disorder in which there is abnormal and excessive discharge of nerve impulses in brain. It causes unprovoked seizures in patient. A seizure of epilepsy is a temporary abnormal state of brain marked by convulsions.

**Treatment:** There is no known cure of epilepsy but medicines can control seizures. Patients of epilepsy have to take medicines daily for the treatment as well as prevention of seizures. These are termed "anticonvulsant" or "antiepileptic" drugs.

**Q.40** How Hormones are essential in Animals life?

**Ans:** The stepwise process of metamorphosis in many animals is controlled by hormones. Life activities such as cell division in invertebrates are also regulated by hormones. Hormones also control activities like migration in birds. Hormones have been identified even in unicellular organism.

### KIPS ADDITIONAL SHORT QUESTIONS

**Q.1** Define coordination.

**Ans:**

#### COORDINATION

The process in which the body works as one unit, and its different organs and systems cooperate and work in harmony with each other is called coordination.

**Q.2** What is the advantage of coordination?

**Ans:**

#### ADVANTAGE OF COORDINATION

Coordination enables the organism to respond to happenings in the world around.

**Q.3** What are two types of coordination in living organisms?

**Ans:**

#### TYPES OF COORDINATION

There are two types of coordination in organisms:

- Nervous coordination brought about by nervous system.
- Chemical coordination brought about by endocrine glands.

**Q.4** How does coordination take place in unicellular organisms?

**Ans:**

#### COORDINATION IN UNICELLULAR ORGANISMS

Coordination takes place in unicellular organisms. The response to stimuli is brought about through chemicals.

Q.5 What is difference between coordination systems in animals and plants?

**DIFFERENCE IN COORDINATION SYSTEMS**

Ans: Animals have both the nervous and chemical coordination systems in their bodies while plants and other organisms have only chemicals coordination.

Q.6 Write the five components of coordinated action.

**COMPONENTS OF A COORDINATED ACTION**

Ans: The following are the components of a coordinated action:

- Stimulus.
- Receptor
- Coordinator
- Effector
- Response

Q.7 What are the two major components of nervous system?

**MAJOR COMPONENTS OF NERVOUS SYSTEM**

Ans: The two major components of nervous system are as follow:

(i) Central Nervous System:

It comprises of

- Brain
- Spinal cord

(ii) Peripheral Nervous System:

It consists of nerves that arise from central nervous system and spread in different parts of the body.

Q.8 Define nerve impulse.

**NERVE IMPULSE**

Ans: A wave of electrochemical changes that travels along the length of neurons is called nerve impulse.

Q.9 How regeneration of broken nerve cells take place?

**REGENERATION OF BROKEN NERVE CELLS**

Ans: The regeneration of broken nerve cells takes place by a protein called nerve-growth-factor.

Q.10 How degeneration brain cells are repaired?

**REPAIRING DEGENERATION BRAIN CELLS**

Ans: The degenerating brain cells could be repaired by using embryonic stem cells.

Q.11 Write types of neurons on the basis of their function.

**TYPES OF NEURONS**

Ans: On the basis of their functions, neurons are of three types;

(i) Sensory Neurons:

Sensory neurons conduct sensory information (nerve impulse) from receptors towards the CNS. Sensory neurons have one dendrite and one axon:



**(ii) Interneurons:**

Interneurons from brain and spinal cord. They receive information, interpret them and stimulate motor neurons. They have many dendrites and axons.

**(iii) Motor Neurons:**

Motor Neurons carry information from interneurons to muscle or glands (effectors). They have many dendrites but only one axon.

**Q.12 Define Nerve.**

**Ans:** The union of several axons that are enveloped by a covering made of lipid form a nerve.

**Q.13 Write types of nerves based on the property of axons.**

**Ans:** **TYPES OF NERVES**

Based on the property of axons, the nerves are classified into three types:

**(i) Sensory Nerves:**

Sensory nerves contain the axons of sensory neurons only.

**(ii) Motor Nerves:**

Motor nerves contain the axons of motor neurons only.

**(iii) Mixed Nerves:**

Mixed Nerves contain the axons of both sensory and motor neurons.

**Q.14 What is a ganglion?**

**Ans:** **GANGLION**

In certain parts of the body, the cell bodies of many neurons form a group enveloped by a membrane. This is called ganglion.

**Q.15 What is hippocampus?**

**Ans:** **HIPPOCAMPUS**

**Location:**

Hippocampus is a structure that is deep in the cerebrum.

**Function:**

It functions for the formation of new memories.

**Damaged Hippocampus:**

People with a damages hippocampus can not remember things that occurred after the damage but can remember things that occurred before damage.

**Q.16 What is brain stem?**

**Ans:** **BRAIN STEM**

The following three parts of brain collectively referred as brain stem because these connect the rest of the brain to spinal cord.

- Medulla oblongata
- Pons
- Midbrain

**Q.17 What is the length of spinal cord?**

**Ans:** **LENGTH OF SPINAL CORD**

Spinal cord is roughly 40 cm long and about as wide as your thumb for most of its length.



Q.18 What is the effect of too much light and too little light on retina?

**EFFECT OF LIGHT INTENSITY ON RTINA**

Ans: Too much light being let into the eye can damage the retina. Too little makes sight difficult.

Q.19 How many rods and cones are present in human eye?

Ans: Number of Rods: 125 Lakhs

Number of Cones: 7 Lakhs

Q.20 Why the eyes of cats and dogs shine at night?

**SHINING OF EYES**

Ans: The eyes of cats and dogs shine at night because of the presence of tapetum behind the eyes which is a layer capable of reflecting light.

Q.21 Why colour vision is essential for a pilot?

**NECESSITY OF COLOUR VISION**

Ans: For a pilot, colour vision is essential so that he/she can recognize:

- Aircraft position lights
- Light gun signals
- Airport beacon
- Approach slope indicators
- Chart symbols

A pilot must have the ability to perceive these colours necessary for the safe performance of his/her duties.

Q.22 Which one is the most influential book written in the history of physics?

**MOST INFLUENTIAL BOOK**

Ans: Ibn al-Haytham's "Book of Optics" has been ranked alongside a book of Isaac Newton. It is one of the most influential books written in the history of physics.

Q.23 Why owl is not able to see during day time?

**VISION OF OWL IN DAY TIME**

Ans: Owl is not able to see during day time. The reason for this is the deficiency of cones which receive and sense the bright light. But the presence of more rods gives it greater power of vision during night. All animals that search for prey during night have this characteristic.

Q.24 Which is the smallest bone of the human body?

**SMALLEST BONE OF HUMAN BODY**

Ans: Stapes is the smallest bone of human body.

Q.25 What is thunderstorm and lightening?

**THUNDERSTORM AND LIGHTENING**

Ans: A thunderstorm is characterized by the presence of lightning and a thunder. The lightning is caused by an electrical charge due to the movement of water droplets or crystals carried by the wind. The sudden increase in pressure and temperature from lightning produces rapid expansion of the air. This expansion of air produces a sound of thunder. The flash of lightning is followed after some seconds by a roar of thunder. This time difference is due to the fact that sound travels slower than light.



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Q.26 Name some activities of the body which are required to be regulated.

**ACTIVITIES REQUIRE REGULATION**

Ans: Following are the some of the activities of the body which are required to be regulated:

- Growth
- Reproduction
- Maintenance of glucose concentration in blood
- Reabsorption of water in kidneys

Q.27 Define Hormone.

**HORMONE**

Ans: A specific chemical messenger molecules synthesized and secreted by endocrine gland is called a hormone.

Q.28 What is the difference between endocrine and exocrine glands?

**DIFFERENCE BETWEEN ENDOCRINE AND EXOCRINE GLANDS**

Endocrine Glands	Exocrine glands
These glands are ductless and release their secretions called hormones directly into blood stream.	These glands have ducts for releasing their secretions into the target organs.
<p style="text-align: center;"><i>Examples:</i></p> <ul style="list-style-type: none"> <li>• Pituitary gland</li> <li>• Thyroid gland</li> </ul>	<p style="text-align: center;"><i>Example:</i></p> <ul style="list-style-type: none"> <li>• Digestive glands</li> <li>• Skin glands</li> </ul>

Q.29 What are the different roles of hormones?

**ROLES OF HORMONES**

- Ans:
- The stepwise process of metamorphosis in many animals is controlled by hormones.
  - Life activities such as cell division in invertebrates are also regulated by hormones.
  - Hormones also control activities like migration in birds.
  - Hormones have been identified even in unicellular organisms.

Q.30 Why during summer, urine output is low?

**LOW URINE OUTPUT DURING SUMMER**

Ans: During summer, urine output is low. Due to increased sweating, the water level of blood is lowered. As a result, pituitary gland releases more antidiuretic hormone (ADH) into blood.

Q.31 What is the relationship between calcitonin and parathormone?

**RELATIONSHIP BETWEEN CALCITONIN AND PARATHORMONE**

Ans: Calcitonin and parathormone complement each other and regulate the level of calcium ions in the blood.

Q.32 What is tetany?

**TETANY**

Ans:

Symptoms:

Tetany is marked by:

- Flexion of the wrist and ankle joints
- Muscle twitching
- Cramps
- Convulsions

Cause:

It is due to decreased calcium level which makes the nerves and muscles more excitable.



Q.33 Which changes prepare the body to face any emergency situation?

### FACING EMERGENCY SITUATIONS

Ans: When a person experiences fear, anger or anxiety, the following changes prepare the body to face any emergency situation:

- The rate and intensity of heartbeat increases
- Blood flow to the limbs increases
- Blood flow to alimentary canal and skin is reduced

Q.34 At what rate the blood glucose concentration is maintained?

### MAINTENANCE OF BLOOD GLUCOSE CONCENTRATION

Ans: The blood glucose concentration is maintained at the rate of 80 to 120 mg per 100 ml of blood

Q.35 What is BGC test?

### BLOOD GLUCOSE CONCENTRATION TEST

Ans: The amount of glucose in blood is measured by this test. It is used to diagnose diabetes. Blood glucose may be measured on a fasting basis (collected after an 8 to 10 hour fast). Randomly (anytime) and after a meal.

Q.36 Write the blood glucose concentration level of normal, pre-diabetic and diabetic persons after 8-10 hours fast.

### BLOOD GLUCOSE AFTER 8-10 HOURS FAST

Ans:

Blood Glucose After 8-10 hours fast	
BGC	Diagnosis
From 70 to 99 mg/ 100ml	Normal
From 100 to 125 mg/ 100ml	Pre-diabetic
126 mg/ 100ml and above	Diabetic

Q.37 Write the blood glucose concentration level of normal, pre-diabetic and diabetic persons 2 hours after a 75 gram glucose drink.

Ans: **BLOOD GLUCOSE CONCENTRATION 2 HOURS AFTER A 75 GRAM GLUCOSE DRINK**

Blood Glucose 2 hours after a 75 gram Glucose drink	
BGC	Diagnosis
Less than 140 mg/ 100ml	Normal
From 140 to 200 mg/ 100ml	Pre-diabetic
Over 200 mg/ 100ml	Diabetic

Q.38 How knowledge of nervous system has helped man to treat nervous disorders?

Ans:

### TREATMENT OF NERVOUS DISORDERS

The knowledge of the composition and functioning of nervous system has helped man in the diagnosis and treatment of nervous disorders including paralysis and epilepsy. Man has discovered the areas of brain that receive information from different sense organs and the areas that send messages to different effectors. Such knowledge helps a lot in identifying the malfunctioning areas of brain.



**Q.39 Why objects should never be placed in a patient's mouth during a seizure attack?**

**Ans:**

**SEIZURE ATTACK**

during a seizure attack, objects should never be placed in a patient's mouth as it can result in serious injury. It is possible that the patient will bite his/her own tongue.

**Q.40 What is the contribution of Ali Ibn Isa?**

**Ans:**

**CONTRIBUTION OF ALI IBN ISA**

Ali Ibn Isa was a famous Arab scientist.

**Period:** 950-1012

**Contribution:**

He wrote three books on ophthalmology (study of the disease and surgery of eyes). He described 130 eye disease and prescribed 143 drugs to treat these diseases.

**Q.41 What is the contribution of Ibn al-Haytham?**

**Ans:**

**CONTRIBUTION OF IBN AL-HAYTHAM**

Ibn al-Haytham was an Arab scientist.

**Period:** 965-1039

**Contribution:**

He made significant contributions to the principles of eye and vision. He is regarded as the father of optics (study of the behavior of light). His "Book of Optics" correctly explained and proved the modern theory of vision. He discussed the topics of medicine and eye surgery in his book. He made several improvements to eye surgery and accurately described the following:

- The process of sight
- The structure of eye
- Image formation in eye
- Visual system
- The principles of pinhole camera

**Q.42 What is deafness?**

**Ans:**

**DEAFNESS**

Deafness is a state in which hearing is not possible.

**Cause:**

The defect of ear drum, cochlea, middle ear ossicles, or auditory nerve may cause deafness. Infection in Eustachian tube may spread to middle ear too. Ear drum may be damaged by an infection in auditory canal.

**Effect on Hearing:**

Excessive noise, strong blows on cheek, pointed entering auditory canal and attack from insects, may also affect hearing.

**Q.43 How do ears maintain the balance of body?**

**Ans:**

**MAINTENANCE OF BALANCE O BODY**

Semicircular canals and vestibule help to maintain the balance of body. Semicircular canals contain sensory nerves which can detect any movement of head. Vestibule can detect any changes in the posture of body. The neurons coming from these two receptors reach cerebellum through the auditory nerve.



**LONG QUESTIONS**

Q.No.1 Describe the components of a coordinated action.

**COMPONENTS OF A COORDINATED ACTION**

A coordinated action has following five components:

- (i) Stimulus
- (ii) Receptor
- (iii) Coordinator
- (iv) Effector
- (v) Response

(i) **Stimuli**

**Definition:**

Any change in external and internal environment of an organism which can provoke a response is called a stimulus.

**Examples:**

- Touch
- Light
- Heat
- Cold
- Pressure
- Sound waves
- Presence of chemicals
- Microbial infections

(ii) **Receptors:**

**Definition:**

The organs, tissues or cells which are specifically built to detect particular type of stimuli are called receptors.

**Examples:**

- Sound waves are detected by ears
- Light is detected by eyes
- Chemicals in air are detected by nose
- Touch, heat, cold and pressure are detected by skin
- Taste is detected by tongue

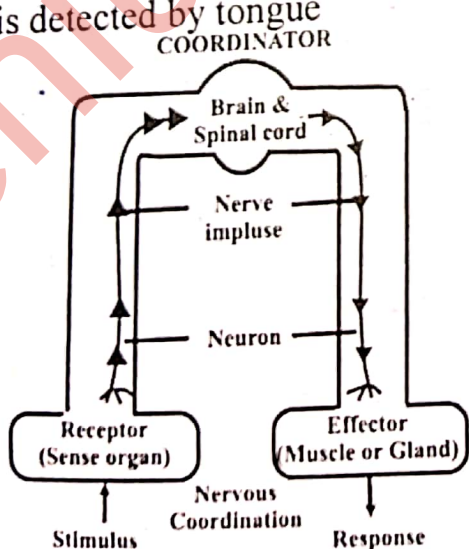


Figure: Nervous Coordination

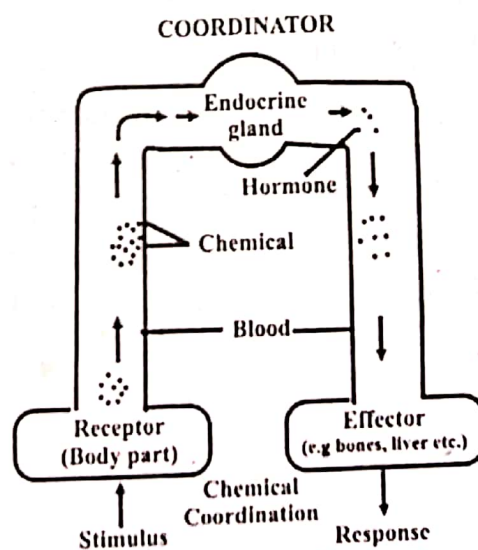


Figure: Chemical Coordination

**(iii) Coordinators:****Definition:**

The organs that receive information from receptors and send messages to particular organs for proper action are called coordinators.

**Nervous Coordination:**

In nervous coordination, brain and spinal cord are coordinators. They receive information and send messages through neurons in the form of nerve impulses.

**Chemical Coordination:**

In chemical coordination, various endocrine glands play the role of coordinators. They receive information in the form of various chemicals and send messages by secreting particular hormones in blood.

**(iv) Effectors:****Definition:**

The parts of body which receive messages from coordinators and produce particular responses are called effectors.

**Nervous Coordination:**

In nervous coordination, neurons carry messages from coordinators (brain and spinal cord) to muscles and glands, which act as effectors.

**Chemical Coordination:**

In chemical coordination, particular hormones carry messages from coordinators (endocrine glands) to particular target tissues, which act as effectors. For some hormones, nephrons act as effectors. Similarly, bones and liver act as effectors for many hormones.

**(v) Response:****Definition:**

The action performed by the effectors on receiving the message from coordinators is called response.

**Examples:**

- Pulling our hand away from something very hot
- The movement of the flower of sunflower towards light

**Nervous Coordination:**

Nervous coordination produces immediate but short-living responses.

**Chemical Coordination:**

Chemical coordination produces slow but long-living responses.

**Q.No.2 Describe the structure of a neuron.****NEURON****Introduction:**

Neuron is also called as nerve cell.

**Definition:**

The unit of the nervous system is called neuron or nerve cell.

**Number:**

The human nervous system consists of billions of neurons plus supporting neuroglial cells.

**Function:**

Neurons are specialized cells that are able to conduct nerve impulses from receptors to coordinators and from coordinators to effectors. In this way they communicate with each other and with other types of body cells.



**PARTS OF A NEURON**

A neuron consists of the following parts:

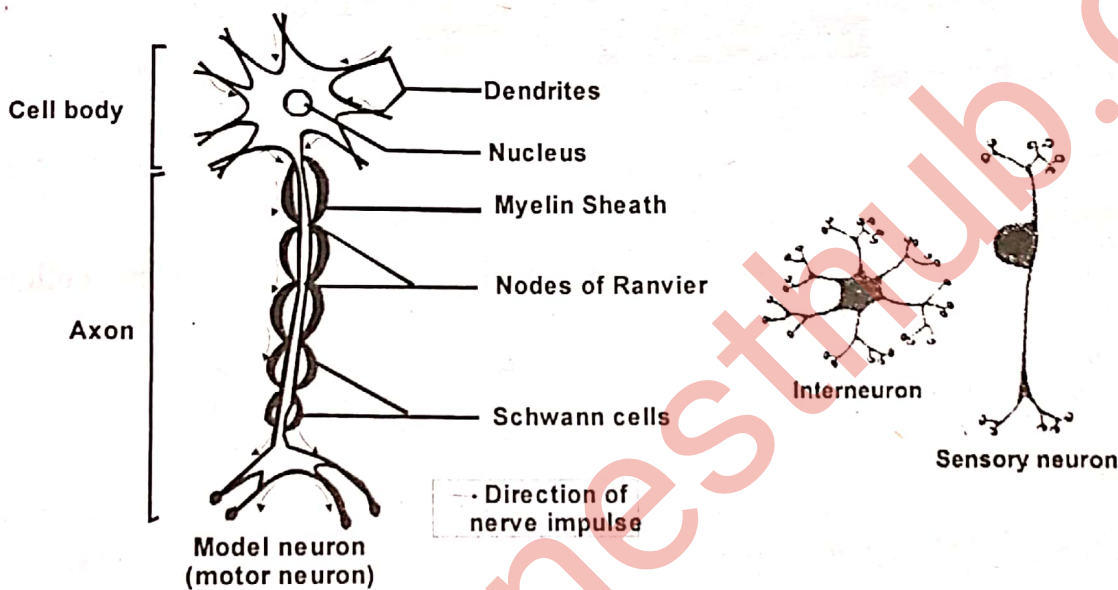
- (i) Cell Body
- (ii) Dendrites
- (iii) Axon
- (iv) Schwann Cells
- (v) Myelin Sheath
- (vi) Nodes of Ranvier

(i) **Cell Body:**

The nucleus and most of the cytoplasm of a neuron is located in its cell body.

(ii) **Dendrites:**

Different processes extend out from cell body, these are called dendrites. Dendrites conduct impulses toward cell body.



**Figure: Neurons**

(iii) **Axon:**

An axon arises from the cell body and conducts impulses away from cell body.

(iv) **Schwann Cells:**

Schwann cells are special neuroglial cells located at regular intervals along axons.

(v) **Myelin Sheath:**

In some neurons, Schwann cells secrete a fatty layer called myelin sheath, over axons.

**Saltatory Impulse:**

Myelin sheath is an insulator so the membrane coated with this sheath does not conduct nerve impulse. In such a neuron, impulses 'jump' over the areas of myelin going from node to node. Such impulses are called saltatory ('jumping') impulses. This increases the speed of nerve impulse.

(vi) **Nodes of Ranvier:**

Between the areas of myelin on an axon, there are non-myelinated points, called the nodes of Ranvier.

## Q.No.3 Describe the structure of brain.

**BRAIN****Introduction:**

In animals, all life activities are under the control of brain. The structure of brain is suitable to perform this function.

**Cranium:**

Brain is situated inside a bony cranium which is the part of skull.

**Meninges:**

Inside cranium, brain is covered by three layers called meninges. Meninges protect brain and also provide nutrients and oxygen to brain tissue through their capillaries.

**Ventricles:**

The brain contains fluid-filled ventricles that are continuous with the central canal of spinal cord.

**Cerebrospinal Fluid:**

Fluid within ventricles and central canal is called cerebrospinal fluid (CSF).

**THE DIVISIONS OF BRAIN**

There are three major regions in the brain of human and other vertebrates. These are:

- 1) Forebrain
- 2) Midbrain
- 3) Hindbrain

**I) FOREBRAIN**

Forebrain is the largest area of brain. It is most highly developed in humans. Following are the important parts of this region.

- (i) Thalamus
- (ii) Hypothalamus
- (iii) Cerebrum

**(i) Thalamus:****Location:**

Thalamus lies just below cerebrum.

**Functions:**

- Thalamus serves as a relay centre between various parts of brain and spinal cord.
- It also receives and modifies sensory impulses (except from nose) before they travel to cerebrum.
- Thalamus is also involved in pain perception and consciousness (sleep and awakening).

**(ii) Hypothalamus:****Location:**

Hypothalamus lies above midbrain and just below thalamus.

**Size:**

In humans, it is roughly the size of an almond.

**Functions:**

- One of the most important functions of hypothalamus is to link nervous system and endocrine system.
- It controls the secretions of pituitary gland.
- It also controls feelings such as rage, pain, pleasure and sorrow.

**(iii) Cerebrum:**

Cerebrum is the largest part of forebrain.



**Functions:**

It controls:

- Skeletal muscles
- Thinking
- Intelligence
- Emotions

**Divisions of Cerebrum:**

Cerebrum is divided into two cerebral hemispheres.

**Olfactory Bulbs:**

The anterior parts of cerebral hemispheres are called olfactory bulbs which receive impulses from olfactory nerves and create the sensation of smell.

**Cerebral Cortex:**

The upper layer of cerebral hemispheres is cerebral cortex that consists of grey matter. The grey matter of nervous system consists of cell bodies and non-myelinated axons.

**White Matter:**

Beneath this layer is present the white matter. The white matter of nervous system consists of myelinated axons.

**Lobes of Cerebral Cortex:**

Cerebral cortex has a large surface area and is folded in order to fit in skull. It is divided into four lobes.

**(i) Frontal Lobe:**

- Controls motor functions
- Permits conscious control of skeletal muscles
- Coordinates movements involved in speech

**(ii) Parietal Lobe:**

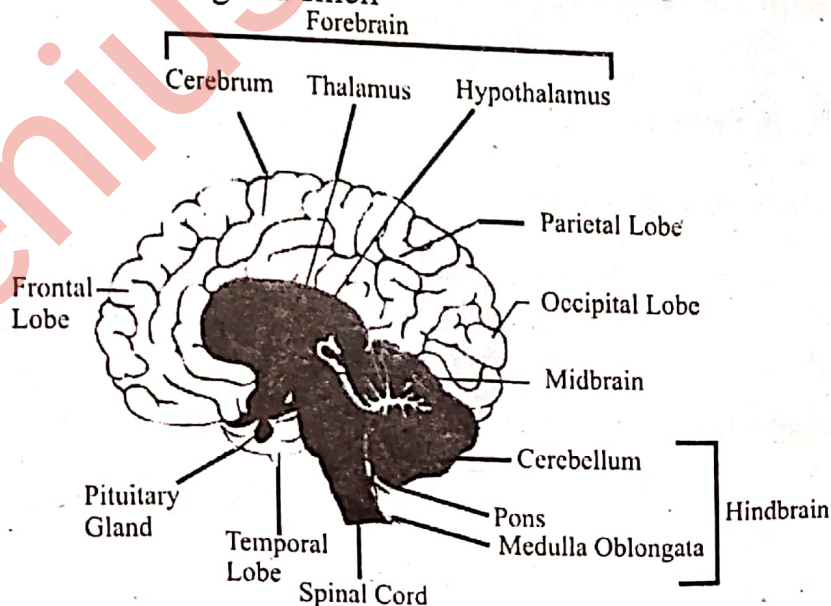
- Contains sensory areas that receive impulses from skin

**(iii) Occipital Lobe:**

- Receives and analyzes visual information

**(iv) Temporal Lobe:**

- Concerned with hearing and smell



**Figure: Structure of Human Brain**

**2) MIDBRAIN****Location:**

Midbrain lies between hindbrain and forebrain and connects the two.

**Functions:**

- The midbrain receives sensory information and sends it to the appropriate part of forebrain.
- Midbrain also controls some auditory reflexes and posture.

**3) HINDBRAIN**

Hindbrain consists of three major parts:

- Medulla Oblongata
- Cerebellum
- Pons

**(i) Medulla Oblongata:****Location:**

Medulla oblongata lies on the top of spinal cord. Information that passes between spinal cord and the rest of brain pass through medulla.

**Functions:****It controls:**

- Breathing
- Heart rate
- Blood pressure
- Reflexes such as vomiting, coughing, sneezing

**(ii) Cerebellum:****Location:**

Cerebellum lies behind medulla oblongata.

**Function:**

It coordinates muscle movements.

**(iii) Pons:****Location:**

Pons is present on top of medulla.

**Functions:**

- It assists medulla in controlling breathing.
- It also serves as a connection between cerebellum and spinal cord.

**Q. No.4 Write a note on spinal cord.****SPINAL CORD****Introduction:**

The spinal cord is in fact a tubular bundle of nerves.

**Location:**

It starts from brain stem and extends to lower back.

**Meninges:**

Like brain, spinal cord is also covered by meninges.

**Protection:**

The vertebral column surrounds and protects spinal cord.

**Outer Region:**

The outer region of spinal cord is made of white matter containing myelinated axons.

**Central Region:**

The central region is butterfly shaped that surrounds the central canal. It is made of grey matter containing neuron cell bodies.

**Spinal Nerves:**

31 pairs of spinal nerves arise along spinal cord. These are "mixed" nerves because each contains axons of both sensory and motor neurons.



**Roots of Spinal Nerve:**

At the point where a spinal nerve arises from spinal cord, there are two roots of spinal nerve. Both roots unite and form one mixed spinal nerve.

**Dorsal Root:**

The dorsal root contains sensory axons and a ganglion where cell bodies are located.

**Ventral Root:**

The ventral root contains axons of motor neurons.

**Functions:**

Spinal cord performs two main functions:

- It serves as a link between body parts and brain. Spinal cord transmits nerve impulses from body parts to brain and from brain to body parts.
- Spinal cord also acts as a coordinator, responsible for some simple reflexes.

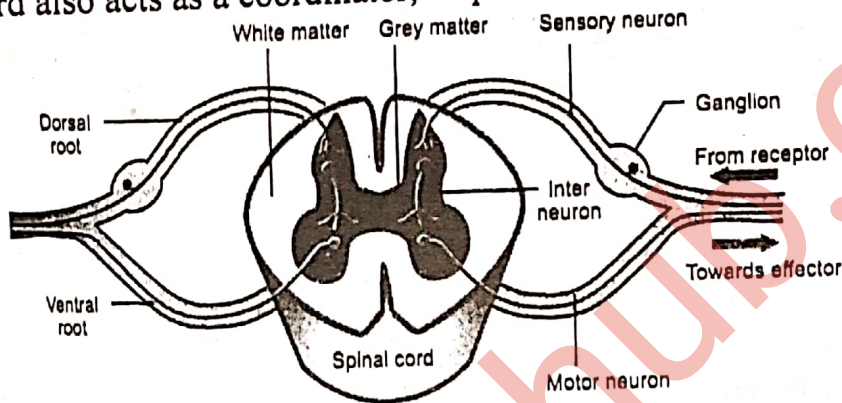


Figure: Spinal Cord and Spinal Nerves

Q.No.5 Write a note on peripheral nervous system.

### PERIPHERAL NERVOUS SYSTEM

**Composition:**

The peripheral nervous system (PNS) is composed of nerves and ganglia. Ganglia are the clusters of neuron cell bodies outside central nervous system.

**Cranial Nerves:**

The nerves that arise or lead to brain are called cranial nerves. Humans have 12 pairs of cranial nerves. Some cranial nerves are sensory, some are motor and some are mixed.

**Spinal Nerves:**

The nerves that arise or lead to spinal cord are called spinal nerves. Humans have 31 pairs of spinal nerves. All spinal nerves are mixed nerves.

**Pathways:**

The cranial and spinal nerves make two pathways:

**(i) Sensory Pathway:**

The sensory pathway conducts impulses from receptors to central nervous system.

**(ii) Motor Pathway:**

The motor pathway conducts impulses from central nervous system to effectors.

Motor pathway makes two systems:

- 1) Somatic Nervous System
- 2) Autonomic Nervous System

### 1) SOMATIC NERVOUS SYSTEM

**Composition:**

It includes all of the motor neurons that conduct impulses from central nervous system to skeletal muscles.

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**Function:**

- It is responsible for the conscious and voluntary actions.

**2) AUTONOMIC NERVOUS SYSTEM**

**Composition:**

It consists of motor neurons that send impulses to:

- Cardiac muscles
- Smooth muscles
- Glands

**Function:**

- It is responsible for the activities, which are not under conscious control.

**Types of Autonomic Nervous System:**

Autonomic nervous system comprises of:

- (i) Sympathetic Nervous System
- (ii) Parasympathetic Nervous System.

**(i) Sympathetic Nervous System:**

Sympathetic nervous system prepares body to deal with emergency situations. This is often called the "fight or flight" response. During an emergency situation, this system takes necessary actions. It

- Dilates pupils
- Accelerates heartbeat
- Increases breathing rate
- Inhibits digestion

**(i) Parasympathetic Nervous System:**

When stress ends, the parasympathetic nervous system takes action and normalizes all the functions. It

- Causes pupils to contract
- Promotes digestion.
- Slows the rate of heartbeat and breathing rate

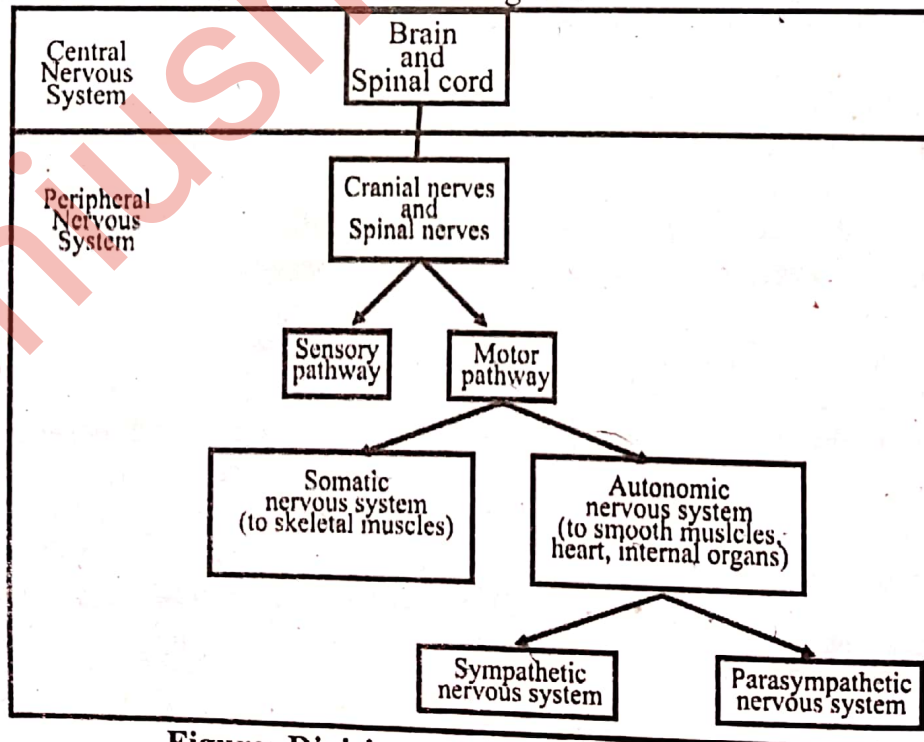


Figure: Divisions of the nervous system

Q.No.6 Write a note on reflex action.



**TYPES OF ACTIONS**

When central nervous system sends impulses to muscles and glands, two types of actions (responses) result.

- 1) Voluntary Actions
- 2) Involuntary Actions

**1) VOLUNTARY ACTIONS:**

The higher centres of brain control the conscious action or voluntary actions.

**2) INVOLUNTARY ACTIONS:**

When impulses are not passed to the higher centres of brain, it results in responses which are not under conscious control. Such responses are called involuntary actions.

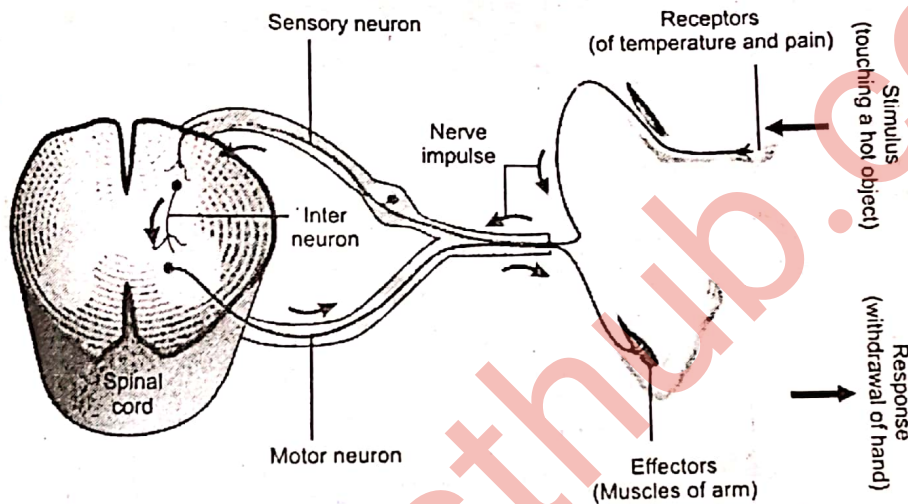


Figure: Reflex Arc in a Reflex Action

**REFLEX ACTION****Definition:**

A very quick involuntary response produced by the central nervous system is called reflex action.

**Reflex Arc:**

The pathway followed by the nerve impulses for producing a reflex action, is called reflex arc.

**Example:**

The most common example of reflex action is the withdrawal of hand after touching a hot object.

**Mechanism:**

In this reflex action, spinal cord acts as coordinator. Heat stimulates temperature and pain receptors in skin. A nerve impulse is generated which is carried by sensory neurons to the interneurons of spinal cord. From interneurons, the impulse is passed to motor neurons, which carry it to the muscles of arm. As a result, the muscles contract to withdraw hand. During it, other interneurons transmit nerve impulses up to brain so that the person becomes aware of pain and what happened.

Q.No.7 Describe the structure of eye.

## EYE

### Introduction:

Eyes are the sensory organs that are associated with the sense of vision.

### Orbit:

Our eyes are located in small portions of skull known as the orbits or eye sockets.

### Eyelids:

Eyelids wipe eyes and prevent dehydration. They spread tears on eyes, which contains substances for fighting bacterial infections.

### Eyelashes:

Eyelashes prevent fine particles from entering eye.

## STRUCTURE OF EYE

The structure of eye can be divide into three main layers.

- 1) Outer Layer
- 2) Middle Layer
- 3) Inner Layer

### 1) OUTER LAYER

The outer layer of eyeball consists of sclera and cornea.

#### Sclera:

Sclera gives eye most of its white colour. It consists of dense connective tissue and protects the inner components of eye and maintains its shape.

#### Cornea:

In the front, sclera forms the transparent cornea. Cornea admits light to the interior of eye and bends light rays so that they can be brought to a focus.

### 2) MIDDLE LAYER

The middle layer is called choroid.

#### Choroids:

The choroid contains blood vessels and gives the inner eye a dark colour. The dark colour prevents disruptive reflections within eye.

#### Iris:

Behind cornea, choroid bends to form a muscular ring, called iris.

#### Pupil:

There is round hole, called pupil, in the centre of iris. After striking the cornea, light passes through the pupil. The size of pupil is adjusted by the muscles of iris. Pupil constricts in bright light when the circular muscles of iris contract. Similarly, pupil dilates in dim light when the radial muscles of iris contract.

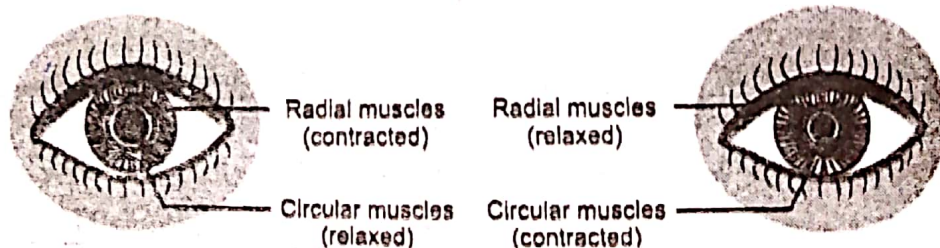


Figure: Contraction and Dilation of Pupil

#### Lens:

Behind iris, there is a convex lens, which focuses light on retina.



**Ciliary Muscles:**

Lens is attached to ciliary muscles of eye via a ring of suspensory ligament. To clearly see an object far away, ciliary muscles are relaxed and lens becomes less convex. When ciliary muscles contract, lens becomes more convex and round.

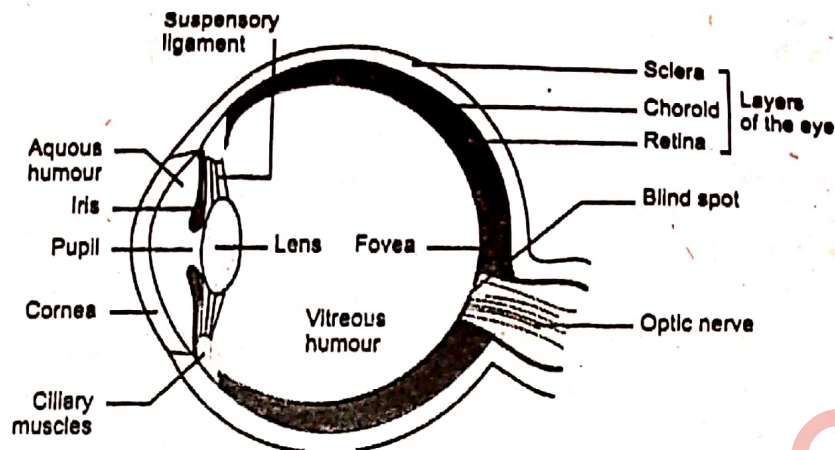


Figure: Structure of Human Eye

### 3. INNER LAYER

**Retina:**

The inner layer is sensory is called as retina. It contains the photosensitive cells called rods and cones and associated neurons.

**Rods:**

Rods are sensitive to dim light.

**Cones:**

The cones are sensitive to bright light and so distinguish different colours.

**Fovea:**

Fovea is a dip in retina, directly opposite to lens and is densely packed with cone cells. It is largely responsible for colour vision and sharpness.

**Optic Disc:**

Optic disc is a point on retina where the optic nerve enters retina.

**Blind Spot:**

There are no rods and cones at optic disc point that is why it is referred to as the blind spot.

**Chambers of Eye:**

The iris divides the cavity of eye into two chambers.

**Anterior Chamber:**

The anterior chamber is in front of iris i.e. between cornea and iris. The anterior chamber contains a clear fluid known as aqueous humour.

**Posterior Chamber:**

The posterior chamber is between iris and retina. The posterior chamber contains a jelly-like fluid known as vitreous humour. It helps maintain the shape of eye and suspends the delicate lens.

### Q.No.8 Write a note on image formation.

#### IMAGE FORMATION

Light from objects enters eye and is refracted when it passes through cornea, aqueous humour, lens and vitreous humour. Lens also focuses light on retina. As a result, the image falls on retina. Rods and cones generate nerve impulses in the optic nerve. These impulses are carried to the brain, which makes the sensation of vision.

**Role of Rhodopsin:**

Rods contain a pigment called rhodopsin. When light falls on rhodopsin, it breaks for generating a nerve impulse. In the absence of light, the breakdown products are again converted into rhodopsin.

**Night Blindness:**

Body synthesizes rhodopsin from vitamin A and that is why the deficiency of vitamin A causes poor night vision. This problem is called night blindness.

**Role of Iodopsin:**

Cones also contain a pigment, known as iodopsin. There are three main types of cones and each type has a specific iodopsin. Each type of cones recognizes one of the three primary colours i.e. blue, green and red.

**Colour Blindness:**

If any type of cones is not working well, it becomes difficult to recognize that colour. Such person is also not able to distinguish different colours. This disease is called colour blindness and it is a genetic problem.

**Q.No.9 Describe disorders of eye.**

**Disorders of the Eye**

The working of eye is affected by the changes in the shape of eyeball.

- 1) Myopia
- 2) Hypermetropia

**1) MYOPIA (SHORT SIGHT)**

The image of a distant object is formed in front of retina.

**Cause:**

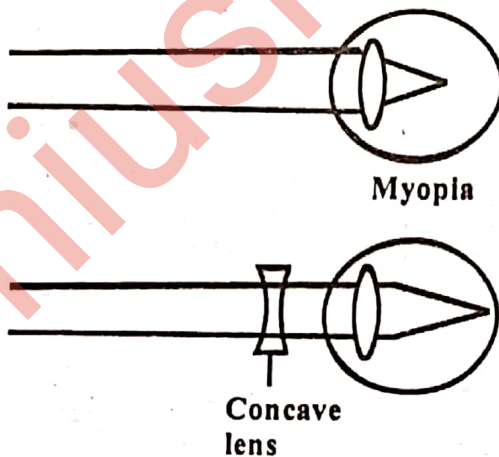
The elongation of eyeball results in myopia.

**Effect:**

Such persons are not able to see distant objects clearly.

**Treatment:**

This problem can be rectified by using concave lens.



**2) HYPERMETROPIA (LONG SIGHT)**

The image is formed behind retina

**Cause:**

It happens when eyeball shortness.

**Effect:**

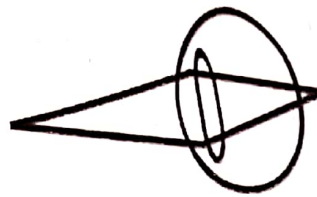
Such persons are not able to see near objects clearly.



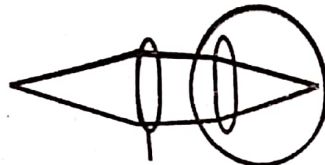
## Chapter-12

### Treatment:

Convex lens is used to rectify this problem.



Hypermetropia



Convex lens

Q.No.10 Describe the structure of ear. Also explain the process of hearing.

### **STRUCTURE OF EAR**

#### Introduction:

Hearing is an important as vision. Our ear helps us in hearing and also to maintain the balance of equilibrium of our body.

Ear has the following three main parts:

- 1) External ear
- 2) Middle ear
- 3) Internal ear.

#### **1) EXTERNAL EAR**

External ear consists of pinna, auditory canal and ear drum (tympanum).

##### Pinna:

Pinna is the broad external part, made of cartilage and covered with skin. It helps to direct sound waves into auditory canal.

##### Auditory Canal:

There are special glands in the walls of auditory canal, which produce wax. The wax and the hairs in auditory canal protect ear from small insects, germs and dust. In additions to this, they help to maintain the temperature and dampness of auditory canal.

##### Ear Drum:

Auditory canal ends in ear drum. This membrane separates external ear from middle ear.

#### **2) MIDDLE EAR**

Middle ear is a chamber after external ear.

##### Ossicles:

Three small bones, called middle ear ossicles, are present in a chain in middle ear. These movable bones include malleus, incus and stapes. Malleus is attached with ear drum, then comes incus and finally stapes that is connected with a membrane called oval window.

##### Oval Window:

Oval window separates middle ear from inner ear.

##### Eustachian Tube:

Middle ear also communicates with the nasal cavity through Eustachian tube. This tube regulates the air pressure on both sides of eardrum.

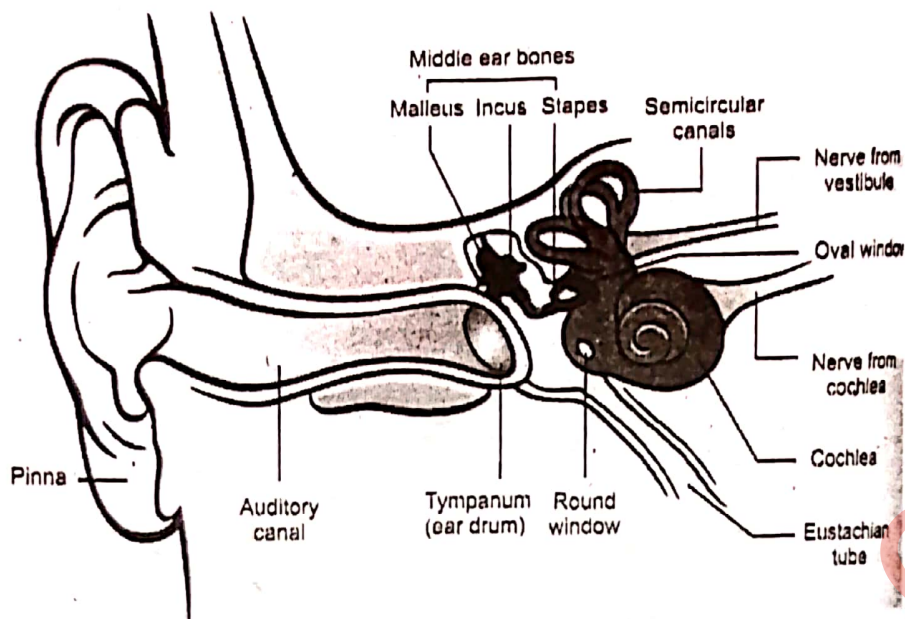


Figure: Structure of Human Ear

### B) INNER EAR

Inner ear consists of three parts i.e. vestibule, semicircular canals and cochlea.

#### Vestibule:

Vestibule is present in the centre of inner ear.

#### Semicircular Canals:

Three canals called semicircular canals are posterior to the vestibule.

#### Cochlea:

The cochlea is made of three ducts and wraps itself into a coiled tube. Sound receptor cells are present within the middle duct of cochlea.

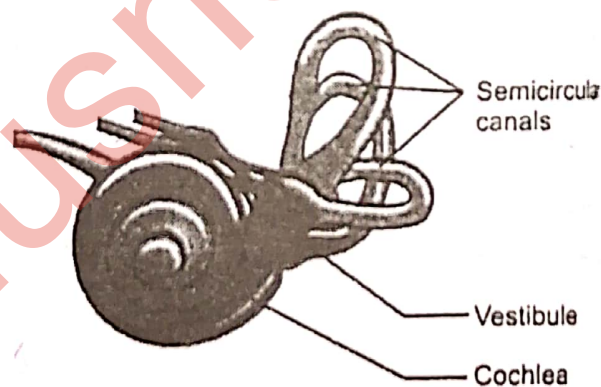


Figure: Structure of the Inner Ear

#### The Process of Hearing:

The pinna of the external ear focuses and directs sound waves into auditory canal. The sound waves strike ear drum and produce vibrations in it. From ear drum, the vibrations strike middle ear and produce further vibrations in malleus, incus and then stapes. From stapes, the vibrations strike the oval window and then reach the fluid-filled middle duct of cochlea. The fluid of cochlea is moved and receptor cells are stimulated. The receptor cells generate a nerve impulse, which travels to brain and is interpreted as sound.



Q. No. 11 Write a note on pituitary gland.

### **PITUITARY GLAND**

**Shape:**

It is a pea-shaped gland.

**Location:**

It is attached to the hypothalamus of brain.

**Master Gland:**

Many hormones (trophic hormones) of pituitary gland influence the secretions of other endocrine glands.

**Direct Action:**

Some hormones of this gland act directly on various tissues of body.

**Lobes of Pituitary Gland:**

There are two lobes of pituitary gland:

- 1) Anterior lobe
- 2) Posterior lobe

#### **1) ANTERIOR LOBE**

It produces many hormones.

(i) **Somatotrophin:**

One of its important hormones is somatotrophin. It is also known as growth hormone. It promotes the growth of body.

**Dwarfism:**

If the production of this hormone is diminished during growing age, the rate of growth decreases. This condition is called dwarfism.

**Gigantism:**

If this hormone is excessively produced during growing age, it leads to gigantism. The person becomes very tall and overweight.

**Acromegaly:**

If somatotrophin is excessively produced after growing age, internal organs and body extremities alone grow large. This condition is known as acromegaly. Such persons will have large hands, feet and jawbones.

(ii) **Thyroid Stimulating Hormone (TSH):**

Another important hormone secreted by the anterior lobe of pituitary gland is thyroid stimulating hormone (TSH). It stimulates thyroid gland to secrete its hormones.

**Other Hormones:**

The remaining hormones of anterior lobe influence reproductive organs and also control adrenal glands.

#### **2. Posterior Lobe:**

The posterior lobe of pituitary gland stores and secretes two hormones.

- (i) Vasopressin (Antidiuretic Hormone)
- (ii) Oxytocin

**Production:**

These hormones are produced by hypothalamus (a part of brain).

(i) **Vasopressin:**

Vasopressin increases the rate of reabsorption of water from nephrons.

**Lesser Water Potential:**

When we have low amount of water in body fluids, pituitary gland secretes vasopressin and so more reabsorption of water occurs from nephrons into blood. In this way, body retains water and less amount of urine is produced.

**Greater Water Potential:**

On the other hand, when body fluids have more than normal water, there is a decline in the secretion of this hormone. If pituitary gland does not secrete this hormone in the required amount; less water is reabsorbed from nephrons and there is excessive loss of water through urine. This condition is known as **diabetes insipidus**.

**(ii) Oxytocin:**

The hormone, oxytocin stimulates the contraction of uterus walls in mothers for child birth. Moreover, this hormone is necessary for the ejection of milk from breast.

**Q.No.12 Write a note on thyroid gland.****THYROID GLAND.****Largest Gland:**

This is the largest endocrine gland in human body.

**Location:**

It is present in neck region, below larynx.

**Hormones:**

It produces two hormones.

(i) Thyroxin

(ii) Calcitonin

**(i) Thyroxin:**

Thyroxin increases the breakdown of food (oxidation) and release of energy in body. It is also responsible for the growth of body.

**Goiter:**

Iodine is required for the production of thyroxin. If a person lacks iodine in diet, thyroid gland cannot make its hormone. In this condition, thyroid gland enlarges. This disorder is called goiter.

**Hypothyroidism:**

Hypothyroidism is caused by the under-production of thyroxin. It is characterized by low energy production in body and slowing down of heart-beat.

**Hyperthyroidism:**

Hyperthyroidism is caused by over-production of thyroxin. Its symptoms are:

- Increase in energy production
- Increased heart-beat
- Frequent sweating
- Shivering of hands

**(ii) Calcitonin:**

The thyroid gland produces another hormone called calcitonin. It decreases the level of calcium ions in blood and promotes the absorption of calcium from blood into bones.



Q.No.13 Write a note on parathyroid glands.

**PARATHYROID GLANDS**

**Number:**

These are four glands.

**Location:**

These are situated on the posterior side of thyroid gland.

**Parathormone:**

They produce a hormone known as parathormone. It increases the level of calcium ions in blood.

**Increased Production of Parathormone:**

When there is increased production of parathormone, more than normal calcium salts are absorbed from the bones and added to blood. Consequently the bones become brittle.

**Decreased Production of Parathormone:**

If there is deficiency in the production of parathormone, blood calcium level falls. It leads to tetany, which affects the functioning of muscles.

Q. No. 14 Write a note on adrenal glands.

**ADRENAL GLANDS**

**Number:**

These are two in number.

**Location:**

These are situated above kidneys.

**Structure:**

Each adrenal gland consists of two parts:

- (i) The outer part is cortex.
- (ii) The inner part is medulla.

(i) **Adrenal Cortex:**

The adrenal cortex secretes many hormones called corticosteroids which maintain the balance of salts and water in blood.

(ii) **Adrenal Medulla:**

Adrenal medulla secretes a hormone called epinephrine or adrenaline in response to stress. It prepares our body to overcome emergency situations. Therefore, adrenaline is also termed as 'emergency hormone'.

Q. No. 15 Write a note on pancreas.

**PANCREAS**

This organ has two functions.

**Exocrine Role:**

The major part of pancreas is a ducted (exocrine) gland. This portion secretes digestive enzymes, through a duct, into the small intestine.

**Endocrine Role:**

Some portions of pancreas serve as ductless (endocrine) gland. This portion contains groups of endocrine cells referred to as islets of Langerhans. These islets secrete two hormones:

(i) Insulin

(ii) Glucagon

**(i) Insulin:**

Insulin influences the liver to take excess glucose from blood and so the blood glucose concentration falls.

**(ii) Glucagon:**

Glucagon influences the liver to release glucose in blood and so the blood glucose concentration rises.

**Diabetes Mellitus:**

If a person's pancreas does not make normal quantity of insulin, the blood glucose concentration rises and we say that the person has diabetes mellitus.

**Symptoms:**

Persons with diabetes have:

- Loss of body weight
- Weakening of muscles
- Tiredness

**Control:**

The disease can be controlled by insulin administration. Formerly, insulin extracted from animals was used for this purpose. But now human insulin produced from bacteria through genetic engineering is available.

**Normal Blood Glucose Concentration:**

The blood glucose concentration is maintained at the rate of 80 to 120 mg per 100 ml of blood.

**Q.No.16 Write a note on gonads.****GONADS**

The male and female reproductive organs are called as gonads. The male reproductive organs are called testes and female reproductive organs are called ovaries. In addition to producing gametes, gonads also secrete hormones, called sex hormones.

**Testes:**

The singular of testes is testis. Testes secrete hormones e.g. testosterone, which is responsible for the development of male secondary sex characters such as:

- Growth of hair on face
- Coarseness of voice



**Ovaries:**

Ovaries secrete the following hormones:

- Estrogen
- Progesterone

**Function:**

These both hormones are responsible for the development of female secondary characters such as the development of breast etc.

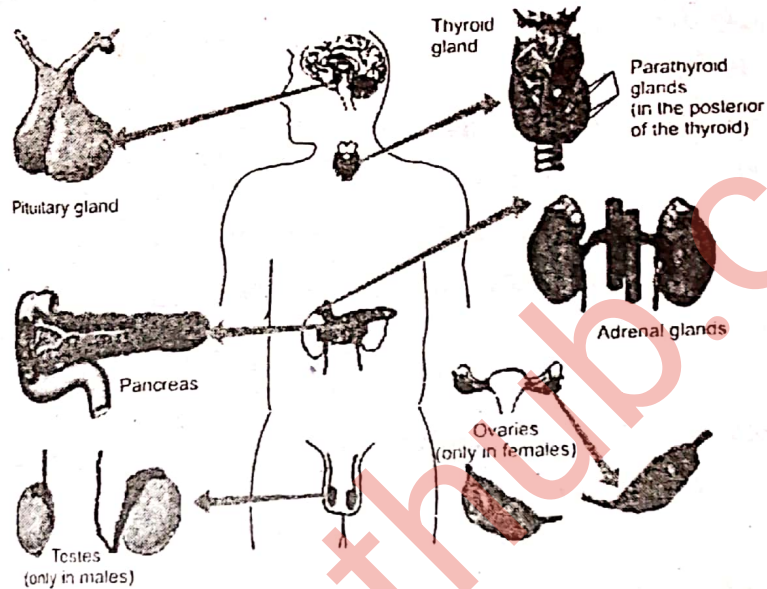


Figure: Endocrine Glands in Human Body

Q.No. 17 Describe feedback mechanisms.

### FEEDBACK MECHANISMS

**Definition:**

The regulation of a process by the output of the same process is called feedback mechanism.

**Explanation:**

Endocrine glands do not secrete their hormones at a constant rate. The rate varies with the needs of the body. Like many other functions in body, the secretion of hormones is also regulated by feedback mechanisms.

**Types of Feedback Mechanisms:**

Feedback mechanisms are of two types:

- (i) Negative Feedback
- (ii) Positive Feedback

**(i) Negative Feedback:****Definition:**

The feedback in which the output of a process decreases or inhibits the process is called negative feedback.

**Need:**

This mechanism works to return a condition towards its normal value.

**Example:**

**Control of Blood Glucose Concentration (BGC):**

The blood glucose concentration (output) controls the process i.e. the secretion of insulin and glucagon.

**Rise in Blood Glucose Concentration (BGC):**

When the blood glucose concentration rises, pancreas secretes insulin. It decreases the blood glucose concentration. Decline in the blood glucose concentration to a normal set-point inhibits the secretion of insulin.

**Decline in Blood Glucose Concentration (BGC):**

When blood glucose concentration drops below normal, pancreas secretes glucagon. It raises the blood glucose concentration. In this case, rise in the blood glucose concentration to a normal set-point inhibits the secretion of glucagon.

**(ii) Positive Feedback:**

**Definition:**

The feedback in which the changes resulting from a process increases the rate of process is called positive feedback.

**Example:**

**Suckling Action of Infants:**

Suckling action of an infant stimulates the production of a hormone in mother. This hormone works for the production of milk. More suckling leads to more hormone, which in turn leads to more milk production.

**Q.No.18 Describe disorders of nervous system.**

**NERVOUS DISORDERS**

The disorders of the nervous system are called as nervous disorders.

**Types of Nervous Disorders:**

There are two main types of nervous disorders:

**1) VASCULAR DISORDER**

The disorders which are due to any disturbance in the blood supply of nervous system are called vascular disorders.

**Example:**

Paralysis

**2) FUNCTIONAL DISORDER**

The disorders which are due to any disturbance in nerve impulse generation and transmission are called functional disorders.

**Example:**

- Epilepsy



**PARALYSIS****Definition:**

The complete loss of function by one or more muscle groups is called paralysis.

**Causes:**

It is most often caused by damage to the central nervous system (brain or spinal cord). The damage may be due to:

- Stroke (rupture in a blood vessel of brain or spinal cord)
- Blood clotting in these blood vessels
- Poison produced by polio viruses

**Effected Areas:**

Patient may have weak paralysis throughout his/her body or have paralysis in one side of the body. There may also be paralysis in the lower extremities or in all four limbs.

**EPILEPSY****Definition:**

The nervous disorder in which there is abnormal and excessive discharge of nerve impulses in brain is called epilepsy.

**Symptom:**

It causes unprovoked seizures in patient. A seizure of epilepsy is a temporary abnormal state of brain marked by convulsions.

**Causes:**

- In younger people, epilepsy may be due to genetic or developmental causes.
- In people over age 40 years, brain tumours are more likely to cause epilepsy.
- Head trauma and central nervous system infections may cause epilepsy at any age.

**Cure:**

There is no known cure of epilepsy but medicines can control seizures. Patients of epilepsy have to take medicines daily for the treatment as well as prevention of seizures. These are termed "anticonvulsant" or "antiepileptic" drugs.

**Precaution:**

During a seizure attack, objects should never be placed in a patient's mouth as it can result in serious injury. It is possible that the patient will bite his/her own tongue.

**EXERCISE MULTIPLE CHOICE QUESTIONS**

- \* Each question has four possible answers. Circle the correct answer.
- (i) Processes that carry nerve impulses away from the cell body are called:  
 (a) Axons (b) Dendrites (c) Synapses (d) Myelin sheath
- (ii) The portion of the nervous system that is involuntary in action:  
 (a) Somatic nervous system (b) Motor nervous system  
 (c) Autonomic nervous system (d) Sensory nervous system
- (iii) Which neurons are present inside the central nervous system?  
 (a) Sensory neurons only (b) Motor neurons only  
 (c) Sensory and motor neurons both (d) Interneurons only
- (iv) The part of the brain responsible for muscle movement, interpretation of the senses and the memory is the:  
 (a) Pons (b) Medulla oblongata (c) Cerebrum (d) Cerebellum
- (v) Apart from hearing, what other major body function is performed by the ear?  
 (a) Hormone secretion (b) Body balance  
 (c) Reduction in nerve pressure (d) All of these
- (vi) The myelin sheath is formed by, which wrap around the axons of some neurons.  
 (a) Nodes of Ranvier (b) Axons (c) Dendrites (d) Schwann cells
- (vii) This is not a part of the hindbrain:  
 (a) Pons (b) Medulla oblongata (c) Cerebrum (d) Cerebellum
- (viii) If you look at an intact human brain, what you see the most is a large, highly convoluted outer surface. This is the:  
 (a) Cerebrum (b) Cerebellum (c) Pons (d) Medulla oblongata
- (ix) Insulin and glucagon are produced in the:  
 (a) Hypothalamus (b) Anterior pituitary (c) Liver (d) Pancreas
- (x) All of these are hormones except:  
 (a) Insulin (b) Thyroxin (c) Glucagon (d) Pepsinogen

**ANSWER KEY**

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1	a	2	c	3	d	4	c	5	b
6	d	7	c	8	a	9	d	10	d



- (viii) Relate the contribution of Ibn-al-Haitham and Al-Ibn-Isa with knowledge about the structure of eye and treatment of various ophthalmic diseases.  
Consult KIPS Additional Short Question No. 40 and 41
- (ix) Outline the major glands of the endocrine system (pituitary, thyroid, pancreas, adrenal, gonads), with name of their hormones and their functions.  
Consult Long Question No. 11,12, 14, 15 and 16
- (x) Describe negative feedback with reference to insulin and glucagon.  
Consult Long Question No. 17
- (xi) Explain how adrenaline may be involved in exercise and emergency conditions.  
Consult Long Question No. 14
- (xii) Enlist the important symptoms and treatments of paralysis and epilepsy.  
Consult Long Question No. 18

### THE TERMS TO KNOW

#### Acromegaly:

Abnormal growth due to excessive production of growth hormone after growing age; the internal organs and body extremities alone grow large and affected persons have large hands, feet and jaw bones

#### Antidiuretic hormone:

The hormone of the posterior pituitary; promotes the reabsorption of water in renal tubules

#### Aqueous humour:

The fluid present in the anterior chamber of the eye i. e. between the cornea and the iris

#### Axon:

A long, thin fibre that carries nerve impulse away from the cell body of a neuron

#### Cell body:

The part of the nerve cell that contains nucleus

#### Cerebellum:

The part of the hindbrain; controls muscle movements

#### Cerebral hemisphere:

The divisions of the cerebrum of the brain

#### Cerebrospinal fluid:

The fluid in the ventricles of the brain and in the central canal of the spinal cord

#### Cerebrum:

The largest part of the forebrain; controls many sensory and motor functions

#### Cochlea:

The part of the inner ear; consists of three ducts wrapped in the form of a coiled tube; contains sound receptors

#### Colour blindness:

Genetic disorder in which person fails to recognize the basic colours

#### Cones:

The photosensitive cells in the retina of the eye; sensitive to bright light and so distinguish different colours

#### Cornea:

The transparent part of sclera that forms in the front of the eye through which light enters

**Cranial nerve:**

Nerves that arise from or lead to the brain

**Dendrites:**

Short, branched projections of neuron's cell body; transmit nerve impulses towards cell body

**Diabetes mellitus:**

More than normal level of glucose in blood; a condition caused by insufficient concentration of insulin in blood

**Dwarfism:**

Less than normal body growth; a condition caused when growth hormone is insufficient during the growing age

**Ear drum:**

Tympanic membrane; a membrane stretched across the inner end of the auditory canal of the ear

**Effectors:**

The parts of the coordination system that respond when stimulated by nerve impulses or hormones

**Endocrine gland:**

A ductless gland; produces and secretes hormones

**Epilepsy:**

A nervous disorder characterized by recurrent unprovoked seizures (convulsions)

**Estrogen:**

A hormone secreted by the ovaries; promotes development of secondary sex characteristics and regulates the reproductive cycle

**Eustachian tube:**

A tube between middle ear and the nasal cavity that equalizes the pressure on both sides of the ear drum

**Exocrine gland:**

A gland that discharges its secretion into a duct

**Ganglion:**

The aggregation of the cell bodies of the neurons

**Grey matter:**

The nervous tissue containing cell bodies and non-myelinated processes of the neurons

**Hormone:**

A substance that is secreted by an endocrine gland directly into the blood and that produces a specific effect on a particular tissue

**Hypermetropia:**

The condition in which a person is not able to see near objects clearly; happens when the eye ball shortens and image is formed behind the retina

**Hypothalamus:**

The part of the forebrain below the thalamus; controls body temperature, blood pressure and emotion

**Insulin:**

The hormone produced by the Islets of Langerhans; lowers blood glucose level

**Interneurons:**

The neurons present in the brain and spinal cord

**Iodopsin:**

A pigment present in the cones of retina



**Iris:**

A muscular ring formed by the bending of the choroid behind the cornea of the eye

**Islets of Langerhans:**

Groups of endocrine cells present in pancreas; secrete hormones insulin and glucagon

**Medulla oblongata:**

Part of the hindbrain; on the top of the spinal cord; controls breathing, heart rate, blood pressure and many reflexes

**Meninges:**

Three layers around the brain and the spinal cord; protect them and provide nutrition and oxygen through their capillaries

**Mixed nerve:**

The nerve containing axons of both the sensory and motor neuron

**Motor nerve:**

The nerve containing axons of motor neuron only

**Myelin sheath:**

The insulating sheath around the axons of some neurons

**Myopia:**

The condition in which a person is not able to see distant objects clearly; happens due to the elongation of the eye ball and image is formed in front of the retina

**Nerve:**

The union of several axons that are enveloped by a covering made of lipid

**Nodes of Ranvier:**

The non-myelinated points where the areas of myelin on the axons of neurons

**Optic disc:**

Blind spot; a point on the retina of the eye where the optic nerve enters the retina; no photosensitive cells exist at this point

**Oxytocin:**

The hormone secreted by the posterior pituitary; stimulates the contraction of uterus walls in females for child birth; necessary for ejection of milk from the breasts.

**Paralysis:**

Complete loss of function by one or more muscle groups due to damage in the nervous system.

**Parathormone:**

Hormone of the parathyroid glands; increases the level of calcium ions in the blood

**Parathyroid:**

The endocrine glands located on the posterior sides of the thyroid gland; secrete parathormone

**Pituitary:**

The endocrine gland attached to the hypothalamus that controls many other endocrine glands in the body.

**Pons:**

Part of the hindbrain; present on the top of medulla; assists the medulla in controlling breathing and serves as a connection between the cerebellum and the spinal cord.

**Progesterone:**

A hormone secreted by the ovaries that maintains the uterus during pregnancy.

**Pupil:**

The opening in the centre of the iris of the eye.

**Receptor:**

The organ, tissues or cells which detect particular type of stimuli.

**Reflex arc:**

The nerve pathway over which the nerve impulses travel in a reflex action.

**Retina:**

The inner most and the sensitive layer of the eye.

**Rhodopsin:**

A pigment present in the rods of the retina.

**Rods:**

The photosensitive cells present in the retina of the eye; sensitive to dim light.

**Schwann cells:**

The supporting cells around neurons; form the myelin sheath.

**Sclera:**

The tough, white outer layer of the eye

**Semicircular canals:**

The three canals present posterior to the vestibule in the inner ear

**Sensory nerve:**

The nerve which contain only the axons of the sensory neurons

**Somatotrophin:**

Growth hormone; a hormone of the anterior pituitary; promotes the growth of the body

**Spinal nerve:**

The nerve which arise from the spinal cord

**Suspensory ligament:**

The ring that attaches the lens of the eye to the ciliary muscles

**Testosterone:**

The male sex hormone secreted by testes; stimulates the development of male reproductive system and the male secondary sex characters.

**Thalamus:**

The part of the forebrain; serves as a relay centre between various parts of the brain and spinal cord

**Thyroid:**

The endocrine gland located in front of the trachea; secretes hormones thyroxin and calcitonin

**Thyroxin:**

The hormone of the thyroid gland; increases the breakdown of the food and release of energy; also responsible for the growth of the body

**Tympanum:**

Tympanic membrane; ear drum

**Vasopressin:**

Antidiuretic hormone; the secreted by the posterior pituitary; responsible for the reabsorption of water from renal tubules of the nephron

**Vestibule:**

Part of the inner ear; helps to maintain balance of the body

**Vitreous humour:**

The fluid present in the posterior chamber of the eye i. e. between the iris and retina